MONASH University

Managing Problematic Student Behaviours in Mainstream Primary Education Settings Through Self-Management

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Abstract

Teachers are regularly challenged with the task of managing disruptive student behaviour in class. High-incidence, low-intensity disruptive and disengaged behaviour are particularly problematic as they may disrupt teaching processes, hinder student learning and academic progress, and increase teacher stress and burnout (Aloe, Shisler, Norris, Nickerson, & Rinker, 2014; Sullivan, Johnson, Owens, & Conway, 2014). This thesis explores *self-management interventions* as a stream of promising strategies which may be used in schools to manage student behaviour. Self-management may be defined as the personal application of behaviour change tactics that are intended to produce or maintain a change in one's own behaviour (Cooper, Heron, & Heward, 2007). Self-management interventions broadly involve teaching students to use tactics to regulate their own behaviour in order to increase student independence while simultaneously reducing teacher behaviour management demands (Hoff & Sawaka-Miller, 2010; Maag, 1999).

In light of an extensive and growing body of school-based self-management research, this thesis comprises three interconnected studies. These studies explore, evaluate and extend research evidence on self-management interventions for primary level students displaying disruptive and disengagement behaviour in general education settings.

Using current Single-Case Design (SCD) evidence review methodology, Study 1 presents an updated SCD systematic evidence review/meta-analysis. Key findings of the review suggested that while sufficient high-quality SCD research evidence to conclude that self-management interventions targeting problem behaviour in general education primary classes may be considered an evidence-based practice, additional high-quality research is warranted to extend and strengthen existing evidence for distinct student populations and targeted outcomes.

Guided by the Self-Management Intervention Checklist (SMIC-2) framework (Fantuzzo & Polite, 1990), Study 2 presents a comprehensive intervention analysis of the SCD articles reviewed in Study 1. Findings indicated no universal self-management intervention exists within the identified evidence base; notable variability was evident across intervention composition, complexity, and degree of student and adult involvement. Intervention variability was also apparent across studies key training and implementation processes. Patterns in component analysis findings demonstrated some consistency across intervention packages in core self-management intervention components. Findings suggested optimal self-management packages may be simple in structure and primarily comprised of student-managed self-monitoring components. Recommendations from this second study include that future research is warranted to investigate technology-supported self-management strategies, and to further research intervention structure and implementation processes.

Informed by Study 1 and 2, Study 3 reports the process and results of a multiple-baseline intervention conducted to evaluate the pilot application of a simple though novel student-managed, technology-based self-management intervention system. Key findings revealed that the intervention was associated with increases in on-task behaviour and decreases in disruptive behaviour for three primary students in a general education class setting. The intervention was implemented with high-fidelity, and student and teacher participant perceptions of social validity were favourable. Taken together, these three studies explore self-management intervention use with primary school students who display problematic behaviour in general education classroom settings. Finally, limitations, implications for practice, and directions for future research are presented throughout this thesis.

Publications during enrolment

Peer Reviewed Articles

Furlonger, B.E., Oey, A., Moore, D.M., **Busacca, M**., & Scott, D. (2017). Improving mature indoor rock-climbing performance using a changing criterion design within self-management program. *The Sport Journal, 19.* Retrieved from http://thesportjournal.org/article/improving-amateur-indoor-rock-climbing-performance-using-a-changing-criterion-design-within-a-self-management-program/

Singh, B.D., Moore, D.W., Anderson, A., Furlonger, B.E., **Busacca, M.L.**, English, D.L. (2017). Teaching reading comprehension skills to a child with autism using behaviour skills training. *Journal of Autism and Developmental Disorders*, EarlyOnline. doi:10.1007/s10803-017-3229-7

Whitehouse, A.J.O., Granich, J., Alvares, G., **Busacca, M**., Cooper, M.N, Dass, A., Cuong, T., Harper, R., Marshall, W., Richdale, A., Rodwell., T., Trembath, D., Vellanki, P., Moore, D.M., & Anderson, A. (2017). A randomized-controlled trial of an iPad-based application to complement early behavioural intervention in Autism Spectrum Disorder. *Journal of Child Psychology and Psychiatry*. doi:10.1111/jcp.12752

Busacca, M. L., Anderson, A., & Moore, D. M. (2015). Self-management interventions for primary school students demonstrating problem behavior in regular classrooms: Evidence review of single-case design research. *Journal of Behavioral Education.* doi:10.1007/s10864-015-9230-3

Granich, J., Dass, A., **Busacca, M**., Moore, D., Anderson, A., Venkatesh, S., Duong, T., Vellanki, P., Richdale, A., Trembath, D., Cairns, D., Marshall, W., Rodwell, T., Rayner, M., & Whitehouse, A. (2016). Randomised controlled trial of an iPad based early intervention for autism: TOBY playpad study protocol. *BMC Pediatrics.* doi:10.1186/s12887-016-0704-9

Lao, S-A., Furlonger, B. E., Moore, D. W., & **Busacca, M**. (2016). Learning to swim using video modelling and video feedback with a self-management program. *Australian Journal of Adult Learning.*

Conference Presentations

Busacca, M. L., Anderson, A., & Moore, D. W. (September, 2016). *Self-Management Assistive Technology (SMAT): Implementation of technology-based self-management to improve on-task behaviour in primary students.* Conference presentation presented at the Association for Behaviour Analysis Australia (ABAA) Conference 2016 in Melbourne Australia.

Busacca, M. L., Anderson, A., & Moore, D. W. (September, 2016). *Implementation of technology-based self-management to improve on-task behaviour in primary school students: Self-Management Assistive Technology (SMAT) – A pilot study.* Conference presentation presented at the 8th Conference of the European Association for Behaviour Analysis, Enna, Italy.

Busacca, M. L., Anderson, A., & Moore, D. W. (July, 2015). *Self-management interventions for primary school students demonstrating problem behaviour in regular classrooms: evidence review of single-case design research.* Conference presentation presented at the MERC Annual Conference at Monash University, Clayton, Victoria. **NOTE**: Was awarded one of five MERC Publication Awards ($500) for the article this presentation was based upon.

Poster Papers

Ostojic. M., Chung, J., **Busacca, M. L.,** & Furlonger, B. (September, 2016). *Methods of assessing health smartphone apps for behavioural content: A systematic review.* Poster paper presented by first two authors at the Association for Behaviour Analysis Australia (ABAA) Conference 2016 in Melbourne Australia. **NOTE:** Poster was awarded 1st price.

Furlonger, B., Dong, J., Stevanovic, N., & **Busacca, M.** (September, 2015). *Applying recent innovations in the changing criterion design to the sports of jogging and tennis.* Poster paper presented by first author at the 8th International Conference for the Association for Behavior Analysis International in Kyoto, Japan.

Thesis Including Published Works Declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes one original paper published in a peer reviewed journal. The core theme of the thesis is the management of problematic or challenging student behaviour in mainstream primary school education settings through self-management intervention. The ideas, development and writing up of the paper in the thesis were the principal responsibility of myself, the student, working within the Faculty of Education) under the supervision of Prof. Dennis Moore and Dr. Angelika Anderson.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research. In the case of Chapter 4 my contribution to the work involved the following:

Thesis Chapter	Publication Title	Status	Nature and % of student contribution	Co-author name(s) Nature and % of Co-author's contribution	Co-author(s), Monash student Y/N*
4	Self-Mangement for Primary School Students Demonstrating Problem Behavior in Regular Classrooms: Evidence Review of Single-Case Design Research	Published	70%. Concept, data collection, data analysis, methodology development, writing first draft, and manuscript revisions/refinement	1) Dr. Angelika Anderson 15% 2) Prof. Dennis Moore 15% Both co-authors had input into the manuscript, assisted with aspects of data analysis and methodology development, and were involved in manuscript revisions/refinement	No

I have renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

Student signature: [redacted] **Date:** July 10th 2017

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Main Supervisor signature: [redacted] **Date:** July 10th 2017

Acknowledgements

Dedicated to my Grandparents,
Guiseppe & Margherita Busacca and Dominic & Giovanna Speranza
for showing me value of hard work and perseverance,
and my parents,
Emanuele & Giovanna Busacca
for supporting me every step of the way

At the beginning of my PhD journey I was told – "completing a PhD is like running a marathon – it's no easy feat." Having just run a marathon at the start of my PhD program in 2013, and now, finally reaching the PhD 'finish line', I now reflect on this statement and consider it to be an absolute truth. Just like running a marathon, finishing a PhD requires a phenomenal amount of commitment, determination, self-discipline, and endurance. And just like training for a marathon, completing a PhD requires one to have a support crew to help them get through the challenges, barriers, and moments of self-doubt. In managing to finally finish the longest marathon I will ever run - my PhD – I need to extend gratitude to my phenomenal support crew who have supported me right until the end.

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Chapter 1: Introduction

This chapter sets the scene for the thesis to follow. The chapter begins with a background on the research area, and a rational for this PhD project. Next, the purpose of this thesis is outlined, followed by an overview of: (i) the studies presented in this project, (ii) research aims and objectives, (iii) the adopted methodological approach, and (iv) the thesis structure. The broad context of this thesis is to explore, evaluate, *and* extend published research evidence which has presented investigations into the use of behaviour self-management interventions to promote positive student behaviour in general education settings.

1.1 Background and Rationale

> *An overarching goal in education is to enable students to become independent and self-sufficient individuals who are able to manage their behaviors without the assistance of others (Cooper, Heron, Heward, 2007; Lan, 2005). When students are able to manage their own behaviors (also known as self-regulation), they do not rely on external controls such as teacher prompting* (Rafferty, 2010, p. 51).

Student misbehaviour has long been a matter of concern for education professionals given that challenging student behaviour can be a significant barrier to student learning, student performance, and teaching processes in education settings (Aloe, Shisler, Norris, Nickerson, & Rinker, 2014; Goss, Sonnemann, & Griffiths, 2017; Sullivan, Johnson, Owens & Conway, 2014). Thus, it may come as no surprise that matters associated with student classroom behaviour, and behaviour management have received a substantial amount of attention throughout education practice guides, education reports, and education research (Epstein, Atkins, Cullinan, Kutash, & Weaver, 2008; Goss et al., 2017; Office of the Auditor General Western Australia, 2014).

The decision to focus this PhD research on self-management interventions for primary students demonstrating problem behaviour in general education settings (a narrow aspect of the broader classroom behaviour management field) stemmed from reading an education article titled, *Can I have your attention?* (Milburn, 2009), published on-line by The Age, a reputable daily newspaper published in Melbourne, Australia. The article (extract in Figure

1.1) published in Oct 12, 2009, highlights concern surrounding student disruptive behaviour, reporting that "one in four teachers loses 30 percent of classroom time because of disruptive student behaviour and administrative tasks" and "teachers in Australia, Italy, Malta, Portugal, Spain and Iceland spend on average more than 14 per cent of their classroom time restoring order." Fast forward to February 2017, nearing PhD submission, student behaviour remains a topical issue with The Australian, another mainstream Australian newspaper, publishing an on-line article titled *Disengaged students challenge teachers without being disruptive* (Balogh, 2017) (extract in Figure 1.2). The author, Stefanie Balogh, National Education Correspondent, reports disengagement is Australia's "hidden classroom epidemic", warning that "disengaged students are classed as quiet and inattentive, or engaging in disruptive behaviours such as being noisy, restless or -interrupting others." The article also highlights disengaged and unproductive type behaviours are negatively impacting academic results.

Classroom settings are complex environments encompassing an array of interacting factors, including student behaviour, which can impact upon teaching and learning processes, as well as teacher and student well-being. School teachers on a daily basis face the challenge of educating diverse student populations, while simultaneously managing an array of student behaviour (Rafferty, 2010; Sullivan et al., 2014). Minor behaviour, including *active disruptive behaviour*[1] and *passive disengagement*[2], are of widespread concern due to high frequency, the negative impact on teacher instruction and student learning and academic progress, and the demand placed on teachers in terms of increased risk of stress, emotional exhaustion, and burnout (Aloe et al., 2014; Goss et al., 2017; Jull, 2009; Sullivan et al., 2014). With a recent report documenting teachers largely perceive minor, low-level challenging student behaviour to be more difficult to manage than aggressive or violent behaviours (Goss et al., 2017), disruptive and disengaged behaviour were elected as the focal point of this research.

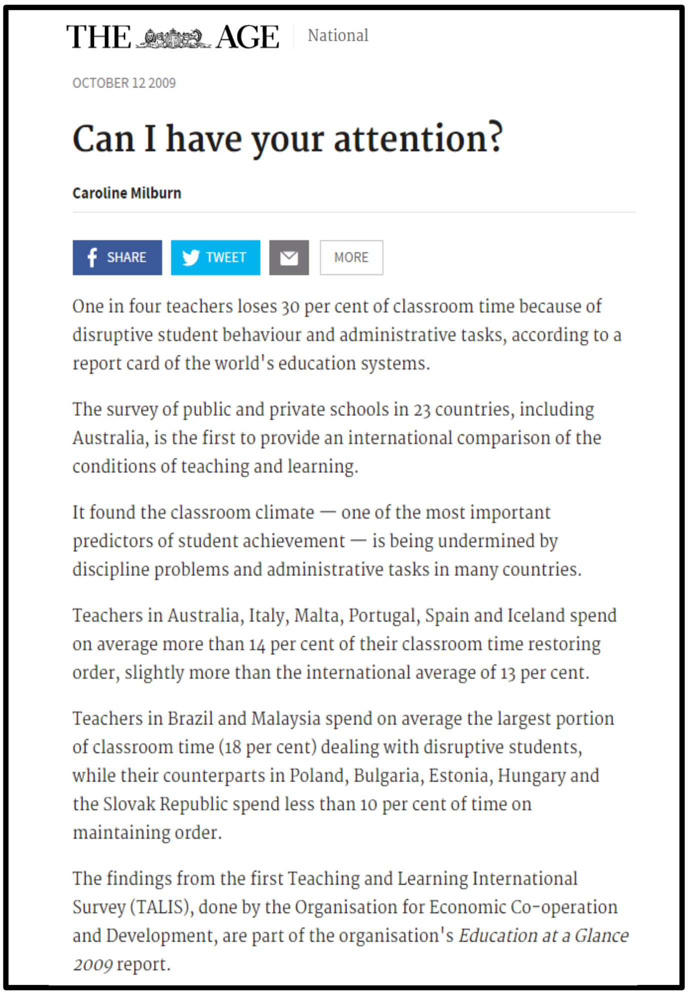
A long tradition of research exists for behaviour management approaches in education settings exists, with researchers investigating a wide range of interventions (Briesch, Briesch & Chafouleas, 2014; Epstein et al., 2008; Stage & Quiroz, 1997), and prevention-based School-Wide Positive Behaviour Support (SW-PBS) models as a way to promote positive

[1] E.g., avoiding school work, disengaged behaviour, being late for class
[2] E.g., disrupting the lesson, taking out of turn, being rowdy, making distracting noises, moving around, interfering with property

student academic and behavioural outcomes (Fairbanks, Simonsen, & Sugai, 2008; Lane, Menzies, Ennis, & Bezdek, 2013; Lewis, Mitchell, Bruntmeyer, & Sugai, 2016; Sugai & Horner, 2002). Although numerous promising strategies have been used to effectively address problem student behaviour (Epstein et al., 2008; Stage & Quiroz, 1997), many behaviour management interventions and behaviour support frameworks are implicitly designed to be implemented or directed by teachers and education professionals (Jones, 2011; Levin & Nolan, 2000; Little, 2003; Oliver & Reschly, 2007; Rosenbaum & Drabman, 1979). It can be difficult for education professionals to implement such approaches with integrity due to existing teaching responsibilities, classroom constraints, high costs, and time and resource demands (Briesch & Chafouleas, 2009; Levin & Nolan, 2000).

Since the late 1960s, *self-management interventions* have been widely promoted as an effective student-mediated alternative to teacher-mediated interventions, with the appeal of self-management interventions largely stemming from the idea these strategies require minimal teacher involvement, and can be effectively taught and used by a wide range of student populations to improve behaviours (Briesch & Chafouleas, 2009; Hoff & Sawka-Miller, 2010; Stage & Quiroz, 1997). Broadly speaking, self-management interventions may be defined as a collection of strategies which involve the personal use of behaviour change tactics or processes that are intended to produce and/or maintain a change in one's own behaviour (Cole, 1992; Cooper, Heron, & Heward, 2007). In essence, self-management interventions involve teaching students to use strategies that increase positive behaviours or decrease problem behaviours (Cole, 1992). Through self-management interventions students may learn to actively and independently control their own behaviour, and thus reduce behaviour management demands on teachers such that more time may be spent on academic instruction and tasks (Hoff & Sawka-Miller, 2010; Maag, 1999). Aiding students to develop *self-regulation, or self-management skills* is crucial for promoting life-long learning, student self-reliance, and behavioural independence (Briesch & Chafouleas, 2009; Goss et al., 2017; Rafferty, 2010; Shapiro & Cole, 1994).

While an extensive body of research literature broadly investigates self-management interventions targeting student outcomes across a range of education settings with various student populations, research in recent years has begun to emphasise the need for more *targeted reviews* of self-management interventions utilising *current Single-Case Design (SCD) evidence review methodologies*. Furthermore, a prominent trend in more recent self-management intervention literature exists where researchers emphasise the need to investigate self-management interventions factors beyond effectiveness (e.g., Briesch & Chafouleas, 2009; Bruhn, McDaniel, & Kreigh, 2015; Davis, Mason, Davis, Mason, & Crutchfield, 2016). Refined research is needed to investigate how self-management interventions are to be (a) optimally *structured*, (b) efficiently *implemented*, and (c) *advanced* to fit within the modern classroom context.



THE AGE | National

OCTOBER 12 2009

Can I have your attention?

Caroline Milburn

SHARE TWEET MORE

One in four teachers loses 30 per cent of classroom time because of disruptive student behaviour and administrative tasks, according to a report card of the world's education systems.

The survey of public and private schools in 23 countries, including Australia, is the first to provide an international comparison of the conditions of teaching and learning.

It found the classroom climate — one of the most important predictors of student achievement — is being undermined by discipline problems and administrative tasks in many countries.

Teachers in Australia, Italy, Malta, Portugal, Spain and Iceland spend on average more than 14 per cent of their classroom time restoring order, slightly more than the international average of 13 per cent.

Teachers in Brazil and Malaysia spend on average the largest portion of classroom time (18 per cent) dealing with disruptive students, while their counterparts in Poland, Bulgaria, Estonia, Hungary and the Slovak Republic spend less than 10 per cent of time on maintaining order.

The findings from the first Teaching and Learning International Survey (TALIS), done by the Organisation for Economic Co-operation and Development, are part of the organisation's *Education at a Glance 2009* report.

Figure 1.1. Extract from education article published in The Age (Milburn, 2009) (Extracted May 23rd, 2017, from http://www.theage.com.au/national/education/can-i-have-your-attention-20091009-gqkw.html)

THE AUSTRALIAN
FOR THE INFORMED AUSTRALIAN

Disengaged students challenge teachers without being disruptive

Students Harriet Dawson and Akwasi Boakye at Living Faith Lutheran School, where student results have improved and the level of engagement is up. Photo: Glenn Hunt.

The Australian | 12:00AM February 6, 2017 41 Save

STEFANIE BALOGH
National Education Correspondent | Canberra @stefaniebalogh

Sometimes they slump in their chairs in the back row or meld into the throng of classmates in the middle, camouflaged by everyone else busily getting on with their day. These students are not necessarily disruptive or rude; they've turned up to class and they're doing enough. They're just switched off. Meet Australia's hidden classroom epidemic: disengagement.

Those flying under the radar include intermittent workers — they get on with things when the teacher's gaze is on them, dropping off when attention switches elsewhere. Then there are the easy riders who work more slowly than others. Their skill is in finding ways to drag out even simple or routine tasks without causing ripples. Ghost students, who go completely unnoticed by teachers, are less common.

A new report by the Grattan Institute, Engaging Students: Creating Classrooms that Improve Learning, details how disengagement is a bigger drain on classroom productivity than headline-grabbing violence or anti-social behaviour.

Disengaged students are classed as quiet and inattentive, or engaging in disruptive behaviours such as being noisy, restless or interrupting others.

Figure 1.2. Extract from education article published in The Australian (Balogh, 2017) (Extracted May 23rd, 2017, from http://www.theaustralian.com.au/news/inquirer/disengaged-students-challenge-teachers-without-being-disruptive/news-story/af9a15657580bc80302c8c5cb4eda180)

1.2 Purpose of PhD

Building upon a long line of research investigating the use of self-management interventions in education settings, the purpose of this PhD research was to explore, evaluate *and* extend current research evidence which documents investigations on school-based self-management interventions in promoting positive classroom behaviour. More specifically, this research endeavoured to examine use of self-management interventions with primary school students displaying low-level, high-frequency disruptive behaviour and disengagement in general education settings.

1.3 Study Research Aims and Objectives

This PhD consists of three interlinked studies which have been designed to address the broader research aim. These three studies and their respective aims, objectives, or research questions are outlined below.

1.3.1 Study 1 – Evidence review (Systematic literature review/Meta-analysis). The first study is an evidence review of Single-Case Design (SCD) research investigating self-management interventions for primary school students demonstrating challenging behaviour in general education classroom settings. With the goal of systematically identifying, appraising, evaluating, and synthesizing high-quality SCD research evidence, systematic literature review and meta-analysis methodologies[3] were adopted for this research. The key objective of this study was to determine whether adequate high-quality SCD research literature, documenting sufficient empirical evidence exists, such that self-management may be classified as an effective evidence-based practice for primary students demonstrating challenging behaviours in general education classrooms.

1.3.2 Study 2 – Comprehensive intervention analysis. The second study is a comprehensive review conducted to explore the structure and procedures of self-management interventions used to target challenging behaviour displayed by primary school students in general education classroom settings. The purpose of this study was to identify core elements

[3] Guided by current SCD research design and evidence standards – What Works Clearinghouse (WWC) Single-Case Design Standards (WWC, 2014)

and critical features required to implement optimally effective self-management interventions. An adapted version of the Self-Management Intervention Checklist (SMIC-2), by Fantuzzo and colleagues (Fantuzzo & Polite, 1990; Fantuzzo, Polite, Cooke & Quinn, 1988; Fantuzzo, Rohrbeck, & Azar, 1987) was applied in this study to systematically code, evaluate, and compare the intervention packages contained within the SCD evidence-base identified in Study 1. Self-management interventions were mapped and evaluated in terms of: component structure, intervention management, complexity, implementation processes, training procedures, social validity, procedural fidelity, and intervention fading processes. In addition, this study involved examining intervention features (i.e., component structure, management, complexity), student characteristics (e.g., disability status and grade), and targeted behaviour as potential moderators influencing self-management effect size outcomes.

1.3.3 Study 3 –Pilot self-management intervention SCD study. The third, and final study, is a SCD investigation which was conducted to examine the pilot application of a novel self-management intervention system. The primary goal of this study was to build upon, and extend the self-management evidence-base by piloting an innovative, simple, technology-based, student-directed self-management intervention system, informed by Study 1 and 2 findings. This study piloted a self-management intervention incorporating Self-Management Assistive Technology (SMAT) (Bertram, 2015), using a multiple-baseline design (MBD) such that What Works Clearinghouse (WWC) SCD design and evidence standards (WWC, 2014) were met; enabling the SCD study to contribute to the existing evidence-base. An objective of this study was to evaluate intervention effects on targeted on-task behaviour and concomitant disruptive behaviour outcomes for three primary school student participants in a general education class setting. Further objectives included evaluating the modern self-management system in terms of: outcome generalisability across conditions, maintenance of behaviour over time, social validity (i.e., useability, acceptability), treatment fidelity, and the degree to which students were directly responsible for intervention elements.

1.4 Methodological Approach

The research methodologies applied throughout this thesis are applied behaviour analysis SCD research approaches. In addition to the overarching purpose of this PhD (exploring, evaluating, *and* extending research evidence on the use of self-management interventions to address behavioural needs for primary students in general education), this thesis had a secondary objective associated with investigating use of SCD research in establishing Evidence-Based Practice (EBP). Granted no universally accepted approach for revising and synthesising SCD literature exists (Maggin & Chafouleas, 2013; Smith, 2012; Wendt & Miller, 2012), a goal of this research was to establish a justifiable SCD evidence review methodology for use in this PhD. As such, efforts were dedicated to investigating, and adapting existing SCD analysis methods and evidence evaluation processes documented throughout existing literature; analysis elements and standards considered are listed in Table 1.1. Advantages and disadvantages related with this task are discussed in depth throughout this thesis. A notable sub-objective of this PhD was to address the state of SCD visual analysis methodologies, and to develop a Single-Case Design Visual Analysis protocol for use in Study 1.

Table 1.1
Methodological Elements

Adopted Single-Case Design Methodological Elements
What Works Clearinghouse (WWC) Single-Case Design and Evidence Standards
SCD Visual Analysis
SCD Effect Size Computations
SCD experimental design – Multiple-Baseline Design

1.5 Thesis Structure and Chapter Summary

This thesis structure differs slightly from that of a traditional thesis. In planning this project, it became evident that four distinct sections existed. The four sections, collectively made up of eight chapters, are outlined in the flow chart in Figure 1.3 and Table 1.2. Section I (*Introduction, Background, and Rationale*) introduces the thesis topic, provides a brief background on behaviour management in schools and the potential of self-management as a behaviour management strategy, reviews broader literature surrounding the topic of self-management interventions, provides a framework for this research, forms a rationale for the current thesis, and presents the research intentions of this project. The first section is broken into an introduction chapter (Chapter 1, this chapter), and a literature review (Chapter 2) that broadly considers the state of published review literature on self-management interventions in education. The presented review (Chapter 2) specifically provides a background on the thesis research area, including an overview of: (a) theoretical framework (i.e., self-determination theory), (b) self-management interventions in education contexts, (c) self-management and its place within the SW-PBS framework, and (d) self-management strategy terminology.

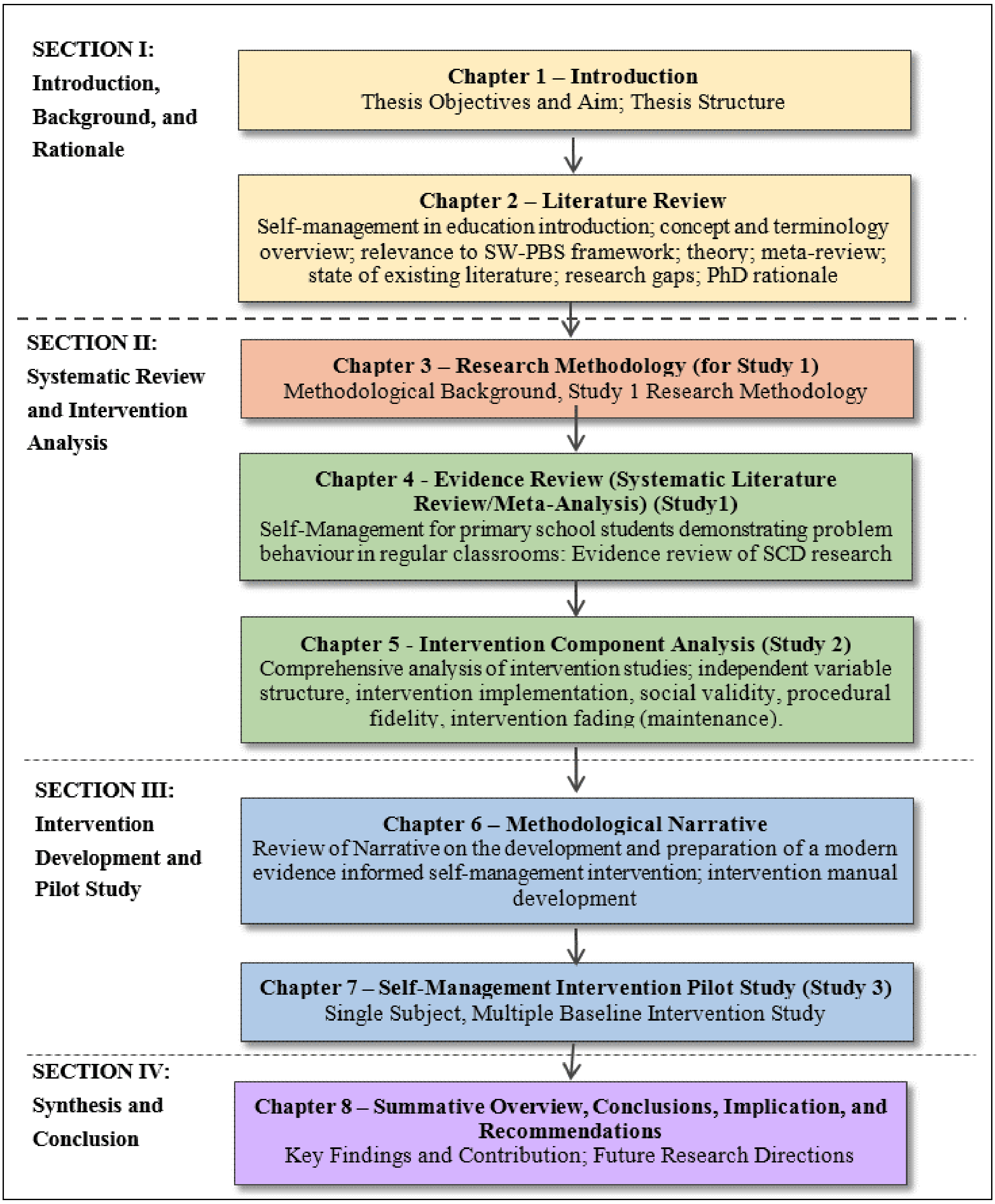


Figure 1.3. PhD framework by section and chapter

Section II (*Systematic Review and Intervention Analysis*) seeks to explicitly investigate the current state of, and the findings documented by, high-quality research evidence for self-management interventions targeting the behaviour of primary school students in general education settings. This section presents Study 1 (*Systematic Literature Review/Meta-Analysis*) and Study 2 (*Component Analysis*) in Chapters 4 and 5, along with an expanded methodology chapter (Chapter 3) to supplement Study 1 and Study 2.

Section III (*Intervention Development and Pilot Study*) motions to address gaps identified in the existing evidence-base, and endeavours to expand and advance the evidence identified and reviewed in Section II. This section contains an intervention development chapter (Chapter 6), followed by Study 3, a SCD self-management intervention pilot study (Chapter 7). The development chapter presents a brief literature review on current intervention development matters, focusing on the use of technology in self-management interventions. It then goes on to detail the development of a modern self-management intervention (along with step-by-step intervention implementation and training guidelines) informed by the current technology movement in self-management literature and findings from Studies 1 and 2. Study 3 (Chapter 7) presents a self-contained SCD study which details the methodology, findings, and subsequent discussion, from the study investigating use of a novel technology-based self-management intervention used with three primary school students in a general education setting to target on-task and disruptive behaviour.

Section IV (*Synthesis and Conclusion*) presents the final chapter (Chapter 8): a PhD conclusion which synthesises the findings from the series of studies presented in this PhD, and details discussion points, conclusions, limitations, and research and practice implications arising from the work.

Table 1.2

Thesis Structure

Section	Section Focus	Chapter
Section I	Introduction, Background, and Rationale	Chapters 1 & 2
Section II	Systematic Review and Intervention Analysis	Chapters 3 - 5
Section III	Intervention Development and Pilot Study	Chapters 6 & 7
Section IV	Synthesis and Conclusion	Chapter 8

This thesis includes a published paper, and is thus classified as a "*Thesis including Published Works."* Capter 4 (Study 1) is presented in its original publised format, and is thus formatted to the specific formatting and layout requirements of the *Journal of Behavior Education*. The presented article has been writen by the author of this PhD (Margherita Busacca), along with the two named PhD supervisors (Prof. Dennis Moore, and Dr. Angelika Anderson); as such a declaration regarding authorship has been made in the preliminary pages of this thesis. While attempts have been made to reduce repetition across chapters as much as possible, sections in the presented article overlap with content in other chapters (e.g., introduction background and methodology). Excluding Chapter 4, the remainder of this thesis takes the form of a traditional thesis. The format of this thesis meets the requirements of the Monash University Institute of Graduate Research (MIGR) and the requirements of the Faculty of Education, Monash University.

The citations and referencing conform to the guidelines of the American Psychological Association (APA) – 6th Edition. For the most part, the formatting and layout of this thesis adheres to the standards, although deviations occur primarily in the use of coloured figures (for increased visual appeal and clarity), and the use of alternate table layouts to communicate information more effectively. With the exception of Chapter 4, the published article, full references for in-text citations are located in a reference list provided at the end of this thesis.

Chapter 2: Literature Review

The purpose of this chapter is to provide an introduction to the area of education-based behavioural self-management interventions and to provide a review of literature relevant to this PhD. The chapter begins by outlining the importance of addressing student self-management skills within education contexts from the perspective of self-determination framework and self-regulation skill development. Next, the construct of *self-management* is formally introduced and defined. An overview of self-management components, concepts, and terminology is provided within a seminal framework. Use of self-management interventions as a strategy which can promote positive student behaviours is then discussed within a School-Wide Positive Behaviour Support (SW-PBS) framework. Following on, a brief overview of theories which underpin self-management interventions is presented. Published review literature investigating self-management intervention use in education contexts is then analysed to evaluate the current state of literature. Finally, this chapter closes with an overview of notable research gaps in the review literature and a rationale for the investigations that make up this PhD.

2.1 Self-Determination as an Educational Outcome

The construct *self-determination* broadly refers to “acting as the primary causal agent in one’s life and making choices and decisions regarding one’s quality of life free from undue external influence or interference” (Wehmeyer, Kelchner, & Richards, 1996, p. 632). Over the last two decades self-determination has emerged as a prominent theme throughout education and special education literature, and is now considered a critical educational outcome for students with and without disabilities (Algozzine, Browder, Karvonen, Test, & Wood, 2001; Carter, Lane, Jenkins, Magill, Germer, & Greiner, 2015; Cho, Wehmeyer, & Kingston, 2011, Martin, Mithaug, Cox, Peterson, Van Dycke, & Cash, 2003; Wehmeyer, 1997, Wehmeyer, Agran, & Hughes, 2000). Accordingly, wide-spread agreement supports the idea that students should be educated in a manner that not only facilitates critical academic outcomes, but in ways which facilitate development of critical self-determination skills and behaviour (Algozzine et al. 2001; Carter et al., 2015; Cho et al., 2011; Martin et al., 2003; Stang, Carter, Lane & Pierson, 2008; Wehmeyer, 1997, 2011).

According to Wehmeyer's (1999) *functional model of self-determination* the behaviour of self-determined individuals reflects autonomy, self-regulation, psychological empowerment and self-realization. Thus, it is proposed, students should be provided with opportunities to develop interrelated skills, abilities, attitudes, and beliefs that will enable them to display these four essential characteristics at school (Algozzine et al. 2001; Field, Martin, Miller, Ward, & Wehmeyer, 1998; Wehmeyer, 1999). Wehmeyer et al. (2000) suggest instruction and intervention efforts which facilitate acquisition of the aforementioned characteristics and associated skills may aid students in becoming causal agents who can take greater responsibility for their own learning and behaviour.

2.2 Student Self-Regulation and Self-Management

Researchers investigating promotion of student self-determination frequently draw attention to *self-regulation* as a critical instructional or intervention focus (Carter, Lane, Crnobori, Bruhn, & Oakes, 2011; Martin et al., 2003; Mithaug, Mithaug, Agran, Martin, & Wehmeyer, 2007). According to Whitman (1990) self-regulation "enables individuals to examine their environments and their repertoires of responses for coping with those environments to make decisions about how to act, to act, to evaluate the desirability of the outcomes of the action, and to revise plans as necessary" (p. 375). Self-regulation skills may enable students to be actively involved in learning processes, improve student engagement and learning, enhance learning opportunities, and increase greater student control (Mithaug et al., 2007; Wehmeyer et al., 2000, Wehmeyer, Abery, Mithaug, & Stancliffe, 2003). Given the potential benefits associated with self-regulation, development of self-regulation skills is held in high regard by education stakeholders.

In a survey-based study by Stang et al. (2008), 891 general and special education teachers in middle and elementary school rated the extent to which they valued and provided instruction on seven self-determination instructional domains proposed in Wehmeyer's (1999) framework. While all self-determination domains were judged to be of high importance, self-management and self-regulation was ranked the second most important (only exceeded by problem-solving) with 95.5% of respondents ranking this skill domain to be of *moderate* (28.6%) *to high* (66.9%) importance (Stang et al., 2008). In replicating the Stang et al. study with 407 special and general elementary teachers, Cho et al. (2011) also found the self-management and self-regulation domain was ranked second in terms of importance, falling behind goal-setting and attainment skills. These findings have been recently verified by Carter et al. (2015) who investigated school administrators' (*n* = 333, 92.6% principals) views on promoting self-determination in elementary, middle, and high school settings. Skill importance ratings revealed 72.9% of participants ranked self-management and self-regulation to be of high importance; only problem-solving (84.9%) and decision making (76.3%) were rated to be of higher importance.

While aforementioned studies show self-management and self-regulation promotion is highly valued by school personnel, results reveal instruction and interventions targeting these student skills are not consistently used. Stang et al. (2008) reported only 51.4% of respondents indicated they "often" provided instruction on self-management skills. Similarly, Cho et al. (2011) and Carter et al. (2015) indicated most participants reported students are not frequently exposed to self-management and self-regulation learning opportunities. In light of these findings, further research is needed to investigate instructional approaches and intervention strategies which may be used in school settings to promote self-determination via teaching students vital self-management and self-regulation skills.

Over the years substantial research attention has been directed at investigating self-regulation and self-management skill promotion through the use of self-management interventions in education contexts (Bruhn, McDaniel, & Kreigh, 2015; Field et al., 1998; Korinek, 2015; Konrad, Fowler, Walker, Test & Wood, 2007; Mithaug et al., 2007; Prater, 1994; Wehmeyer et al., 2000; Wehmeyer, Field, Doren, Jones & Mason, 2004). As individual self-regulation typically involves displays of self-management skills such as self-monitoring, self-evaluation, goal-setting and self-reinforcement (Mithaug et al., 2007; Wehmeyer et al., 1996; Wehmeyer, 1997, 1999; Whitman, 1990), self-management interventions may foster self-determination development. This idea is supported by Carter et al., (2011) in their review findings which highlight that self-management strategies have been frequently incorporated in interventions to promote self-determination and self-regulation in school contexts. After reviewing literature investigating self-determination interventions for students with and at risk for emotional and behavioural disorders (K-12), Carter et al. (2011) found self-regulation and self-management strategies were the most prevalent self-determination intervention components, incorporated in nearly two thirds of the reviewed studies (65.4%; *n*Studies=81).

2.3 Behavioural Self-Management in Education Contexts

As a construct, self-management may be broadly defined as "the personal application of behaviour change tactics that produces a desired change in behaviour" (Cooper, Heron, & Heward, 2007, p. 578). Historically known as self-control, self-management represents a broad range of strategies, which typically involves students using tactics to identify, monitor, and assess their own behaviour without the aid of others (Cooper et al., 2007; Rafferty, 2010; Rumsey & Ballard, 1985). In education, self-management interventions generally involve teaching students to engage in numerous processes or strategies that will aid them in developing the self-management skills necessary for them to independently change and maintain their own behaviour (Briesch & Daniels, 2013; Cole, 1992; Prater, 1994). Self-management interventions are widely heterogeneous, multi-component interventions, as they incorporate various self-management strategies including self-monitoring (self-observation and self-recording), self-evaluation, self-reinforcement, and goal setting (Cooper et al., 2007; Rafferty, 2010; Southhall & Gast, 2011). Description of these strategies is provided in Table 2.1. While self-management interventions are not strictly limited to the aforementioned strategies they are amongst most commonly referenced in self-management literature.

Table 2.1

Common Self-Management Strategies

Strategy	Definition
Self-monitoring	Involves students systematically observing their own behaviour (self-observation) and recording the occurrence or non-occurrence of a target behaviour (self-recording)
Self-evaluation	A process in which students assess their own behviour (i.e., performance of a target behaviour) against a set standard or goal. This strategy is sometimes referred to as *self-assessment*
Self-reinforcement	A tactic which requires students to self-deliver an earned reward contingent upon meeting a set standard or goal
Goal-setting	A strategy which involves students creating a specific behaviour target or standard

Note: Definitions adopted from Cooper et al., 2007; Rafferty, 2010; Southhall & Gast, 2011

In a classic review of self-management intervention literature Fantuzzo, Rohrbeck, and Azar (1987) propose the structure of various self-management intervention packages may vary broadly, incorporating up to 11 different self-management components. Fantuzzo et al. (1987) developed the Student Management Intervention Checklist (SMIC), to evaluate and compare self-management interventions presented within the self-management intervention literature targeting elementary school children. Through the SMIC (Fantuzzo et al., 1987; Fantuzzo, Polite, Cook, & Quinn, 1988), and the later revised SMIC-2 (Fantuzzo & Polite, 1990), Fantuzzo and colleagues operationalized 11 components typically built into student self-management intervention packages. Table 2.2 presents the most current SMIC – SMIC-2.

One appeal of school-based self-management interventions lies in teaching students highly valued skills which will enable them to actively self-regulate their behaviour and learning participation (Mithaug et al., 2007; Wehmeyer et al., 2000; Wehmeyer et al., 2004). With emphasis placed on shifting behaviour management responsibility from external managers to students via student-led management tactics (Cole, 1992), self-management interventions hold the potential to foster student independence, self-awareness, self-regulation, and self-reliance (Carter et al., 2015; Korinek, 2015; Lane, Menzies, Ennis, and Bezdek, 2013; Lee, Simpson, & Shogren, 2007; McDougall, 1998), and to reduce teacher behaviour management demands in classroom settings (Fantuzzo et al., 1987; Hoff & Sawka-Miller, 2010; King-Sears, 2008; Robinson & Ricord-Griesemer, 2006). Given these potential benefits, self-management interventions may be a feasible and effective alternative to teacher-managed behaviour interventions which tend to be time-consuming, resource demanding, and difficult to implement in a classroom full of students with diverse needs and behaviour (Briesch & Chafouleas, 2009; Briesch & Daniels, 2013; Levin & Nolan, 2000; Rafferty, 2010).

Table 2.2

Self-Management Intervention Checklist (SMIC-2)

Strategy	Definition
Selection of Target Behaviour	
Definition	Selecting the behaviour to be treated/investigated
Definition of Target Behaviour	
Definition	Operationally defining the target behaviour
Selection of Primary Reinforcer	
Definition	Choosing the primary or 'back-up' reinforce
Determination of Performance Goal	
Definition	Determining performance criterion for target behaviour
Instructional Prompt for Target Behaviour	
Definition	Delivering prompt(s) to engage in target behaviour
Observation of Target Behaviour	
Definition	Tracking the occurrence of the target behaviour
Recording	
Definition	Writing down the frequency of the occurrence of target behaviour during daily sessions
Evaluation to Determine Whether Performance Goal Was Met	
Definition	Comparing actual performance of the target behaviour with stated performance goal
Administration of Secondary Reinforcers	
Definition	Dispensing tokens or points
Administration of Primary Reinforcers	
Definition	Dispensing or initiating the dispensing of primary reinforcers
Graphing or Charting Behaviour Across Days	
Definition	Keeping track of the child's performance across days (e.g., graphing or charting).

Note: Extracted from Fantuzzo & Polite (1990).
Permission to reproduce obtained from John Fantuzzo Jan 2017.

2.4 Self-Management and School-Wide Positive Behaviour Support (SW-PBS)

Given self-management interventions have the potential to promote student engagement and school success they have become widely recognized as a key self-regulatory intervention which may be implemented within Positive Behaviour Intervention and Supports (PBIS), or SW-PBS frameworks[4] (Anderson, & Borgmeier, 2010; Lane et al., 2013; Lewis, Mitchell, Bruntmeyer, & Sugai, 2016; Sugai & Horner, 2009a, 2009b). This section provides a brief overview of the SW-PBS framework and outlines how self-management interventions may fit within schoolwide programs. Readers are referred to the following articles and book chapters for further information on SW-PBS as a detailed overview is beyond the scope of this PhD project: Anderson and Borgmeier, (2010); Fairbanks, Simonsen, and Sugai, (2008); Lane et al. (2013); Lewis et al. (2016), Mitchell, Bruhn, and Lewis, (2016); and Sugai and Horner, (2009b).

2.4.1 Behavioural Challenges in Schools. It is well documented throughout education literature that dealing with challenging student behaviour is an on-going issue of concern for school administrators and teachers (Clunies-Ross, Little, & Kienhuis, 2008; Mayer & Philipp, 2012; Wheldall & Merrett, 1988). Challenging or problem student behaviour can vary in nature, severity, and outcomes, with most challenging behaviour holding the potential to have widespread negative impact on students displaying the behaviour, their peers, and their teachers. Faced with increasingly varied student populations along with concerning levels of student problem behaviour schools work towards the adoption of school-wide proactive, multi-tiered systems which promote prosocial behaviour, prevent problem behaviour and increase opportunities for teaching and academic achievement (Briesch & Daniels, 2013; Lane et al., 2013; Mitchell et al., 2016).

2.4.2 SW-PBS. School-wide systems of behaviour support broadly refers to a prevention-based framework for addressing inappropriate, problematic, disruptive, and antisocial behaviours in schools (Fairbanks et al., 2008; Lane et al., 2013; Lewis et al., 2016; Sugai & Horner, 2002). Referenced in the Individuals for Disabilities Education Act (IDEA,

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[4] For consistency the term SW-PBS will be used throughout this literature review.

1997), as PBIS, SW-PBS is a three-tiered behavioural framework used to integrate and apply evidence-based behavioural practices, data-driven decision making systems, process systems, and leadership and administrative supports to enhance student academic and behaviour outcomes (OSEP Technical Assistance Centre on Positive Behavioral Interventions and Supports, 2015). At the school level PBIS is commonly known as SW-PBS.

SW-PBS is designed to improve school-wide adoption, implementation and sustained use of pro-active, evidence-based behaviour management, school disciplinary, and classroom management practices (Sugai & Horner, 2009a, 2009b). SW-PBS is not a curriculum, intervention, or program-based approach (Lewis et al., 2016; Sugai & Horner, 2009a, 2009b), rather, it is a prevention framework aimed to help schools address social, emotional, and behavioural needs of students with challenging behaviours to establish safe and effective learning environments (OSEP Technical Assistance Centre on Positive Behavioral Interventions and Supports, 2015). While adaptations of SW-PBS can vary across schools, systems consistently incorporate six foundational characteristics. The following information is based largely on the work of Sugai and Horner (2009a, 2009b), along with that of Lewis et al. (2016), Mitchell et al. (2016), and Solomon, Klein, Hintze, Cressey, and Peller (2012).

The first defining characteristic of SW-PBS is its theoretical and conceptual foundation in *behavioural theory and applied behaviour analysis.* Second, SW-PBS firmly emphasizes *prevention* via establishment of systems that prevent the development, triggering, and increase of new or existing problem behaviours. Third, the behavioural strategies and interventions at each tier are underpinned by an *instructional focus.* A fourth defining feature relates to the use of *evidence-based behavioural practices* to increase the chance of effective and generalisable outcomes. The adoption of a *systems approach* in existing school culture when selecting and implementing behavioural practices is the fifth defining characteristic. The final defining feature of SW-PBS is the *collection and use of data* for decision-making and monitoring purposes.

2.4.3 SW-PBS: Three Tier System. SW-PBS widely promotes positive student behaviour via an interconnected continuum of increasing intervention support (Lewis et al., 2016; Mitchell et al., 2016; Sugai & Horner, 2009a, 2009b) described in Table 2.3 and depicted in Figure 2.1.

Table 2.3

SW-PBS Tiers

Tier		Prevention Description
i.	Primary (Universal)	Aims to **prevent** the development and exacerbation of problem behaviours by creating school-wide high quality learning environments for **all** students and staff across **all settings**
ii.	Secondary (Targeted)	Aims to **reduce** the prevalence of students displaying problem behaviours that are high-risk and/or non-responsive to primary intervention practices. At this tier more focused, intensive, and frequent small-group orientated support in situations where problem behaviour is likely to occur.
iii.	Tertiary (Intensive)	Aims to **reduce** the intensity and/or complexity of existing cases of problem behaviour that are resistant to or non-responsive to primary and secondary tier efforts. At this tier individualised support is provided in situations where problem behaviour is likely to occur.

Adapted from OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports (2015)

Each tier incorporates the following SW-PBS elements, with varying levels of student support: (a) identification of the problem or concern, (b) identification of desired pro-social or desirable replacement skills or school-wide behaviour expectations, (c) provision of explicit instruction to teach skills or expectations, and (d) environment alterations to increase likelihood of student success (Lewis et al., 2016; Sugai & Horner, 2009a, 2009b). All tiers also incorporate evidence-based practices and established procedures for on-going progress and fidelity assessment via data-based monitoring, evaluation, dissemination and decision making (Mitchell et al., 2016; OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports, 2015; Sugai & Horner, 2009a, 2009b).

At the primary level *all students* in the school are exposed to a continuum of universal programming and intervention in *all settings*. Primary-tier, or universal, interventions are tailored to target common social behavioural challenges by teaching alternative pro-social behaviours, providing opportunity for student practice, and providing frequent positive behaviour-specific praise and feedback (Mitchell et al., 2016). Primary supports target the needs and characteristics of the whole-school culture, successfully supporting most students (80-90%) (Sugai & Horner, 2009a, 2009b). Universal expectations, instructional strategies and environmental supports are adopted, school-wide, across all structured (e.g., classroom) and unstructured (e.g., playground) environments to foster prosocial behaviour (Mitchell et al., 2016; Sugai & Horner, 2009a, 2009b).

Within established SW-PBS frameworks students are monitored to determine if they respond to Tier 1 strategies (Mitchell et al., 2016). Students who do not respond to Tier 1 supports are then exposed to more intensive social, emotional, cognitive, and/or behavioural supports implemented through Tier 2, small group interventions, and/or Tier 3, individualized interventions (Mitchell et al., 2016). As the need for Tier 2 and 3 interventions arises Tier 1 supports are continued with increased structure and guidance, thus, maintaining an on-going continuum of supports to further support students in meeting school expectations (Anderson & Borgmeier, 2010; Mitchell et al., 2016; Sugai & Horner, 2009a, 2009b).

At the secondary level, small-group support systems are provided for at-risk students who generally display non-dangerous problem behaviour that is disruptive to their learning and the learning of others (Anderson & Borgmeier, 2010). Tier 2 interventions typically target small-groups and involve more intensive support processes, explicit instruction, prompts for appropriate behaviour, resources, adult supervision, feedback, and implementation frequency (Anderson & Borgmeier, 2010; Mitchell et al., 2016; Sugai & Horner, 2009a, 2009b). Support from a SW-PBS team, often comprised of school psychologists, special educators, behaviour specialists, counsellors, school administrators, and content-area specialists is usually required to establish Tier 2 (and Tier 3) systems and practices (Mitchell et al., 2016).

At the final, tertiary level students who do not respond to supports provided at Tiers 1 and 2 are provided with more intense, individualized, function-based supports (Anderson & Borgmeier, 2010; Sugai & Horner, 2009a, 2009b). This level of support typically involves comprehensive Functional Behaviour Assessment (FBA) used to design instruction-based behaviour intervention plans tailored to suit individual students (Anderson & Borgmeier, 2010; Lewis et al., 2016). Tier 3 supports often incorporate individualised support plans for each student which include strategies for prevention, teaching, positive reinforcement, controlled reduction of natural rewards for problem behaviour, and safety (OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports, 2015). Essentially, Tier 3 involves use of FBA-informed support plans to teach individual students functionally equivalent replacement behaviour which can be reinforced and promoted by environmental modifications (Mitchell et al., 2016).

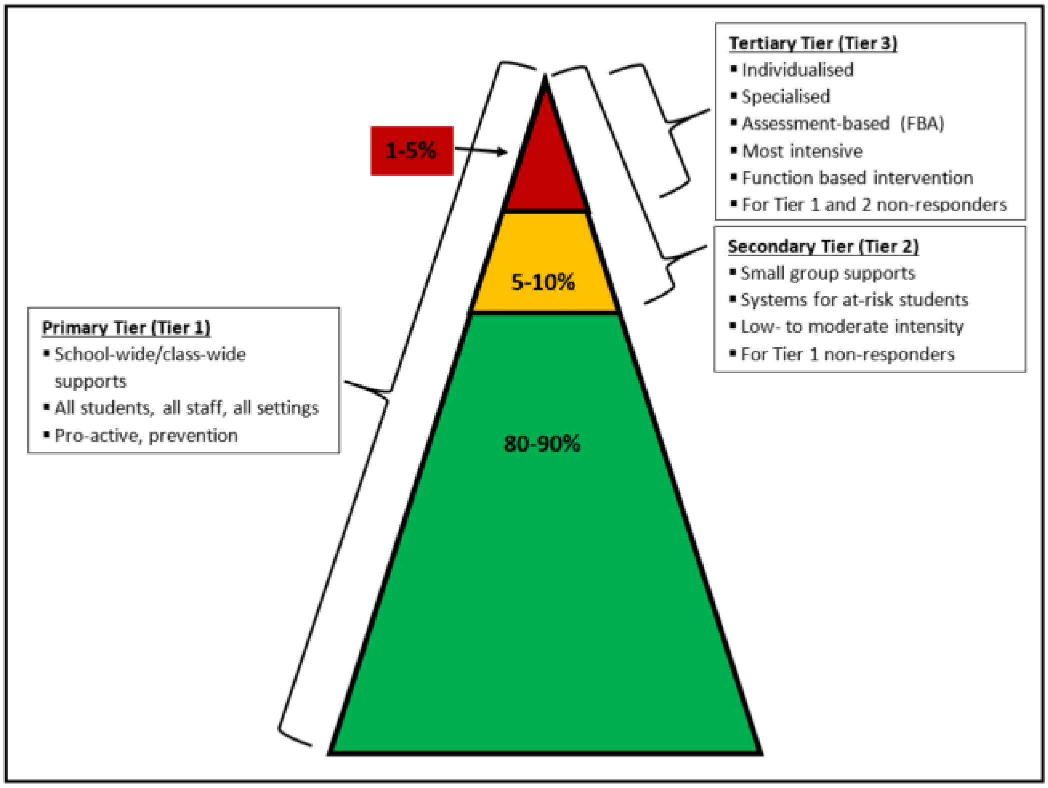

Figure 2.1. Graphic representation of the SW-PBS intervention tiers.
Figure adapted from Anderson & Borgmeier (2010), Lewis et al. (2016) and OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports (2015)

2.4.4 Self-Management: A tier 2 and tier 3 strategy. Within the SW-PBS framework, school teams are encouraged to implement a range of interventions and supports tailored to students' needs at Tiers 2 and 3 (Mitchell et al., 2016). In light of this, the current literature review identifies self-management strategies as a collection of behaviour interventions which may be incorporated within SW-PBS.

Throughout the SW-PBS literature, self-management interventions have been well documented as a series of strategies which can be incorporated within comprehensive SW-PBS frameworks (Anderson & Borgmeier, 2010; Crosland & Dunlap, 2012; Lane et al., 2013; Lewis et al., 2016; Mitchell et al., 2016; Ness, Sohlberg, & Albin, 2011; Sugai & Horner, 2009a, 2009b). Self-management strategies can promote appropriate student behaviour within the context of SW-PBS by aiding students in developing their ability to think about their own behaviour, and for helping students learn to take responsibility for their behaviour (Crosland & Dunlap, 2012; Lane et al., 2013). While recognised as a Tier 2 strategy (Briesch & Daniels, 2013; Ness et al., 2011); self-regulation or self-management interventions can also function as an individualized Tier 3 strategy when informed by FBAs (Brooks, Todd, Tofflemoyer, & Horner, 2003; Grandy & Peck, 1997; Hansen, Wills, & Kamps, 2014; Lane et al., 2013; Lewis et al., 2016).

2.5 Self-Management Theoretical Perspectives

As self-management literature has grown rapidly over past decades theories have emerged regarding the nature of self-management and the mechanisms underlying self-management reactivity. This section briefly highlights fundamental elements, constructs, and characteristics of key self-management theoretical perspectives and models including: *functional model of self-determination* (Wehmeyer, 1999); *social cognitive theory of self-regulation* (Bandura, 1991; Zimmerman, 2000), *Kanfer's cognitive-mediational theory* (as cited in Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1985; 1988), *Rachlin's operant model* (as cited in Mace et al., 1989; Mace & Kratochwill, 1985) and *multiple-cueing stimulus model* (Nelson & Hayes, 1981). Theories are split into two categories (see Table 2.4), illustrating the role and importance of self-management skill in education, and explaining the reactivity of self-management (Mace, Belfiore, & Shea, 1989; Mace & Kratochwill, 1985; Nelson & Hayes, 1981). As it is beyond the scope of this chapter to provide a comprehensive overview of all self-management theories readers are encouraged to seek out the following references for further detail: Bandura, 1988; Mace et al., 1989; Mace and Kratochwill, 1988; Nelson and Hayes (1981); Schunk (1989).

Table 2.4

Self-Management Theories

Role of Self-Management	Reactivity of Self-Management
The Functional Model of Self-Determination	Rachlin's Operant Model
Social Cognitive Theory of Self-Regulation	Kanfer's Cognitive-Mediational Theory
	Multiple-cueing stimuli model

2.5.1 Functional model of self-determination. As noted, this model asserts self-determined individuals display behaviour or actions reflective of four essential characteristics: autonomy, self-regulation, psychological empowerment, and self-realisation (Wehmeyer, 1999; Wehmeyer & Little, 2013). This model further posits student self-determination can be fostered through development of seven related component skill domains including: (a) choice making, (b) decision making, (c) problem solving, (d) goal setting and attainment, (e) self-advocacy and leadership skills, (f) self-management and self-regulation skills, and (g) self-awareness and self-knowledge (Wehmeyer, 1999, 2011; Wehmeyer & Field, 2007; Wehmeyer et al., 2000). While this model contends that development of all interrelated essential characteristics and associated skills is necessary for students to be considered self-determined individuals, particular attention is drawn to self-management skill development due to its relevance in the current research topic. This model highlights that if student self-determination outcomes are to be achieved in education settings, the development of student self-management skills (in conjunction with other self-determination skills) through instruction and intervention is crucial.

2.5.2 Social cognitive theory of self-regulation. Classic social cognitive theory (SCT) explains individual functioning and self-regulation in terms of a continuous reciprocal interaction between behaviour, cognitive and personal factors, and environmental influences (Bandura, 1986, as cited in Bandura 1988; Zimmermann, 2000). From an education perspective SCT theorists assert student functioning, or learning behaviour, results from reciprocal interactions between the learning environment, student cognition (inclusive of goals and self-efficacy), and three self-regulatory sub-processes including self-monitoring (i.e., self-observation and self-recording), self-judgement or self-evaluation, and self-reaction (Bandura, 1991; Schunk, 1989; Zimmerman, 1989; 2000). According to Bandura (1991; p. 282) “self-regulation is a multifaceted phenomenon operating through a number of subsidiary cognitive processes including self-monitoring, standard setting, evaluative judgement, self-appraisal, and affective self-reaction.”

Zimmermann (2000) proposes it is crucial for individuals to demonstrate self-management skills in the form of self-regulatory sub-processes to manage environmental contingencies. Proficiency in self-regulatory sub-processes is thought to enable individuals to exert greater influence over their own motivation and actions, and thus undertake self-directed behaviour change (Schunk, 1989). Self-monitoring in particular serves as a key sub-process through which self-regulative mechanisms operate (Bandura, 1988; 1991). Through continuous self-monitoring, individuals obtain critical feedback on immediate past behaviour performance which may activate evaluative and reactive sub-processes (Bandura, 1991; Schunk, 1989; Zimmermann, 1989, 2000). The feedback obtained via self-monitoring may enable individuals to appraise their own behaviour in line with personal goals or standards (i.e., evaluate), and can also prompt individuals to maintain appropriate behaviour or adjust inappropriate behaviour in future responses (i.e., reaction). The importance of having students learn self-management skills in education contexts is supported by the idea that training in "self-monitoring and related decision" is necessary for students to engage in optimal self-regulation (Zimmermann, 1990, p. 10).

2.5.3 Theories of reactivity in self-management. Over time researchers have developed theoretical explanations for behaviour change, or reactive effects, which result from self-monitoring. Within self-management literature the *reactivity of self-monitoring* refers to the tendency for behaviour to change as a result of self-observation and self-recording (Mace et al. 1989). Mace and Kratochwill (1985; 1988) report classic literature contains three proposed theories accounting for self-monitoring reactive effects. While this section provides a brief overview of reactivity theories, readers are referred to Korotitsch and Nelson-Gray (1999), Mace et al. (1989), Mace and Kratochwill (1985; 1988), Nelson and Hayes (1981) for a comprehensive overview and research evidence supporting each theory.

2.5.3.1 Kanfer's cognitive mediational model (as cited in Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1985; 1988). According to Kanfer's cognitive-mediational model, effective control over ones behaviour occurs through a self-regulatory multi-stage, sequential chain process incorporating self-monitoring, self-evaluation and self-reinforcement (Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1985; 1988). Reactivity is thought to begin via self-monitoring when individuals observe and record an aspect of their own behaviour. Individuals then react to self-monitoring feedback data by covertly comparing monitored behaviour against an internalized standard or goal for performance (self-evaluation). Finally, reinforcers are self-delivered by individuals if performance is determined to equal or exceed the set standard or goal. According to Kanfer (1977; as cited by Korotitsch & Nelson-Gray, 1999; and Mace & Kratochwill, 1988, 1985) the future probability of target behaviour responses are influenced by self-administered consequences.

2.5.3.2 Rachlin's operant model (as cited in Mace et al., 1989; Mace & Kratochwill, 1985). Rachlin's operant model contends that reactivity occurs through self-monitoring processes and subsequent administration of self-consequences (i.e., reinforcement and punishment) delivered contingent upon self-monitoring responses (Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1988; Nelson & Hayes, 1981). According to Rachlin (1974, cited in Korotitsch & Nelson-Gray, 1999 and Nelson & Hayes, 1981) self-monitoring and self-consequences function as discriminative stimuli which prompt ultimate environmental consequences that subsequently control target behaviour occurrences. Discriminative stimuli may take the form of recording devices, prompts to self-record, or the feedback on prior responses, and are thought to be responsible for eliciting behaviour responses at levels which yield environmental reinforcement or punishment (Mace et al., 1989). Central to this theory is the idea that self-recording or self-monitoring is critical to triggering reactivity and environmental contingencies are responsible for future likelihood of target behaviour occurrence (Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1988).

2.5.3.3 Multiple-cuing stimuli model (Nelson & Hayes, 1981). An expansion of Rachlin's operant theory proposed by Nelson and Hayes (1981) represents the third and final reactivity theory. Nelson and Hayes' multiple-cuing model proposes that the entire self-monitoring process, not just self-recording response, triggers reactivity and prompts external environmental consequences (Mace & Kratochwill, 1988). This model asserts external consequences which control behaviour are cued by instruction, self-monitoring training, the self-monitoring devices, and self-recording responses (Korotitsch & Nelson-Gray, 1999; Mace & Kratochwill, 1988).

2.6 School-Based Self-Management Interventions: Review of Reviews

Given the potential positive implications self-management interventions hold for students and education professionals, self-management interventions targeting a range of student outcomes have been extensively researched. In the late 1960s to early 1970s promotion of student self-management skills became an area of interest in education research and practice; it continues to be a notable research focus in recent years given the considerable importance assigned to student self-determination as an educational outcome. Over the years a substantial body of empirical studies, systematic reviews, and meta-analyses investigating the potential benefits of self-management in educational settings has formed. This research body continues to grow, as researchers broadly explore and appraise use of self-management interventions across a range of education contexts with various student populations. Completion of this PhD resulted in identification of 30 published literature reviews investigating self-management interventions in education settings. Given the extensive nature of school-based self-management research literature this chapter presents a review which explores and evaluates published literature reviews on this topic. Such a review was warranted to synthesize the vast self-management literature base, and to identify any unaddressed research questions or research gaps in this area of research.

This *meta-review*, functions partially as an evaluative review that appraises relevant self-management literature reviews in terms of coverage and knowledge contribution, and partially as an exploratory review dedicated to determining what exists in published review literature in terms of scope, evidence, research methods, and findings. The following review facets were analysed:

- *Review details* (i.e., authors, publication date, title, journal published in, review form, number of reviewed studies, study design, and date range of reviewed studies) – Appendix A, Table 1
- *Participant demographics and setting details* (i.e., number of participants, gender, diagnosis, education level, and intervention setting) –Appendix A, Table 2
- *Intervention details and outcomes* (i.e., review aim, objective or focus, intervention description (independent variable), targeted outcomes (dependent variables), and reported findings) – Appendix A, Table 3
- *Review methodology details* (i.e., research design quality appraisal, visual analysis, effect size computations, social validity measurement, fidelity or integrity measurement, and results presentation) – Appendix A, Table 4

2.6.1 Review details. The 30 reviews analysed in this chapter were published in 22 peer-reviewed journals over a 40 year timespan (published 1976 to 2016) (McLaughlin, 1976 to Davis, Mason, Davis, Mason, & Crutchfield., 2016). Identified reviews were most frequently published in *Remedial and Special Education* (*n*Reviews =4), followed by *Behavioural Disorders* (*n*Reviews =3), *School Psychology Quarterly* (*n*Reviews =2), *Journal of Applied Behavior Analysis* (*n*Reviews =2), and Exceptional Children (*n*Reviews =2). Eleven reviews (36.7%) take the form of traditional narrative reviews where authors have written about research studies associated with self-management interventions. The remaining 19 (63.3%) were systematic literature reviews which utilized explicit systematic processes to comprehensively identify studies relevant to a specified research question, appraise methods of identified studies, summarize results, present central findings, identify possible reasons for differential results across studies, and suggest limitations (Garg, Hackam, & Tonelli, 2008). Identified reviews contained 25 studies on average (Range 7-59), and predominately reviewed single-case design (SCD) research studies. While thirteen reviews (43%) contained mostly SCD studies (i.e., over 60% of reviewed studies), nine reviews (30%) evaluated only SCD studies. Only one review (3%) evaluated group design research, whereas seven reviews (23%) did not specify the form of research reviewed. All review details are presented in Appendix A, Table 1.

2.6.2 Participant demographics and setting details. Overall, 3963 participants were included in reviewed studies across the identified self-management reviews that specified the total number of participants (*n*=23). Not all reviews reported participant gender, however those which did (*n*= 16) specified 1324 (73.6%) participants were male, and 476 (26.4%) participants were female. All participant and setting details are presented in Appendix A, Table 2.

2.6.2.1 Disability diagnosis. Forty percent of reviews considered in this chapter (*n*=12) contained studies exclusively investigating self-management interventions used with students classified within explicit disability categories including: attention deficit/hyperactivity disorder (ADHD) (i.e., Reid, Trout, & Schartz, 2005); autism spectrum disorders (ASDs) (i.e., Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker, 2015; Carr, Moore, & Anderson, 2014; Davis et al., 2016; Lee et al., 2007; Southhall & Gast, 2011); developmental delay (i.e., Harchik, Sherman, & Sheldon, 1992); mental retardation (i.e., Hughes, Korinek, & Gorman, 1991), behavioural disorders (i.e., Hughes, Ruhl, & Misra, 1989; Nelson, Smith, Young, & Dodd, 1991); emotional and behavioural disabilities (EBDs) (i.e., Mooney, Ryan, Uhing, Reid, & Epstein, 2005); and learning disabilities (LDs) (i.e., Reid, 1996). Conversely nine reviews broadly analysed studies targeting students with a mix of disabilities, along with students considered “at-risk”, and typically developing students (i.e., Briesch & Chafouleas, 2009; Bruhn et al., 2015; Fishley & Bedesem, 2014; Maggin, Briesch, & Chafouleas, 2012; McDougall, 1998, 1996; Sheffield & Waller, 2010; Webber, Scheuermann, McCall, & Coleman, 1993; Workman & Hector, 1978). Reviews by Fantuzzo and colleges (1990; 1988; 1987) did not specify the specific student populations targeted in reviewed studies, specifying only that children of "normal intelligence" were targeted, while six reviews give no indication of targeted student populations.

2.6.2.2 Age/Education level. Participant age ranged from 3 to 25 years in most reviews that specified participant age (*n*=16); one review (Aljadeff-Abergel et al., 2015) reported age ranged from 3 to 49 years. Fourteen of the 30 reviews included studies targeting students of primary and high-school age. Eight reviews contained studies focusing on students across pre-school, primary, and high school grades, while three reviews included studies targeting participants ranging from pre-school age to adult-hood. Overall, 83% (*n*=25) of reviews contained studies targeting a mix of primary and high-school student populations. Five reviews targeted primary school participants (i.e., Fantuzzo & Polite, 1990; Fantuzzo et al., 1988, Fantuzzo et al., 1987; Panagopoulou-Stamatelatou, 1990; Reid et al., 2005), while no review focused solely on students of kindergarten age, or high school age.

2.6.2.3 Setting. Identified reviews frequently reviewed studies implemented across both general and special education environments (*n*=8). Three reviews explicitly included intervention studies conducted in general education settings, while two reviews explicitly analysed studies completed in special education contexts. Seven reviews included studies conducted across general, special, *and* non-education (e.g., work, home, hospital, clinic settings) settings. Two reviews contained studies completed in general education and non-education settings, and one review incorporated studies conducted in special education and non-education settings. Seven reviews omitted any description of the setting in which reviewed studies were undertaken.

2.6.3 Intervention details and targeted outcomes. While all reviews considered in this chapter hold relevance to research regarding self-management intervention applications in education contexts, each addressed a unique research aim, objective, or focus (Appendix A, Table 3). Review intentions broadly range from: investigating intervention effectiveness (e.g., Davis et al., 2016; Fishley & Bedesem, 2014; Lee et al., 2007); evaluating self-management packages structure (e.g., Briesch & Chafouleas, 2009; Fantuzzo & Polite, 1990); appraising intervention acceptability (e.g., Aljadeff-Abergel et al., 2015; Mitchem & Young, 2001); examining various implementation variables (e.g., Bruhn et al., 2015); exploring procedures (e.g., Davis et al., 2016); and reviewing research methodologies (e.g., Maggin et al., 2012). Published self-management reviews clearly address a diverse range of review objectives and aims. Given the vast scope of self-management literature review intentions, notable variances concerning intervention strategies (independent variables) and targeted outcomes (dependent variable) are evident across the reviewed reviews.

Intervention studies evaluated across the identified reviews investigated an extensive assortment of self-management intervention packages, reflecting the heterogonous nature of self-management strategies. Throughout the analysed reviews, self-monitoring, self-reinforcement, self-recording, and self-evaluation are the most common elements, documented as having been integrated within implemented multi-component packages. Multi-component, self-management packages were most prevalent throughout reviewed intervention studies. Despite over 40 years of research on self-management in education contexts, universal recommendations concerning how these interventions may be optimally structured has not yet eventuated. Though published literature may suggest self-management packages commonly comprise of a set class of intervention strategies, a universally accepted self-management intervention package is yet to be conceptualized.

Reviewed studies incorporated within self-management reviews targeted a wide range of academic, behavioural, and social skills outcomes. Self-management interventions have been largely implemented to improve or maintain desirable student outcomes associated with social skills (e.g., positive interactions, social facilitation strategies, verbal and non-verbal skills), academic outcomes (e.g., performance, accuracy and/or task completion), and task-engagement behaviour (e.g., on-task behaviour, attention to presented tasks). Self-management interventions have also been implemented to reduce student disruptive behaviour or other problem classroom behaviour (e.g., inappropriate behaviour, talking out, out-of-seat, yelling, and aggression). Table 2.5 presents the proportion of identified reviews containing studies targeting the aforementioned dependent variables. While most reviews (93%) contained studies targeting disruptive or problem behaviour outcomes, a large portion of reviews included studies targeting academic (83%) and task engagement (73%) outcomes. Less than one third of reviews (27%) contained studies targeting social skill improvements. Miscellaneous outcomes were targeted in 50% of the reviews (e.g., stereotypy- Davis et al. (2016), self-injurious behaviour – McDougall (1998), daily living – Nelson et al. (1991)). With the exception of one review solely targeting academic outcomes (Mooney et al., 2005), and one review solely targeting behaviour outcomes (Lee et al., 2007) all reviews contained studies targeting an assortment of dependent variables.

Table 2.5

Targeted dependent variables

Dependent Variable	# of Reviews
Disruptive/problem behaviour	28
Academic	25
Task Engagement	22
Social Skills	8
Other	15

2.6.4 Review methodology. Given SCD research methodologies have been widely adopted throughout self-management intervention research, and are the most common form of research utilised in the evaluated reviews, each review in this chapter was analysed for key SCD research methodology features (see Appendix A, Table 4). Reviews have been explored in terms of *design quality appraisal processes, visual analysis procedures, effect size computations, social validity measurement*, and *fidelity or integrity evaluations* as SCD researchers throughout the past decade assert these features represent key elements to consider when evaluating SCD experiments and synthesizing study findings (Horner, Carr, Halle, McGee, Odom, & Wolvery, 2005; Horner, Swaminathan, Sugai, & Smolkowski, 2012; Maggin, Briesch, Chafouleas, Ferguson, & Clark, 2013; Maggin & Odom, 2014). Chapter 3 presents a detailed explanation of the aforementioned SCD methodological features.

2.6.4.1 Research design quality. Analysis of self-management review literature demonstrates the scarce nature of research design quality analyses, as only five of the 30 reviews considered in this chapter made reference to SCD research design quality. Reviews which considered design quality, have generally applied design standards to fulfill two main purposes: screening processes (i.e., Carr et al., 2014, Davis et al., 2016), and study design appraisal (i.e., Aljadeff-Abergel et al., 2015; Maggin et al., 2012; McDougall, 1998). SCD quality analyses may be more prevalent in recent years as four of five studies which incorporated design quality evaluations have been published within the last five years.

What Works Clearinghouse (WWC) design standards (Kratochwill, Hitchcook, Horner, Levin, Odom, Rindskopf et al. 2010) were most commonly used, having been applied in three reviews. Carr et al. (2014) and Davis et al. (2016) incorporated WWC design quality standards within inclusion criteria to ensure their respective reviews only included high quality SCD studies which met design standards. Via this approach WWC standards function as a screening tool to ensure individual SCD studies are of adequate methodological rigor and experimental control prior to acceptance into the final collection of reviewed studies. Davis et al. proposed this process ensures more confidence can be placed on results obtained at the individual study and aggregated results level. Rather than applying design standards as a screening tool, Maggin et al. (2012) applied WWC standards to an existing self-management SCD database identified by Briesch and Chafouleas (2009) to re-evaluate design quality and effectiveness. Maggin et al. conclude sufficient high-quality empirical support exists to "classify self-management interventions as an evidence-based practice for improving the classroom conduct of students with challenging behaviours" (p. 8).

Adopting a slightly different approach Aljadeff-Abergel et al. (2015) used quality standards adapted from the National Standards Report (NSR) (National Autism Center, 2015), the WWC design standards (Kratochwill et al., 2010), Horner et al. (2005), and Horner et al. (2012) to evaluate the methodological rigor of studies which met their systematic review inclusion/exclusion criteria. Aljadeff-Abergel et al. concluded self-management interventions are effective for individuals with autism, however caution should be applied when interpreting the database findings given that some reviewed studies were identified to be of low quality. This finding highlights the importance of undertaking quality assessments in review research, as studies which meet inclusion/exclusion criteria may vary substantially in rigor. Finally, McDougall (1998) – in what was the first review to consider quality, reported that reviewed ABA studies adhered to "recognized standards for quality research" (p. 318), however it was not stated which specific standards were adhered to or how standards were applied.

2.6.4.2 Visual Analysis. Despite visual analysis of graphically displayed data representing a critical interpretation process historically used to analyse SCD research (Cooper et al., 2007; Kennedy, 2005; Lane & Gast, 2013; Manolov, Gast, Perdices, & Evans, 2014; Plavnick & Ferreri, 2013; Smith, 2012), this form of analysis has often been omitted from published self-management review literature. Only two of the 30 reviews in this chapter reference use of visual analysis processes. Maggin et al. (2012) utilised visual analysis processes, as outlined by WWC standards, to ascertain whether self-management interventions resulted in evidence of treatment effects or not. Similarly, McDougall (1998) reported visual analysis processes were used to evaluate the evidence of functional control, however the author did not specify use of any formal visual analysis protocol.

2.6.4.3 Effect size computation. Effect size metrics were computed in ten of the 30 reviews to determine the effectiveness of self-management interventions. The most frequently computed SCD effect size was the non-parametric metric, percentage of non-overlapping data (PND) (Scruggs, Mastropieri, & Casto, 1987), which was computed in four reviews (Briesch & Chafouleas, 2009; Carr et al., 2014, Lee et al., 2007, Nelson et al., 1991). In addition Nelson et al. (1991) computed Glass' delta (Glass, McGraw, & Smith, 1981) to obtain group design effect sizes. Three reviews computed effect sizes using the Busk and Serlin (1992) "no assumption" standardized mean difference (SMD) metric (Briesch & Chafouleas, 2009; Fantuzzo & Polite, 1990; Fantuzzo et al., 1988). Reid et al. (2005) computed a group design (Glass' delta) and a SCD (unspecified metric) effect size. Maggin et al. (2012) utilised two metrics in the form of the nonparametric index, percentage of all non-overlapping data (PAND; Parker, Hangan-Burke, & Vannest, 2007), and generalized least squares regression (Maggin, Swaminathan, Rogers, O'Keeffe, Sugai, & Horner, 2011). Davis et al. (2016) reported to have used Tau-U (Parker, Vannest, Davis, & Sauber, 2011) to compute SCD effects. While Mooney et al. (2005) reported on an effect metric, the authors did not specified which metric was utilised.

2.6.4.4 Social validity. Eight identified reviews formally evaluated social validity, ascertaining if reviewed articles documented any social validity measure to analyse intervention acceptability and feasibility (i.e., Aljadeff-Abergel et al., 2015; Briesch & Chafouleas, 2009; Fantuzzo & Polite, 1990; Fantuzzo et al., 1988; Fishley & Bedesem, 2014; McDougall, 1998; Mitchem & Young, 2001; Southhall & Gast, 2011). Webber et al. (1993) reported social validity checks with teachers and students concerning the desirability and acceptability of self-management strategies were documented throughout few reviewed studies, however the authors did not report formal social validity evaluations.

Aljadeff-Abergel et al. (2015) reported 54% of the studies evaluated aspects of social validity, generally reporting "self-management interventions were perceived as important, satisfying, and acceptable respectively" (p. 42). Similarly, Briesch and Chafouleas (2009), McDougall (1998), Mitchem and Young (2001), and Southhall and Gast (2011) respectively reported 40%, 36%, 43%, and 46% of reviewed studies evaluated social validity specific to implemented self-management interventions; findings, generally showed participants viewed interventions positively in regard to procedure acceptability and feasibility. Fishley and Bedesem (2014) recently reported 93% of reviewed studies evaluated social validity, indicating positive views of the applied self-monitoring interventions. Older reviews show social validity was not often documented across reviewed studies; Fantuzzo and Polite (1990) reported 5% of reviewed studies evaluated social validity, whilst Fantuzzo et al. (1988) reported no reviewed studies presented social validity analyses. These findings show social validity evaluations have been documented to a greater extent in more recent self-management research, potentially suggesting that social validity has become considered of greater importance throughout self-management literature in more recent years.

2.6.4.5 Treatment fidelity. Five of the 30 identified reviews included reports of treatment fidelity measurement (i.e., Aljadeff-Abergel et al., 2015; Briesch & Chafouleas, 2009; Bruhn et al., 2015; Sheffield & Waller, 2010; Southhall & Gast, 2011). Bruhn et al. (2015). Sheffield and Waller (2010) and Southhall and Gast (2011) respectively reported treatment fidelity was evaluated across 66%, 44%, and 25% of reviewed studies, while Briesch and Chafouleas (2009) reported fidelity was evaluated in less than 25% of reviewed studies. Aljadeff-Abergel et al. (2015) reported intervention implementation fidelity measurement was conducted in an acceptable manner across 11% of reviewed studies and in an exemplary manner across a further 19% of studies. While Aljadeff-Abergel et al. reported 70% of studies contained below standard fidelity measurement, it was not stated how many studies omitted fidelity measurement. Across the five reviews treatment fidelity was diversely defined, evaluated to varying degrees, and examined for training integrity and intervention integrity. Lack of consistent evaluation of intervention fidelity across self-management intervention research may lead to questions regarding proper intervention implementation.

Table 2.6

Self-Management Review Features: Outcome Variables, Populations, Settings and Education Level

	Outcome Variables			Disability/ Functioning	Setting				Education Level				
Review	Academic	Behavioural	Other (including Social)	Targeted a specified participant population	General education settings	Special education settings	Non-education settings	Education setting – not specified	Preschool age	Primary school age	High school age	Older than high school age	Did not specify*
Davis, Mason, Davis, Mason, & Crutchfield (2016)	X	X	X	X(ASD)	X	X			X	X	X		
Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker (2015)	-	-	-	X (ASD)				X	X	X	X	X	X
Bruhn, McDaniel, & Kreigh (2015)	X	X	X		X	X			X	X	X		
Carr, Moore, Anderson, (2014)	X	X	X	X (ASD)	X	X	X		X	X	X	X	
Fishley & Bedesem (2014)	X	X	X		X					X	X		
Maggin, Briesch & Chafouleas (2012)	X	X			X	X				X	X		
Southhall & Gast (2011)	X	X	X	X (ASD)	X	X	X		X	X	X		
Sheffield & Waller (2010)	X	X	X		X	X	X			X	X		X

Briesch & Chafouleas (2009)	X	X			X	X				X	X		
Lee, Simpson & Shogren (2007)		X	X	X (ASD)			X	X	X	X	X		X
Reid, Trout & Schartz (2005)	X	X		X (ADHD)	X	X	X			X			
Mooney, Ryan, Uhing, Reid & Epstein (2005)	X			X (EBD)		X	X			X	X		X
Mitchem & Young (2001)	X	X			X				X	X	X		
McDougall (1998)	X	X	X		X		X			X	X		X
McDougall (1996)	X	X	X		X		X			X	X	X	
Reid (1996)	X	X		X (LD)	X	X				X	X		X
Webber, Scheuermann, McCall & Coleman (1993)	X	X	X		X	X	X			X	X		X
Harchik, Sherman, & Sheldon (1992)	X	X	X	X (DD)			X	X	X	X	X		X
Hughes, Korinek & Gorman (1991)	X	X	X	X (MR)		X				X	X		X
Nelson, Smith, Young, & Dodd (1991)	X	X	X	X (BD)				X	X	X	X		

Panagopoulou-Stametelatou (1990)	X	X			X					X			
Fantuzzo & Polite (1990)	X	X		X (normal functioning children)	X	X				X			
Hughes, Ruhl & Misra (1989)	X	X		X (BD)		X				X	X		X
Fantuzzo, Polite, Cook & Quinn (1988)	X	X		X (non-retarded children)	X	X				X			
Fantuzzo, Rohrbeck & Azar (1987)	X	X		X (“normal” children)				X		X			
O’Leary & Dubey (1979)	X	X	X				X	X	X	X	X		X
Rosenbaum & Drabman (1979)	X	X	X					X		X	X		X
Sanders (1978)	X	X	X					X		X	X		X
Workman & Hector (1978)	X	X			X	X	X	X		X	X		X
McLaughlin (1976)	X	X	X		X	X				X	X		
Number of Reviews	**28**	**28**	**17**	**15**	**19**	**17**	**12**	**9**	**10**	**30**	**25**	**3**	**14**
Percentage	**93%**	**93%**	**57%**	**50%**	**63%**	**57%**	**40%**	**30%**	**33%**	**100%**	**83%**	**10%**	**47%**

* Grade level estimated based on age range

2.7 Conclusion: Gaps in Existing Self-Management Review Literature and Future Research Directions

2.7.1 Participant, setting, and outcome variables. Extensive research conducted on the use of self-management interventions in education contexts has consistently reported that self-management is considered an effective intervention strategy which may yield promising outcomes across a wide range of educational contexts, for diverse student populations addressing a wide variety of academic, behaviour, and social outcomes. Table 2.6 provides a summary of review features including outcome variables, participant disability, setting and participant education level. Published reviews have demonstrated self-management effectiveness in mainstream and special education contexts for students spanning across pre-school to adult education levels. Review literature not only shows self-management interventions produce positive outcomes across education settings and education/age levels, published findings also indicate self-management strategies can be successfully used across disability populations. Past review findings report the successful use of self-management interventions in improving various outcomes for students diagnosed with a range of disabilities, student classified as "at-risk", and typically developing students. Despite a long documented history of widespread positive findings demonstrating mounting support for self-management interventions in educational settings, this review highlights some gaps throughout the existing literature base which warrant attention in future research.

Firstly, disability category is one student factor which deserves closer scrutiny in future review literature. As most self-management reviews, either exclusively or widely, evaluated self-management intervention use for students classified in various disability categories, this review's findings suggest a large emphasis has been placed on investigating self-management applications with special needs student populations. Interestingly, findings reveal that over the past three decades no published review has exclusively investigated self-management intervention research targeting typically developing student populations. Reviews published in the last decade alone predominately target self-management use with students diagnosed with ASD; five of the 10 reviews published 2006 to 2016 have explicitly reviewed self-management studies targeting students with ASD. Future investigations may endeavor to review research studies investigating self-management interventions used explicitly with typically developing students, and with student disability populations beyond ASD populations.

Education level and student age is another factor which warrants closer analysis in future as published review literature has broadly analysed self-management studies involving students from an array of education levels. With only five identified reviews explicitly targeting research conducted with primary school students, and no reviews targeting research conducted with pre-school and high-school students, few reviews have thoroughly evaluated self-management use with distinct education levels or age groups. Investigators in future may build upon existing self-management review literature by opting to evaluate studies targeting distinct education levels (i.e., pre-school, primary school, high school, or university).

Conducting reviews targeting distinct student populations and education levels may enable researchers to better investigate student factors that may impact upon self-management effectiveness. For instance, considering participant education level may reveal that the suitability and effectiveness of self-management interventions may differ for younger primary students and adolescents attending high school due to various developmental, physical, and psychosocial differences between these populations (de Bruin, Deppeler, Moore, & Diamond, 2013). Moreover, such research can assist researchers in determining how self-management interventions may be uniquely tailored to meet the needs of diverse student populations such that optimal outcomes can be obtained.

As minimal reviews have explicitly investigated the use of interventions in general and special education settings, researchers may expand self-management review literature by investigating intervention use across distinct education settings. Such research is warranted as past reviews have commonly conflated studies conducted across education contexts, and have infrequently considered self-management implementation and outcomes in distinct education contexts. Outcomes of such research may have implications for researchers and practitioners needing to implement self-management intervention packages tailored for different education settings. Future researchers should also consider investigating behaviour and academic outcomes as sole outcome measures. While academic and behaviour (disruptive and task engagement) outcomes are the most commonly targeted outcomes through the existing self-management review literature few reviews have targeted behavioural outcomes as a sole outcome measure. Such research holds implications for tailoring unique self-management interventions which yield optimal outcomes for each outcome category.

This analyses of published self-management review literature suggests researchers should address the aforementioned research gaps by conducting future reviews to investigate more focused applications of self-management interventions implemented across differential education contexts, with distinct student populations and education levels, targeting diverse student outcomes. Table 2.7 highlights the variables in need of further research. Undertaking future reviews targeting specific experimental variables (i.e., setting, participant populations, education level, and targeted outcomes), is essential as review of study methodologies and documented outcomes will aid researchers to identify more clearly the specific conditions under which interventions are found to work (Horner et al., 2005).

2.7.2 Research methodology. A final gap identified in this review concerns SCD analysis procedures which have been used to summarise, synthesise, and analyse intervention studies evaluated within the identified self-management reviews. This literature review showed that past self-management reviews tend to omit, or inconsistently consider, key SCD research methodology features, specifically design quality appraisal processes, visual analysis procedures, effect size computations, social validity measurement, and fidelity/integrity evaluations. Unfortunately, lack of systematic quality appraisal and key methodological evaluations can restrict the confidence which may be placed on review findings, and limit the extent to which published reviews align with the current evidence-based practice movement.

Identification of *evidence-based practices* has become central to the education field in recent years due to an increasing desire to implement effective practices and interventions with strong empirical research support (Cook, Landrum, & Tankersley, 2009; Hempenstall, 2006; Lane & Carter, 2013; Maggin et al., 2013). The evidence-based practice movement emphasizes that appraisal of research methodology is critical in literature reviews to ensure aggregated findings (aka. evidence) have been reliably obtained from rigorous SCD research which demonstrates adequate internal validity/experimental control (Cook et al., 2009; Maggin & Chafouleas, 2013; Wendt & Miller, 2012). Inconsistent SCD review methodologies, as identified in this meta-review, can restrict the extent to which objective comparisons can be made across research and may lead to questions about the rigor and reliability of published review findings (Maggin & Chafouleas, 2013; Maggin et al., 2012).

Table 2.7 highlights key methodological gaps to consider in future self-management research reviews. These gaps in the self-management review literature reflects larger challenges and issues that currently underlie SCD synthesis and analysis methods. Despite SCD research methods having received much attention over the years, widespread disagreement exists concerning the suitability and accuracy of various analysis approaches used to evaluate SCD evidence data (Smith, 2012). Contention primarily surrounds use of evidence and design standards, and use of both visual and quantitative analyses (effect sizes). Recent methodological advances in existing review processes, suggest design quality appraisal processes are being embraced as a means of ensuring that documented evidence findings have been reliably obtained from collections of studies which demonstrate adequate internal validity (Maggin & Chafouleas, 2013). Despite recent advancements, most reviews in this meta-review omit quality appraisal processes, thus the quality of reviewed literature in these reviews is unknown. Inclusion of studies with poor quality research methodologies in literature reviews is widely discouraged as documented findings cannot be confidently attributed to the intervention or practice under review (Cook et al., 2009; Garg, et al., 2008; Odom, Brantlinger, Gerstend, Horner, Thompson, & Harris, 2005; Wendt & Miller, 2012).

Addressing challenges relating to quality appraisal and SCD analysis procedures (i.e., visual and quantitative) in the self-management literature is important, particularly as education is increasingly guided by the evidence-based practice movement (Chambless & Hollon, 1998; Horner et al., 2012; Maggin, O’Keeffe, & Johnson, 2011). While an in depth discussion of methodological analyses issues is beyond the scope of this chapter, Chapter 3 presents a background on SCD research methodologies, identifying evidence, multi-faceted approaches to SCD evidence reviews, and use of evidence standards.

Table 2.7

Gaps Warranting Further Research

Area	Knowledge Gap	Potential Future Research
Student Population	Published reviews largely lack investigations explicitly targeting distinct student populations (aside from ASD)	Reviews exclusively targeting: - typically developing students - students with various diagnosed disabilities (e.g., EBD, ADHD, LD etc.)
School Level	Published reviews largely lack investigations explicitly targeting distinct education levels	Reviews exclusively investigating self-management interventions used with students in: - pre-school - primary school - high school
Education Setting	Published reviews largely lack investigations evaluating self-management intervention use in distinct education settings	Reviews exclusively investigating self-management interventions used with students in: - general education settings - special education settings
Intervention Outcomes	Published reviews largely lack investigations evaluating self-management intervention used to target distinct student outcomes	Reviews exclusively investigating self-management interventions targeting: - behavioural outcomes - academic outcomes
Methodology	Published reviews largely lack consideration of key SCD methodological features	Reviews considering the following SCD methodological features when investigating self-management interventions: - design quality appraisal processes - visual analysis procedures - effect size computations - social validity measurement - fidelity/integrity evaluations

2.8 Rationale for Current Research

On a daily basis school teachers face the challenge of educating a wide variety of student populations, while simultaneously managing a range of student behaviour difficulties to ensure learning environments are effective, safe, and enjoyable (Rafferty, 2010; Sullivan, Johnson, Owens, & Conway, 2014). Interestingly, research on student behavior has consistently revealed the most common behaviors of concern to educators are minor disengaged behaviour (i.e., off-task, inattention, work avoidance) and low-level disruptive type behavior (i.e., non-compliance, out-of-seat behaviour, moving around unnecessarily, making inappropriate vocalizations or noises intentionally, talking out of turn, using devices or classroom materials inappropriately, mucking around, rowdiness, disrupting the flow of the lesson) (Beaman, Wheldall, & Kemp, 2007; Goss & Sonnemann, 2017; Sullivan et al., 2014). Though disengaged and disruptive behaviours are often considered trivial compared with aggressive or anti-social behaviour, such behaviour is viewed as problematic in education contexts due to its high incidence, the interruption it causes to teacher instruction, the disruption it causes to student engagement and learning, and the increased risk of stress, emotional exhaustion, and burnout places on teachers (Aloe, Shisler, Norris, Nickerson, & Rinker, 2014; Friedman 1995; Kokkinos, 2007; Jull, 2009; Sullivan et al., 2014). Problem student behaviour is also concerning as it can absorb notable amounts of teacher time. Research conducted in Melbourne has revealed that during a typical day 50% of primary school teachers (n=97) manage student problem behaviour five or more times (Clunies-Ross et al., 2008). A more recent Australian report indicated that 39% of school leaders and teachers (n=1,857 respondents) in public primary and secondary school settings spend at least 20% of their school day on behaviour management – this is the equivalent of one day a week (Office of the Auditor General Western Australia, 2014).

Management of student behaviour in mainstream classroom settings is an enduring concern for school teachers (Beaman et al., 2007; Sullivan et al., 2014; Wheldall & Merrett, 1988), with recent research indicating problem behaviour is a more prominent concern for primary (elementary) school educators, relative to high school educators (Clunies-Ross et al., 2008; Ding, Li, Li, & Kulm, 2008; Harrison, Vannest, Davis, & Reynolds, 2012; Mayer & Philipp, 2012). A recent study by Harrison et al. (2012) investigating problem behaviour incidence and prevalence across 3,600 school-age children in general education classrooms as rated by U.S teachers, revealed disruptive behaviour as the most common problem behaviour for children and adolescents. Disengagement was also identified as a common problem behaviour. Teachers participating in the Harrison et al. study rated 5.10% of children as almost always, and 15.31% as often, and 4.31% of adolescents as almost always, and 13.45% as often demonstrating excessive movement. Similarly, teachers rated 5.06% and 13.09% of children, and 3.22% and 9.39% of adolescents as talking without permission almost always and often, respectively (Harrison et al., 2012). In terms of disengagement, Harrison et al. reported teachers rated 9.91% of children as almost always, and 19.98% as often, and 4.12% of adolescents as almost always, and 11.62% as often being generally distracted. Furthermore, teachers rated 9.03% and 18.22% of children, and 4.06% and 12.18% of adolescents as being distracted from tasks almost always and often, respectively (Harrison et al., 2012). While Harrison et al. identified teachers perceive problem behaviour to be commonly demonstrated by both children and adolescents, findings reveal teachers rated problem behaviours to be most prevalent for primary school aged children.

With recent research suggesting common problem behaviours are most prevalent in primary-school aged student populations effective behaviour management interventions are needed in a bid to reduce classroom management demands on primary schools educators. Although an extensive collection of review literature has comprehensively investigated the use self-management interventions across educational contexts researchers have yet to conduct a systematic review of self-management intervention literature explicitly addressing primary student problem behaviour in general classroom settings. At this stage one literature review (Panagopoulou-Stamatelatou, 1990) - conducted 27 years ago - has explicitly reviewed research investigating self-management intervention use with primary school students in general education class settings. Panagopoulou-Stamatelatou (1990) broadly examined applications of self-management in mainstream primary school settings to improve *both* academic and behavioural student outcomes. Thus, positive results documented by Panagopoulou-Stamatelatou, and the other reviews evaluated in this chapter, are currently limited in specific relevance to primary schools students demonstrating problem behaviour.

Given the importance of early intervention (Ramey & Ramey, 1998) and enduring concerns relating to problem student behaviours in primary school settings, an updated systematic review examining the effectiveness and suitability of self-management as a behaviour management intervention for primary students in mainstream school contexts is warranted. Furthermore, a current investigation into the *evidence-based status* of behavioural self-management practices in mainstream school settings with primary students is warranted as few published self-management reviews have applied recent systematic standards and guidelines for identifying evidence-based practices in SCD research. While published reviews widely indicate self-management is a promising intervention strategy which may prove beneficial for students and educators, many of the identified self-management reviews do not meet current expectations for SCD systematic evidence reviews. Given the importance of evidence-based practice in current research and practice in education and psychology further research is required to determine the evidence-based status of self-management and instill greater confidence in documented research findings.

To address the aforementioned gaps specified in this literature review, this PhD research presents three connected studies which focus on reviewing and expanding existing SCD self-management research which targets behaviour outcomes for primary school students in mainstream education. This research may help to determine if self-management may be classed as a reliable evidence-based practice that can be effectively implemented in mainstream school settings to improve the behavioural outcomes of primary school aged students.

Chapter 3: Methodology Narrative- Single-Case Design Research Evidence Review

As identified in Chapter 2, published self-management literature reviews have not consistently incorporated current evidence review features which thereby limit the extent to which published reviews align with the current evidence movement. Chapter 2 demonstrates that many existing *single-case design (SCD)* reviews lack detail required to determine exactly what works in terms of self-management interventions, for whom, and under what conditions. In an effort to address this gap in existing self-management literature, this PhD presents two connected SCD literature review studies in Chapters 4 and 5. Prior to presenting these studies an overview of the current state of SCD evidence review literature and *evidence-based practice (EBP)* identification, along with clarification concerning its relevance to this PhD must be provided.

The chapter begins with brief commentary on EBP, focusing on its background in the field of education, the rationale for EBP identification, definitions of EBPs, and a description of how EBPs are identified. Next, this chapter provides a narrative outlining how EBPs are identified via systematic literature review processes, and the role of SCD research in systematic literature reviews (or evidence reviews). The concepts of a functional relation and experimental control are explored. Following on, the chapter briefly touches on the growing number of evidence review standards, and broadly outlines several dimensions which are commonly considered within SCD evidence reviews. These dimensions include methodological design quality, research quantity, and SCD visual and statistical data analyses. This chapter then presents a key methodological resource (Visual Analysis Protocol - Appendix B) which has been purposely developed for and used within Chapter 4.

The final section of this chapter provides an overview and justification of the review methodology used in Study 1 (Chapter 4) and Study 2 (Chapter 5). The review methodology for those chapters is detailed to outline the complementary review elements undertaken within each chapter, and to improve fluency. This chapter is intended to provide a background and overview of SCD research methods, EBP, and systematic review processes. Where relevant readers have been provided with lists of articles and other relevant works which supplement this chapter with more comprehensive information.

3.1 Evidence-Based Practice in Education

Education policy established in the 2000s (e.g., No Child Left Behind Act, 2002; Individuals with Disabilities Education Improvement Act, 2004) has long called for a scientific approach to education services. Such policies have given rise to the EBP paradigm, which has become widely embraced by researchers, practitioners and professionals alike in education related fields inclusive of special education, school or educational psychology, and behavioural education (Cook, Tankersley, Cook, & Landrum, 2008; Freeman & Sugai, 2013; Horner & Kratochwill, 2012; Maggin, Briesch, Chafouleas, Ferguson, & Clark, 2013; Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005; Plavnick & Ferreri, 2013). Supporters of the EBP paradigm advocate that by identifying EBPs and disseminating EBP information, implementation of research-supported practices may increase, and aid in improving student outcomes whilst bridging the long enduring *research-practice gap* (Davis, Mason, Davis, Mason, & Crutchfield, 2016; Cook & Cook, 2013; Cook, Smith, & Tankersley, 2013). The research-practice gap refers to current phenomenon where a discrepancy exists between the findings reported in scientific research investigating educational practices, and what is actually implemented in schools and classrooms (Cook et al., 2013; Fitzpatrick & Knowlton, 2009). Accordingly, identifying, defining, describing, evaluating, promoting, and implementing EBP in education contexts has become a matter of great importance (Cook & Odom, 2013; Fixsen, Naoom, Blase, Frienman, & Wallace, 2005; Horner & Kratochwill, 2012; Maggin et al., 2013).

The *EBP paradigm* is firmly founded on the logic that optimal student outcomes are likely to occur through applications of practices demonstrated to be widely effective and generalizable through rigorous, and reliable scientific research (Cook & Odom, 2013; Cook et al., 2013; Horner & Kratochwill, 2012; Maggin et al., 2013; Odom et al., 2005). Based on this logic identifying a practice as *evidence-based*, essentially endorses a strategy as an effective, empirically supported practice, which should ideally be used in favour of strategies which do not have adequate, rigorous research support (Cook et al., 2013; Maggin et al., 2013). On this basis, education professionals are largely encouraged, and in some instances mandated, to implement EBP (Freeman & Sugai, 2013; Horner & Kratochwill, 2012; Maggin, Briesch, & Chafouleas, 2012; Maggin et al., 2013).

3.2 What is Evidence-Based Practice?

As a commonly embraced construct, EBP has been widely defined throughout education literature. Table 3.1 presents some definitions as identified in notable EBP publications. In the most basic sense, EBP refers to practices (or interventions) found through rigorous empirical research to be effective in bringing about improved, predictable student outcomes.

Table 3.1

Evidence-Based Practice Definitions

Author	Definition
Cook & Cook, (2013)	"Evidence-based practices (EBPs) are instructional techniques that meet prescribed criteria related to the research design, quality, quantity, and effect size of supporting research, which have the potential to help bridge the research-to-practice gap and improve student outcomes" (p. 71)
Dunst, Trivette, & Raab (2013)	"practices that have been scientifically investigated with a focus on the key features or active ingredients of the practices that are empirically related to hypothesized outcomes in which the relationships between the characteristics and consequences of the practices have been replicated under a variety of different conditions" (p. 86)
Cook & Cook (2011)	"practices that are supported by a number of high-quality studies that utilise research designs from which causality can be inferred and that demonstrate meaningful effects on student outcomes" (p. 4)
Cook, Landrum, & Tankersley, (2009)	"practices shown by research to work" (p. 366)
Forman, Olin, Hoagwood, Crowe, & Saka (2009)	"evidence-based interventions (or practices) are those that are empirically supported and substantiated with research findings that demonstrate beneficial and predicable outcomes" (p. 26)
Cook, Tankersley, Cook, & Landrum (2008)	"practices that have been shown to be effective by credible research" (p. 70)
Slavin, (2008)	"practices found to be effective in rigorous research" (p. 5)

3.3 Identifying Evidence-Based Practices

According to Bryan G. Cook and his research peers (Cook & Cook, 2011, 2013; Cook et al., 2008; Cook, Laundrum, & Tankersley, 2009; Cook & Odom, 2013; Cook et al, 2013) ascertaining whether a practice is *evidence-based* involves identifying whether the practice in question is supported by *a sufficient amount of studies* utilising *experimental research designs* of *high methodological quality*, that demonstrate *experimental control*, and show the practice has a *significant effect on meaningful student improvements*. Classifying any practice as evidence-based largely involves evaluating supportive literature for the following features[5]:

- *Research methodological design quality*
- *Quantity of research (i.e., Amount of supporting evidence)*
- *Experimental control demonstration*
- *Intervention outcomes or effectiveness*

3.4 Identifying Evidence-Based Practices via Systematic Literature Reviews

Throughout the evidence movement, *systematic literature review* processes have become key to identifying EBPs (Johnston & Smith, 2010; Maggin et al., 2013; Schlosser & Sigafoos, 2009). Broadly known as *evidence-based practice reviews*, or simply *evidence reviews*, these reviews investigate if a practice is supported by a collection of adequate empirical research literature which encompasses the four aforementioned features (Cook & Cook, 2013; Cook et al., 2013; Maggin et al., 2013). When identifying EBPs, evidence reviews are primarily utilised to investigate practices in terms of *what works, for whom, under what conditions?* (Maggin & Chafouleas, 2013; Shadish & Rindskopf, 2007). Evidence reviews generally involve (a) systematically identifying experimental research relevant to the practice (or intervention) under investigation, (b) evaluating identified literature for design quality, experimental control, intervention outcomes (e.g., effectiveness), and other features

[5] While beyond the scope of this PhD to provide a comprehensive overview of these EBP features some detail has been provided in a later section. For more detail refer to the work of Cook and his research peers, of whom have published an extensive body of literature on special education EBP conceptualisation, identification, and evaluation.

related to posed research questions, (c) synthesising research findings, and (d) interpreting findings (Burns, 2012; Hemingway & Brereton, 2009; Horner & Kratochwill, 2012).

To complete this process, researchers typically utilise a set of field relevant evaluation standards or guidelines, to ascertain whether adequate, high-quality literature consistently demonstrates successful intervention outcomes, thus supporting the decision to classify the practice as evidence-based (Cook & Cook, 2013; Maggin et al., 2013; Mazzotti, Rowe, & Test, 2013). In light of this process the use of established evaluation standards and guidelines has become central to the evidence movement as they are thought to promote review consistency, helping to ensure researchers' objective, thoughtful, and comprehensive reviews (Cook et al, 2013; Odom et al., 2005; Smith, 2012). Responding to the evidence movement, several research synthesis initiatives, task forces, and professional research associations (see Table 3.2) have endeavoured to establish reliable, objective, and defensible standards and guidelines designed to guide evidence review processes (Freeman & Sugai, 2013; Plavnick & Ferreri, 2013; Odom et al., 2005; Slavin, 2008; Smith, 2012).

Table 3.2

Research Initiatives and Associations

Initiative/Task Force/ Research association	Established	Website	Field
Best Evidence Encyclopaedia (BEE)	2004	http://www.bestevidence.org.uk/index.html http://www.bestevidence.org/	Education
Campbell Collaboration	1999	https://www.campbellcollaboration.org/	Promotion of social and economic change
Cochrane Collaboration	1963	http://www.cochrane.org/	Health
Council for Exceptional Children	1922	https://www.cec.sped.org/	Education
Division 16 of the American Psychological Association (APA); School Psychology	~	http://apadivision16.org/	School Psychology
Evidence for Policy and Practice Information and Coordinating Centre (EPPI-Centre)	1993	https://eppi.ioe.ac.uk/cms/	Areas if social policy
Institute of Education Sciences (IES); What Works Clearinghouse (WWC)	2002	https://ies.ed.gov/ncee/WWC/	Education

3.5 Evidence-Based Practices and Single-Case Design Research.

While group-based, randomised control trial research methods are generally considered the most common means of establishing empirical research support, SCD research methods represent an alternative research approach which has long been embraced as a means of investigating the effectiveness of interventions on improving student functioning and behaviour outcomes (Gast, 2010; Horner, Carr, Halle, McGee, Odom, & Wolvery, 2005; Maggin et al., 2013; Plavnick & Ferreri, 2013; Smith, 2012; Wendt & Miller, 2012). According to Horner et al., (2005) "single-subject (case) research is a rigorous, scientific methodology used to define basic principles of behaviour and establish evidence-based practices" (p. 165). SCD research methodologies have been broadly utilised throughout various research fields (e.g., education, psychology, and medicine), and are particularly prominent within applied behaviour analysis research as a means of evaluating intervention effectiveness when used by individuals in everyday applied settings (Gast, 2010; Kazdin, 2011; Kennedy, 2005; Plavnick & Ferreri, 2013).

With a long tradition in applied behavioural science and education research (Cooper, Herson, & Heward, 2007; Gast, 2010; Kennedy, 2005) SCD experimental research is utilised to establish if active and systematic manipulation of an independent variable in an individual's environment is functionally related to predicted and reliable change in an observable and measurable dependent variable (Cooper et al., 2007; Horner, Swaminathan, Sugai, & Smolkowski, 2012; Maggin et al., 2013; Plavnick & Ferreri, 2013; Smith, 2012). Through repeated measurement of a targeted behaviour displayed by an individual participant (or multiple participants), over time under baseline and comparison (or intervention) conditions, researchers can use SCDs to ascertain whether an independent variable has an isolated effect upon the dependent variable (Horner et al., 2005; Smith, 2012). SCD research methods are thought valuable in establishing evidence-bases in applied research given their rigorous experimental nature (Horner & Kratochwill, 2012; Maggin et al., 2013; Shadish & Rindskopf, 2007; Wendt & Miller, 2012).

3.5.1 Functional relations and experimental control. Widespread consensus suggests that practices may be classified as evidence-based once repeated and convincing documentation of a *functional relation* is identified across multiple rigorous SCD studies which demonstrate *experimental control* (Freeman & Sugai, 2013; Gast, 2010; Horner & Kratochwill, 2012; Maggin et al., 2013).

The primary objective of SCD experimental research is to document a causal or *functional relation* between a researcher-manipulated independent variable and a meaningful change in the targeted dependent variable (Cook & Cook, 2011, 2013; Horner et al., 2005; Plavnick & Ferreri, 2013; Smith, 2012). According to Cooper et al. (2007) a functional relation is demonstrated when a specific change in the dependent variable is produced by systematically introducing or manipulating the independent variable, and the observed change is unlikely due to any other factors. Once functional relations have been identified in multiple SCD studies it may be suggested that the intervention demonstrates *generality or external validity,* meaning the independent variable reliably changes the dependent variable through repeat experiments *across* participants, settings, *and/or* behaviours (Horner et al., 2005; Maggin et al., 2013).

To declare evidence of a functional relation exists, SCD studies must demonstrate *experimental control/internal validity* has been established (Cooper et al., 2007; Horner et al., 2005; Kennedy, 2005; Maggin et al., 2013; Plavnick & Ferreri, 2013). According to Horner and Kratochwill (2012, p. 268) experimental control is documented by "repeatedly measuring the same participant both before and after introducing the intervention, and then replicating the effect of the intervention multiple times" (p. 268). Experimental control is believed to be established when systematic manipulation or implementation of an independent variable *reliably* changes the dependent variable in a *predictable* manner (Cooper et al., 2007; Horner et al., 2005; Maggin et al., 2013). The broader SCD research community agrees that SCD studies demonstrate experimental control when a design documents at least *three* experimental effect demonstrations, or r*eplications*, at three different points in time, with a single participant (within-subject replication), or across different participants/settings (inter-subject/setting replication) (Cihak, 2010; Freeman & Sugai, 2013; Horner et al., 2005; Horner et al., 2012; Smith, 2012; Wendt & Miller, 2012).

3.6 Single-Case Design Evidence Reviews and Evidence Standards.

Growing demand for evidence reviews in the last decade has seen the emergence of various field-relevant *evaluation standards and guidelines* which operationalise criteria and procedures intended to guide researchers in systematic literature *identification, evaluation,* *synthesis*, and *interpretation* processes to determine whether a literature-base supports the investigated practice in being classified as evidence-based (Cook et al., 2013; Freeman & Sugai, 2013; Horner et al., 2005; Horner & Kratochwill, 2012; Lane & Carter, 2013; Maggin et al., 2013; Odom et al., 2005; Shadish & Rindskopf, 2007). As such, the EBP movement has seen the emergence of various standards, guidelines, and frameworks designed for the purpose of conducting evidence reviews of SCD research in various fields (including education and special education research). Table 3.3 lists some existing SCD quality appraisal and evidence evaluation standards identified by researchers who have reviewed and examined various evidence evaluation standards.

Table 3.3

Quality Appraisal and Evidence Evaluation Standards

Review	Identified Standards
Maggin, Briesch, Chafouleas, Ferguson, & Clark (2013)	1. Evaluative Method for Assessing Single-Case Research (Reichow et al., 2008) 2. Scientific Merit Rating Scale (National Autism Center, 2008) 3. National Professional Development Centre on Autism Spectrum Disorders 4. Protocol for Assessing Single-Subject Research Quality (Maggin & Chafouleas, 2010) 5. Single-Case Experimental Design Scale (Tate et al., 2008) 6. Single-Subject Research Design Quality Rating (Logan et al., 2008) 7. What Works Clearinghouse Single-Case Design Standards (WWC Standards; Kratochwill et al., 2010)
Smith (2012)	1. WWC Standards (Kratochwill et al., 2010) 2. Division 12 Task Force on Psychological Interventions, with some contributions from the Division 12 Task Force on Promotion and Dissemination of Psychological Procedures and the APA task force for Psychological Intervention Guidelines (DIV12; presented in Chambless & Hollon, 1998; Chambless & Ollendick, 2001) 3. APA Division 16 Task Force on Evidence-Based Interventions in School Psychology (DIV16; Members of the Task Force on Evidence-Based Intervention in School Psychology, 2003). 4. National reading Panel (NRP, National Institute of Child Health and Human Development, 2000) 5. Single-Case Experimental Design Scale (Tate et al., 2008) 6. The reporting guidelines for EMA put forth by Stone and Shffman (2002)
Wendt & Miller (2012)	1. Certainty Framework (Simeonsson & Bailey, 1991) 2. Evaluative Method for Assessing Single-Case Research (Reichow et al., 2008) 3. Evidence in Augmentative and Alternative Communication (EVIDAAC) 4. Single-Subject Research Design Quality Rating (Logan et al., 2008) 5. Single-Case Experimental Design Scale (Tate et al., 2008) 6. Smith, Lelen, and Patterson Scale (Smith et al. 2010) 7. WWC Standards (Kratochwill et al., 2010) 8. Quality Indicators Within Single-Subject Research (Horner et al., 2005)

Note: Information in table above has been extracted directly from the three aforementioned reviews.

Despite some reported discrepancies between existing evaluation standards, in terms of processes, criteria, and evidence classifications (see Cook & Cook, 2013; Maggin et al., 2013; Smith, 2012; Wendt & Miller, 2012), most SCD standards have been purposely designed to provide researchers with an operationalised set of guidelines that can be applied when conducting a SCD evidence review to identify EBPs. Although no universally accepted set of SCD standards exist at this time (Maggin et al., 2012; Maggin & Chafouleas, 2013; Smith, 2012; Wendt & Miller, 2012), several features are widely viewed to be key evidence review considerations, and are as such commonly featured in evaluation standards. These features are outlined and described in the following section.

3.7 SCD Evidence Review Features.

SCD evidence reviews broadly involve identifying EBPs by evaluating empirical literature along several dimensions pertaining to research methodological quality, quantity of research, experimental control, and study outcomes (e.g effect magnitude) (Cook & Cook, 2011, 2013; Cook & Odom, 2013; Cook et al., 2013; Freeman & Sugai, 2013; Horner et al., 2005; Horner et al., 2012; Lane & Carter, 2013; Logan, Hickman, Harris, Heriza, 2008; Maggin et al., 2013).

3.7.1 Methodological design quality. The process for identifying EBPs via SCD evidence reviews is grounded in the idea that empirical support should be based upon high-quality, rigorous research which accounts for possible confounding variables, and thus increases confidence that experimental control has been established and a functional relation exists (Cook & Cook, 2011, 2013; Freeman & Sugai, 2013; Maggin et al. 2013; Odom et al., 2005). Unlike generic meta-analyses and literature reviews, which synthesise findings from all identified topic relevant studies, evidence reviews are typically conducted to synthesise findings from high-quality research studies to ensure supportive research comprises of rigorous, well-constructed research designs from which valid results can be reliably produced (Cook & Cook, 2011; Cook et al., 2013; Maggin & Chafouleas, 2013). To facilitate the quality appraisal process, evaluation standards (see Table 3.3.) typically contain *design quality* *standards* (or *quality indicators*) which can function as a *screening tool*[6], to ensure high-quality studies are included for evidence review.

In considering design quality a number of key indicators are considered, including: (a) choice of research design (e.g., multiple-baseline design (MBD), ABAB reversal design, alternating treatment design (ATD)), (b) level of interobserver agreement (IOA) for dependent variable measurement, (c) the number of intervention manipulations undertaken in effort to demonstrate effect, and (d) the number of data points per study phase (Freeman & Sugai, 2013; Kratochwill, Hitchcook, Horner, Levin, Odom, Rindskopf, & Shadish, 2010, 2013; Maggin & Chafouleas, 2013; Smith, 2012). Appraisal of these key indicators is central in determining whether any SCD study demonstrates a functional relation (Freeman & Sugai, 2013; Horner et al., 2012).

In addition to the aforementioned indicators, Freeman and Sugai (2013); Horner et al. (2005); Horner and Kratochwill (2012); and Maggin et al. (2013) propose evidence review study quality evaluations should consider the following: participant and settings descriptors, dependent variable definition (e.g., what is being targeted), independent variable definition (e.g., what is involved), baseline condition, data collection procedures, social validity (e.g., acceptability, feasibility), and treatment fidelity (e.g., was the intervention be implemented as specified). Through comprehensive evaluation and documentation of such elements, evidence reviews may be better equipped to answer the *what works, for who, under what conditions* question, and identify conditions in which interventions may successfully generalise (Freeman & Sugai, 2013; Maggin et al., 2013).

3.7.2 Amount of supporting evidence (i.e., Research quantity). At the basis of EBP identification is the view that the converging findings from multiple high-quality empirical studies supporting the efficacy of a practice, strengthens the overall evidence for a specific practice or intervention (Cook & Cook, 2013; Cook et al., 2008; Cook et al., 2009). To

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[6] Quality appraisal standards can also be used as an *analysis tool* that is used to analyse and categorise all studies identified as relevant to the review topic. Such reviews do not include or exclude studies on the basis of meeting the applied standards (for examples see Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker, 2015; Maggin, et al., 2012)

identify EBPs in special education using SCD research, Horner et al. (2005) propose evidence reviews evaluating research supporting a practice require (a) a minimum of five high-quality, peer-reviewed SCD studies, (b) conducted across a minimum of three different geographical locations or by at least three different researchers or research teams, and (c) including a minimum of 20 cases across studies. While no official SCD standard for identifying EBPs has been adopted, Horner et al.'s replication standard is accepted across literature (e.g., Horner & Kratochwill, 2012) and evaluation standards (e.g., WWC, 2014) as a benchmark criterion for determining if any practice may be considered *evidence-based.*

3.7.3 Analysis of SCD data. Coinciding with extensive research investigation and growing support for SCD statistical analysis, particularly across the last decade, evidence reviews incorporating visual analysis and meta-analytic/statistical analyses have been increasingly encouraged in recent years (Carr, Anderson, Moore, & Evans, 2015; Horner & Kratochwill, 2012; Maggin & Odom, 2014; Parker & Hagan-Burke, 2007; Shadish & Rindskopf, 2007). The use of visual and statistical analysis as complementary analysis methods in modern SCD reviews is often emphasised as this approach is thought to, (a) support better outcome interpretation and synthesis, (b) allow for greater confidence and credibility in documented findings, and (c) address noted shortcomings associated with each approach when used independently (Lane & Gast, 2013; Rakap, 2015; Vannest & Ninci, 2015). Unfortunately, existing SCD evaluation standards currently lack universal consistency concerning ways in which researchers are guided in analysing SCD studies. For example, some standards largely emphasise use of visual analysis, whilst other standards guide researchers in utilising both visual and statistical analyses (Cihak, 2010; Lane & Gast, 2013; Maggin et al., 2013; Manolov, Gast, Perdices, & Evans, 2014; Parker & Hagan-Burke, 2007; Smith, 2012). Given the undeniable amount of literature supporting the use of combined visual and statistical analyses, future developments in evaluation standards are likely to support this approach. In light of this, this chapter presents a basic overview of visual analysis and statistical analysis methods that have been adopted in this PhD.

3.7.3.1 Visual analysis. Widely viewed as the cornerstone of SCD analysis, *visual analysis,* also termed visual inspection, is the traditional way of evaluating and interpreting graphically displayed data used to determine if sufficient experimental control exists to demonstrate evidence of a functional relation (Freeman & Sugai, 2013; Horner et al., 2005;

Horner et al., 2012; Kazdin, 2011; Kennedy, 2005; Lane & Gast, 2013; Maggin et al., 2013; Plavnick & Ferreri, 2013; Rakap, 2015; Smith, 2012). Identifying evidence of a functional relation in SCD studies generally involves evaluating *effect replication* with a single participant (intra-subject replication), and/or across participants (inter-subject replication) within a study or across studies (Kennedy, 2005; Lane & Gast, 2013). Through visual analysis, experimental control, and the existence of a functional relationship is established via systematic evaluation, interpretation, and integration of research findings presented in SCD graphical data (Cooper et al., 2007; Horner et al., 2005; Horner et al., 2012; Lane & Gast, 2013; Rakap, 2015).

Based upon a set of long accepted basic principles, visual analysis broadly involves evaluating graphed data patterns, features or dimensions, to draw outcome conclusions (Cooper et al., 2007; Kazdin, 2011; Kennedy, 2005; Lane & Gast, 2013). At the core of visual analysis, within-phase data patterns are evaluated across the fundamental dimensions of *level* (average of data within a phase), *trend* (data slope), and *variability* (the degree to which data points deviate from the overall trend) (Cooper et al., 2007; Cihak, 2010; Horner et al., 2005; Horner et al., 2012; Kennedy, 2005; Lane & Gast, 2013). In addition to describing data patterns *within* each SCD phase, the three listed dimensions are also used to evaluate behaviour changes *between* phases (Cihak, 2010; Kennedy, 2005). Along with level, trend and variability, visual analysis also involves evaluation of *data overlap* (the degree to which data in adjacent phases overlap), *immediacy of effect* (how quickly a change in the data pattern occurs after phase change), *magnitude of change,* and *consistency of data patterns* between conditions (Cooper et al., 2007; Horner et al., 2005; Horner et al., 2012; Kennedy, 2005; Lane & Gast, 2013). For more information on visual analysis all visual analysis principles, dimensions, features, and processes refer to the following works: Appendix B; Bourret & Pietras (2013); Cihak, 2010; Cooper et al., 2007; Kennedy (2005); Lane & Gast (2013).

While considered the most suitable SCD research analysis approach, visual analysis is not without limitation. Frequently documented limitations include autocorrelation, the possibility of effect overestimation, and notably, the challenge of synthesising findings from multiple studies in evidence-reviews (Horner et al., 2012; Smith, 2012). Of notable concern is the longstanding view that visual analysis is a subjective process, with no universal standards for completing visual analysis processes (Horner et al., 2012; Plavnick & Ferreri, 2013;

Rakap, 2015). This limitation raises concerns regarding potential for poor, or inconsistent interobserver judgement agreement (Horner et al., 2012; Kennedy, 2005; Lane & Gast, 2013). In a bid to address such concerns, researchers in recent years have investigated the idea of improving SCD visual analysis interpretation agreement and accuracy via the use of operationalised, systematic visual analysis procedures or tools (Gast & Spriggs, 2010; Horner & Kratochwill, 2012; Lane & Gast, 2013). Developers of more recent evaluation standards have also recognised the need for formal visual analysis procedures, and have started working towards the inclusion of visual analysis guidelines (e.g., Horner & Kratochwill, 2012; WWC, 2014). Despite a growing body of literature focused on development of an accepted visual analysis tool, existing limitations continue to cause concern as a “gold standard” tool is yet to be established.

3.7.3.2 Magnitude of effect/effect size. Researchers are increasingly encouraged to conduct meta-analytic evidence reviews to evaluate experimental effect magnitude across the high-quality studies supporting the practice under investigation (Beretvas & Chung, 2008; Cook & Cook, 2013). Systematic literature reviews incorporating meta-analyses are a critical tool in establishing an evidence-base for effective behavioural interventions (Bowman-Perrott, Burke, de Marin, Zhang, & Davis, 2015). As such, statistical analysis of SCD data is widely accepted as an objective and replicable means of quantifying effect size outcomes demonstrated in SCD research, and a way of facilitating *meta-analytic* processes (Horner & Kratochwill, 2012; Horner et al., 2012; Manolov et al. 2014). In light of growing support for SCD statistical analysis techniques, an extensive literature base has emerged over the last two decades, dedicated to investigating the various ways in which SCD study results can be reliably quantified to analyse, synthesise and interpret documented outcomes (Beretvas & Chung, 2008; Horner et al., 2012; Manolov et al., 2014).

Unfortunately, statistical analyses in SCD research is a complex and contentious matter, with no universally accepted effect size metric, and no agree-upon standard for SCD meta-analytic processes (Cihak, 2010; Horner & Kratochwill, 2012; Maggin & Chafouleas, 2013; Rakap, 2015; Smith, 2012). As SCD research data presents a unique set of characteristics and features, this has resulted in the development of several methods for quantifying SCD research results, each presenting with its own strengths and shortfalls (Freeman & Sugai, 2013; Maggin & Chafouleas, 2013; Rakap, 2015). Readers are referred to an extensive body of literature which has investigated various SCD effect metrics (see Beretvas & Chung, 2008; Carr et al., 2015; Lenz, 2012; Parker & Hangan-Burke, 2007; Parker, Vannest, & Davis, 2011; Parker, Vannest, Davis, & Sauber, 2011; Rakap, 2015; Shadish, 2014; Vannest & Ninci, 2015). The status of SCD statistical analysis is reflected in existing evaluation standards with standards either omitting recommendations, or presenting lose guidelines which reflect the evolving nature of SCD statistical analysis (Horner & Kratochwill, 2012; Smith, 2012). While tentative guidelines have been provided by some (e.g., Kratochwill et al., 2010; Manolov et al., 2014), it is currently accepted that researchers conducting evidence reviews will evaluate the existing effect size metric literature to make an informed and justified selection concerning the SCD statistical analysis/meta-analytic approach adopted in any review.

3.8 Evidence Review Methodological Framework: This PhD.

Despite need for further refinement of a standard methodological approach and accepted evaluation criterion, this chapter has demonstrated that systematic evidence reviews incorporating SCD literature are highly valued in the evidence movement and, despite their varied forms, are key to EBP identification and advancement. In light of this, a SCD evidence review methodological framework was established for this PhD based upon evidence conventions broadly embraced within the SCD education research field, which have been outlined in this chapter. This final section provides an overview of the review methodology used in Study 1 (Chapter 4, evidence review) and Study 2 (Chapter 5).

3.8.1 WWC design and evidence standards. Chapter 4 has been conducted in line with a recent set of SCD standards published online by the What Works Clearinghouse (WWC), a research initiative established by the U.S Department of Education’s Institute of Education Science. The WWC Single-Case Design Technical Documentation (Kratochwill et al., 2010, 2013; WWC, 2014) (henceforth the *WWC Standards*) are currently considered one of the most comprehensive, detailed, objective, and explicit set of evidence evaluation guidelines designed specifically for education-based research (Maggin et al., 2012; Smith, 2012; Wendt & Miller, 2012). The WWC standards offer SCD evaluation guidelines designed guide analysis of key evidence dimension mentioned earlier in this chapter (i.e., design quality, research quantity, evidence of experimental control, and effect). This is possible as WWC standards contain (a) design quality standards, (b) evidence standards using visual analysis, (c) evidence standards using statistical analysis, and (d) replication standards (Horner & Kratochwill, 2012; Maggin et al., 2012).

These standards offer a "screening" process which ensures that only studies documenting sufficient design quality and evidence of effect are evaluated and synthesised within evidence reviews (Kratochwill et al., 2013; Maggin et al., 2013; Maggin et al., 2012; WWC, 2014). This screening process begins with appraisal of study design quality. Studies which demonstrate adequate design quality are then subject to a visual analysis to evaluate whether they document a sufficient level of evidence. The final process involves undertaking statistical analyses and applying replication standards to determine whether adequate quality, and effect evidence has been replicated across studies, research teams and cases. This process is illustrated in Figure 3.1 and is directly applied in Chapter 4.

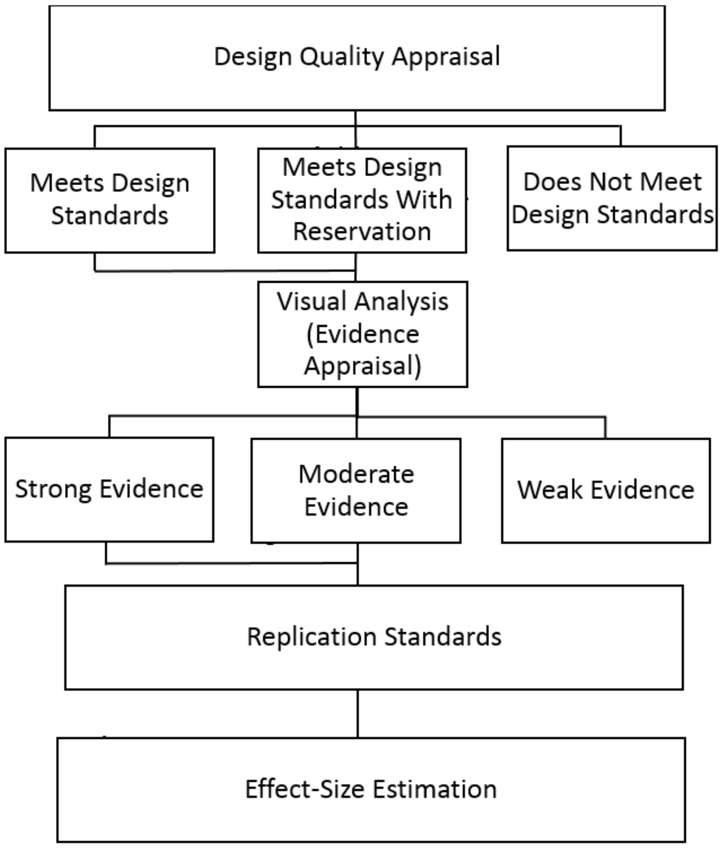

Figure 3.1. WWC Design and Evidence Standards Procedure
(Adapted from Kratochwill et al., 2013)

3.8.2 Quality appraisal approach. As the WWC design quality standards present stringent evaluation criteria which emphasise various technical design features related to the internal validity of analysed SCD studies this can limit the extent to which WWC standards can be used to evaluate other design features and variables related to a study's external validity (Maggin et al., 2012). The WWC has yet to create comprehensive criteria which can be used to evaluate design features associated with both internal and external validity which may explain why these particular standards are not universally accepted. To address this shortfall the Chapter 4 evidence review combines a strict application of the WWC design standards with an expanded evaluation of key quality indicators omitted in the WWC standards - most notably participant and setting descriptors. Chapter 5 expands the Chapter 4 review with an extended appraisal that evaluates identified literature for additional quality indicators omitted in the WWC standards (e.g., independent and dependent variable definitions, social validity, fidelity measurement, generalisation and maintenance)[7].

3.8.3 Evidence analysis. Past and current WWC standards advise, and attempt to guide researchers, in analysing SCD research evidence (Kratochwill et al., 2010; 2013; WWC, 2014) however, existing protocols do not contain formally operationalised guidelines for analysing SCD research. As it stands researchers need to develop their own operationalised visual and statistical analysis protocols to use within the WWC review framework. In an effort to manage the uncertainty and ambiguity associated with SCD visual and statistical analysis procedures, the author of this PhD developed analysis protocols used to guide systematic visual and statistical analysis processes applied in Chapters 4 and 5. The protocols, described here, were developed based upon the WWC standards, and literature relevant to SCD research analysis.

3.8.3.1 Visual analysis protocol. Appendix B presents the visual analysis protocol which was developed for application within the SCD evidence review in Chapter 4. The visual analysis protocol contains a set of explicit, operationalised decision-making rules and criteria that are intended to guide systematic visual analysis of graphed SCD data. More specifically, the protocol contains a step-by-step set of guidelines designed to guide analysts in determining whether visual evidence of a functional relation exists. The protocol has been

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[7] The quality appraisal framework presented by Horner, et al. (2005), Horner and Kratochwill (2012), and Maggin, et al. (2013) were used to identify key indicators that were not captured within the WWC design standards.

designed to aid researchers in objectively coding SCD data in a manner that aligns with the evidence standards specified by the WWC (Kratochwill, 2010; 2013; WWC, 2014). As such, the protocol was developed based primarily on visual analysis guidelines outlined by the WWC standards, whilst considering other notable visual analysis approaches, procedures, criteria, and methods published throughout SCD literature. Appendix B contains, (a) information about visual analysis protocol development and application, (b) literature acknowledgements specifying the visual analysis literature that was drawn upon to develop the visual analysis protocol, (c) information concerning visual analysis basic principles and coding considerations, and (d) visual analysis procedures and coding criteria.

3.8.3.2 Statistical analysis. Although the current WWC Standards (WWC, 2014) currently do not detail specific meta-analytic guidelines, the initial set of WWC Standards (Kratochwill et al. 2010) do recommend that effect size statistical analysis be undertaken following visual analysis. This may suggest that while the WWC have recognised statistical analyses as a key evidence review feature they are yet to formulate solid statistical analysis recommendations which can be confidently documented in the current WWC standards. Despite the lack of methodological consensus concerning SCD effect sizes and meta-analytic processes, statistical analysis has been incorporated within the evidence review in this PhD as a widely promoted analysis form which can complement visual analysis. Justification for the statistical analysis approaches adopted in Chapters 4 and 5 have been respectively justified in these chapters.

Chapter 4: Evidence Review (Systematic Literature Review/Meta-Analysis)

As highlighted in the Chapter 2 literature review, a current investigation into the evidence-based status of behavioural self-management practices in mainstream school settings with primary students is warranted as few published self-management reviews have (a) focused explicitly on this topic, and (b) applied recent systematic standards and guidelines for identifying evidence-based practices in single case design (SCD) research. In an effort to address the identified gap, this chapter contains a comprehensive SCD literature review/meta-analysis undertaken to identify and analyse high-quality SCD literature investigating the use of self-management interventions with primary school students presenting challenging behaviour in general education classrooms. The presented review has been conducted in line with the Evidence Review Methodological Framework, as outlined at the end of Chapter 3.

This chapter takes the form of a published article which is presented in the original publication format to adhere with Thesis Included Published Works requirements. The objective of this study was to determine whether adequate high-quality SCD research literature, documenting sufficient empirical evidence exists, such that self-management may be classified as an effective evidence-based practice for primary students demonstrating challenging behaviours in general education classrooms.

Citation

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ORIGINAL PAPER

Self-Management for Primary School Students Demonstrating Problem Behavior in Regular Classrooms: Evidence Review of Single-Case Design Research

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Abstract This review evaluates self-management literature targeting problem behaviors of primary school students in general education settings. Thirty-one single-case design studies met inclusion criteria, of which 16 demonstrated adequate methodological rigor, according to What Works Clearinghouse (WWC) design standards. Visual analysis and WWC replication standards were applied to determine whether self-management interventions can be classified as evidence based. Effect sizes were calculated using percentage of non-overlapping data. Results were analyzed at study and individual participant levels in terms of behavior outcomes, student disability and grade. Overall, results suggested there is sufficient research for self-management interventions to be classified as evidence-based practice for primary students with problem behaviors in regular classrooms. Interventions were effective across behaviors, disability categories, and grades. Gaps in the identified evidence base are identified and discussed. Additional high-quality research evidence is required to support applications of self-management for particular outcomes and student subgroups. Implications for future research and practice are discussed.

Keywords Self-management · Evidence-based practice · Single-case design systematic review · Primary school · Classroom behavior management

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Introduction

Teachers have long reported concerns about student behavior problems in mainstream primary schools (Clunies-Ross et al. 2008; Primary Sources 2012; Wheldall and Merrett 1988). High-frequency, low-intensity disruptive and off-task behaviors, in particular, are often considered problematic as they absorb teacher time, disrupt teaching and learning processes, and increase the risk of teacher stress, emotional exhaustion, and burnout (Aloe et al. 2014; Sullivan et al. 2014). Self-management interventions hold the potential to address problematic student behaviors by promoting positive behavioral outcomes (Briesch and Chafouleas 2009; Hoff and Sawka-Miller 2010). A substantial body of literature, primarily single-case design (SCD) research, has shown that self-management procedures can be successfully implemented in classrooms (Briesch and Daniels 2013; Moore et al. 2013) to benefit both teachers and students (Hoff and Sawka-Miller 2010; Maag 1999; Rafferty 2010).

Self-Management in Education Contexts

Self-management, defined as the personal application of behavior change techniques or actions to bring about a desired change in one's own behavior (Cooper et al. 2007; Shapiro and Cole 1994), has a long history in education research. Educating students in self-management encourages student independence, self-reliance, and the development of other valued life skills (Cooper et al. 2007; Hoff and Sawka-Miller 2010).

Self-management intervention packages vary in terms of composition and degree of student involvement (Briesch and Chafouleas 2009; Hoff and Sawka-Miller 2010). Typically, they include combinations of one or more of the following strategies: self-monitoring (self-observation and self-recording), goal setting, self-evaluation, and self-reinforcement (Cooper et al. 2007; Rafferty 2010). Self-monitoring is usually the basis of self-management interventions and involves students systematically observing their own behavior and self-recording the occurrence or non-occurrence of a target behavior (Cooper et al. 2007). Self-evaluation often requires students to evaluate their own behavior against a set standard whereas goal setting involves students actively creating behavioral target goals (Maag 1999; Rafferty 2010). Self-management may also involve self-reinforcement, delivery of an earned reward contingent upon performing a behavior or meeting a set standard/goal (Cooper et al. 2007; Maag 1999).

Self-management interventions have the potential to address the operant function of problem behavior. A small body of research has documented promising effects for self-management interventions informed by functional behavior assessment (FBA; e.g., Brooks et al. 2003; Stahr et al. 2006), and research suggests that intervention effects can be enhanced through the implementation of function-based self-management interventions (Hansen et al. 2013).

Past Reviews of Self-Management Applications in Education Contexts

To date, there have been 28 reviews or meta-analyses of self-management interventions in school settings. Although all of the identified reviews have in some way summarized and evaluated research on self-management interventions across different education settings and student populations, only one study (Panagopoulou-Stamatelatou, 1990) specifically examined the evidence base for self-management interventions with primary school students in regular education classrooms. Furthermore, many of the 28 identified SCD reviews do not meet current expectations for systematic evidence reviews in terms of design quality appraisal, systematic visual analysis, and effect size computation.

Of the 28 identified self-management reviews, nine reported effect sizes and three referred to the use of visual analysis; however, only one (Maggin et al. 2012) explicitly detailed the visual analysis process undertaken. In addition, three reviews considered study design quality; however, only two (Carr et al. 2014; Maggin et al. 2012) explicitly reported on systematic evaluations of design quality for studies included in their meta-analytic reviews.

Identifying Evidence-Based Practice in SCD Research

Given the recent focus on evidence-based practices in education, much attention has been devoted to systematically reviewing literature on specific practices and determining whether the practices in question may be considered evidence-based (Cook et al. 2013; Maggin et al. 2014). This growing focus on evidence-based practice along with the rising status of SCD research (Plavnick and Ferreri 2013; Shadish 2014) has resulted in numerous attempts to develop reliable, objective, and defensible standards that can be used to evaluate SCD evidence (see Maggin et al. 2014; Smith 2012). Although consensus has yet to be achieved regarding how to best evaluate SCD research, scholars generally emphasize the importance of three elements: methodological design quality appraisal, experimental control, and increasingly, the computation of effect size metrics.

In SCD research, design quality appraisal generally involves evaluating study rigor in terms of various design and methodological features associated with internal validity such as adequate inter-observer agreement, treatment integrity data, and repeated measurement of the outcome variable in the presence and absence of the intervention over time (Maggin and Chafouleas 2013; Maggin et al. 2014; Smith 2012). In adddition, design quality appraisal researchers can evaluate whether research findings are reliably obtained across sets of rigorous SCD studies (Maggin and Chafouleas 2013).

In SCD, experimental control is evaluated via visual inspection of graphed data to assess the presence of a functional relation between the independent and dependent variables. Typically, visual analysis involves the systematic evaluation of data patterns within and between phases on various dimensions including variability, level, and trend (Cooper et al. 2007). For meta-analytic reviews across studies, some researchers have called for the use of effect size calculations (Horner et al. 2012; Shadish 2014). Although there is currently no one agreed upon SCD effect size metric, reporting on treatment effect size is widely recognized as a critical element in systematic reviews of SCD research (Carr et al. 2015; Horner et al. 2012; Maggin and Odom 2014; Shadish 2014).

Self-Management Evidence Review

To our knowledge, there has been only one evaluation of SCD self-management studies that incorporated design quality appraisal, visual analysis, and effect size computations in evaluating SCD research evidence (Maggin, Briesch, & Chafouleas, 2012). In a strict application of the What Works Clearinghouse (WWC) SCD design and evidence standards (Kratochwill et al. 2010), Maggin et al. re-analyzed studies previously reviewed by Briesch and Chafouleas (2009). The original Briesch and Chafouleas review investigated effects of self-management in promoting appropriate classroom behaviors of school-aged students (kindergarten to 12th grade) with a range of diagnosed disabilities/disorders in regular and special education settings. In their re-analysis, Maggin et al. reported that 12 of the 30 studies originally reviewed by Briesch and Chafouleas (2009) failed to meet design standards. Based on these results, it may be suggested that prior reviews in which design quality was not appraised should therefore be treated with caution.

The purpose of the current study was to provide both an updated and more refined analysis of the self-management literature. We applied both quality appraisal and evidence evaluation processes (visual analysis and effect size analysis) to SCD studies of self-management interventions but focused our review on primary students in regular education classrooms. This refined focus seems important given that recent research suggests common classroom behavior problems to be more prevalent in children of primary school age (Harrison et al. 2012). In addition, we conducted exploratory analyses to evaluate characteristics associated with effective interventions and to identify any gaps in the current evidence base.

Methods

Literature Search and Inclusion Criteria

Potential studies were identified through a systematic search of peer-reviewed literature published through April 2014 using the PsychINFO and ERIC databases. Keywords relating to three categories were entered into the databases: (1) *self-management* (i.e., self-monitoring, self-reinforcement, self-recording, self-observation), (2) *mainstream primary school* (i.e., regular, mainstream, elementary/primary school, elementary/primary students) and (3) *problematic behavior* (challenging behavior, disruptive behavior, on-task, off-task, behavior management). A list of keywords is available upon request from the primary author. Combinations of terms were entered into keyword and thesauri searches that mapped each term to subject headings. No date limits were imposed on the search process, thereby ensuring that all relevant research, including work undertaken nearly 40 years ago, was subject to appraisal using current standards.

This initial search produced 1178 citation records. Articles identified through the database search were selected for further review if they: (1) investigated the application of an intervention containing student-managed self-management components either in isolation or in a multi-component package (studies were excluded if self-management elements were included in later phases of the experiment, such as to promote generalization and/or maintenance); (2) conducted the intervention in a regular, mainstream, or general classroom (studies conducted in special education, self-contained, or resource room settings were excluded); (3) contained a minimum of one participant in a primary (or elementary) school grade;[1] (4) utilized the intervention to target at least one observable problematic behavior (i.e., disruptive, challenging, or inappropriate behaviors, task disengagement, off-task behaviors); (5) employed SCD methodology and presented graphed data; and (6) were peer reviewed and written in English.

All citation titles and abstracts were evaluated to determine whether an article was likely to meet inclusion criteria for further review. Full articles were then examined where necessary to make a final decision regarding inclusion. A total of 1152 studies were excluded from review due to not fulfilling all inclusion criteria. Twenty-six articles met inclusion criteria and were retained following this process. Ancestral searches were undertaken on the reference lists of the 26 retained articles to locate any relevant studies not identified in the initial search. Papers with titles indicating possible relevance, which had not been captured previously, were downloaded and reviewed against the inclusion criteria. This process yielded five additional studies, resulting in 31 studies overall.

The What Works Clearinghouse (WWC) Single-Case Design Standards

The WWC single-case design standards (2014; henceforth the WWC standards) were used to guide the quality appraisal and evidence evaluation processes in the current review. The current WWC standards were selected because they are a well-established set of guidelines endorsed by the Institute of Education Sciences, a US Department of Education research initiative.

Design Quality Appraisal

The 31 selected studies were appraised against the WWC design standards for methodological rigor. The design standards were applied to baseline and intervention phases only, and follow-up and maintenance phases were not considered. Studies were categorized as (a) *meets standards,* (b) *meets standards with reservations* or (c) *does not meet standards.* To meet standards with or without reservations, the following criteria needed to be satisfied: (i) The intervention must have been systematically manipulated with the researcher

[1] The term primary school is used in this review to refer to the education children receive between preschool and high school. Some countries use the term elementary school. In Australia, primary school generally runs from Prep (or Pre-grade 1) to grade 6 (Australian Bureau of Statistics 2012). This review considered studies targeting students in Grade 1 to Grade 6. Studies conducted in middle-school settings were included for review if participants were in Grade 6.

deciding when and how the conditions changed, (ii) each outcome variable must have been systematically measured by more than one assessor over time; inter-observer agreement (IOA) must have been collected in each phase for at least 20 % of the data points in each condition; and IOA must have met minimum thresholds (i.e., 80 % agreement; 0.60 Cohen's kappa), and (iii) the study must have shown at least three attempts to demonstrate an intervention effect at different points in time. Studies required a specific number of phases to demonstrate replication of intervention effects at different points in time (i.e., multiple baseline designs require at least six phases; withdrawal designs required a

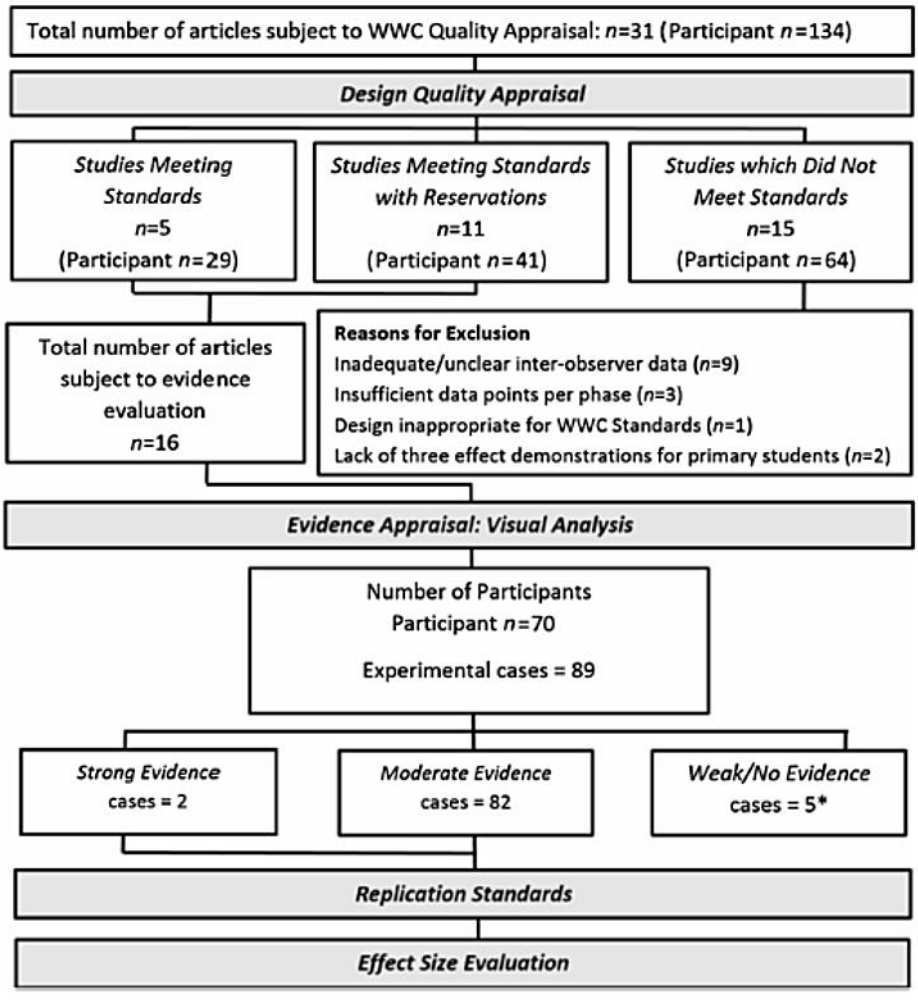

Fig. 1 Design quality appraisal and evidence appraisal process. n = number of studies; n participants = number of participants; experimental cases = number of cases (or instances) in which participants were assigned an evidence rating for a dependent variable outcome. The number of *cases* ($n = 89$) is greater than the total number of participants ($n = 70$) as three studies contained participants which provided data across multiple outcomes; *Cases excluded from the effect size analyses

minimum of four phases). One final criterion, appraising the number of data points per phase, was used to differentiate studies that met standards from those that met standards with reservations. To *meet standards with reservations* studies required at least three data points per phase, and to *meet standards* studies required five or more data points per phase. Studies that did not meet the aforementioned criteria on any account were classified as *does not meet standards*. For a more detailed description of the quality appraisal criteria, readers are directed to the WWC procedures and standards handbook (version 3.0) (WWC 2014).

In terms of the second criterion above, studies generally reported that IOA data were collected in excess of 20 % of all data for a study and exceeded minimum thresholds of 80 % or 0.60 Cohen's kappa. However, many reports did not clearly detail whether IOA data were obtained in each phase for at least 20 % of the data points in each condition. When the design quality of a study could not be established on this basis, we emailed corresponding authors seeking clarification of the IOA data collection process. Papers were subsequently included or excluded based upon the information provided by authors. Studies were excluded if authors did not respond or could not provide this information.

The quality appraisal process resulted in the retention of 16 studies having met the standards with or without reservations. In total, 15 studies (48 %), dating from 1984 to 2008 and involving 64 participants, were eliminated from further review as they did not meet methodological quality standards (see Fig. 1). A small number of studies was excluded due to insufficient data points per phase ($n = 3$), lack of three effect demonstrations ($n = 2$), and use of a design unsuitable for design appraisal ($n = 1$). The most common reason for study exclusion related to the reporting of IOA data. Studies were excluded due to not collecting IOA data in all study phases ($n = 1$) and insufficient IOA data collection ($n = 2$) (i.e., reported percentage of IOA observations did not exceed the minimum 20 % criteria). Exclusion of most studies ($n = 6$) resulted from inadequate IOA detail (i.e., despite reporting adequate percentage, agreement studies did not clearly specify whether minimum required IOA observations were obtained within all conditions across all phases).

Study Coding

Articles satisfying both the initial inclusion criteria and the design quality standards were coded for the following variables: intervention description, number of participants, participant characteristics (i.e., gender, age, grade, and disability diagnosis if applicable), setting description, experimental design, targeted behavior, and study findings. Studies were also coded for: (a) fading, follow-up, and/or response maintenance data, (b) procedural fidelity checks, and (c) functional behavior assessment (FBA) procedures to determine whether interventions were based on the hypothesized function of behavior as derived from an FBA. As the purpose of this review was to evaluate effects of self-management on student behavior, measures of academic changes were not coded.

Evidence Standards: Visual Analysis

Visual analysis was undertaken with all studies that met the design standards with or without reservations to evaluate the evidence of functional relations as documented in the graphed data. To facilitate visual analysis, we developed a structured protocol based on the WWC visual evidence standards (Kratochwill et al. 2010; WWC 2014) and a number of other notable visual analysis approaches in the SCD literature (e.g., Gast and Spriggs 2010; Horner et al. 2012; Maggin et al. 2012). The visual analysis protocol was used to assign study ratings of *strong, moderate* or *weak/no evidence of a functional relation*. If more than one behavior was targeted for participants in a given study, separate evidence ratings were assigned for each behavior.

The protocol specified procedures for the visual analysis of level, trend, and variability in data paths both within and between experimental phases, as well as for assessing the immediacy of treatment effect, between-phase data overlap, and the projected versus observed data patterns of the outcome variable (contact the first author to obtain a copy of the protocol). Analysis consisted of three stages. In the first stage, graph construction was evaluated (e.g., labeling, scaling) to identify potential data distortions. The second and third stages, respectively, involved evaluating baseline suitability (within-phase factors) and adjacent phases (between-phase factors) to assess treatment effects. We assigned evidence ratings of strong, moderate, or weak/no evidence to each study based on (a) the number of data points per phase, (b) baseline data suitability, (c) the number of between-phase treatment effect demonstrations, and (d) the ratio of effects to non-effects. When considering the final point, we assigned outcome ratings of: *strong evidence* for three or more effect demonstrations with no non-effects, *moderate evidence* for three effect demonstrations with one non-effect, and *weak/no* evidence for three effect demonstrations that were accompanied by more than two non-effects or when three effect demonstrations were not observed. This coding system was adopted directly from the WWC evidence guidelines.

Replication Standards

The WWC recommendations for combining studies (henceforth the *replication standards*) were applied to ascertain whether sufficient effect replication was demonstrated across reviewed studies. There is general consensus that the replication standards are an acceptable criterion that can be used to identify evidence-based practices in literature reviews (Horner and Kratochwill 2012). The standards recommend that practices under review may be considered, "*evidence based*" if the data set which demonstrated strong or moderate evidence: (1) contained a minimum of five studies investigating the same intervention with a rating of either *meets standards* or *meets them with reservation* for design quality; (2) was conducted by at least three research teams with no overlapping authorship at three different institutions; and (3) included at least 20 participants across the papers. This 5-3-20 threshold was applied to the overall collection of SCDs and to studies grouped in terms of behavioral outcomes; participant characteristics (i.e., disability status and grade); and FBA use.

Quantitative Synthesis: Percentage of Non-overlapping Data (PND)

The final stage of this review involved computing an effect size for studies that (a) met replication standards *with and without reservation* and (b) demonstrated *strong* or *moderate* evidence (WWC 2014). Although the WWC recommends that effect size computations follow visual analysis, current standards do not specify what statistical procedures should be applied, acknowledging the need for further research and greater consensus in this area. In light of the current lack of consensus regarding how to best calculate SCD effect sizes (Shadish 2014), we adopted the most well-known and widely used estimate, percentage of non-overlapping data (PND; Scruggs et al. 1987). PND is a conceptually simple estimate, which can be calculated reliably (Schlosser et al. 2008). While some have criticized PND and advised against its use (Allison and Gorman 1993; Kratochwill et al. 2010), recent research reports that this estimate is still broadly applicable, relatively conservative, and provides a valid summary of SCD research (Carr et al. 2015; Scruggs and Mastropieri 2013).

Statistical Analyses

Calculating PND involved: (1) determining the number of intervention phase data points that surpass the most extreme data point within the preceding baseline phase in the expected direction of a therapeutic effect and then (2) dividing this value by the total number of data points in the treatment phase (Scruggs et al. 1987) and multiplying resulting values by 100. Scores exceeding 90 % were interpreted as very effective, 70–90 % were interpreted as effective, 50–70 % were considered questionable, and below 50 % were deemed ineffective treatments (Scruggs and Mastropieri 1998).

The primary unit of analysis was each individual participant. Study outcomes were the average PND of participants in each respective study. Average estimates for target behavior outcomes, disability status, and grade level were obtained by grouping individual participants according to these variables, summing the estimates, and finding the average. We used design conventions outlined by Scruggs et al. (1987) and Schlosser et al. (2008). For reversal designs, the PND for each individual baseline and intervention pair was summed and divided by the number of pairs to obtain the mean. Where participant behavior was measured across multiple settings (i.e., multiple baseline), the PND for each tier was summed and divided by the number of tiers. Where multiple behaviors were reported, PND was calculated for each outcome and averaged across outcomes to obtain an overall behavior change estimate for each participant.

Nonparametric Kruskal–Wallis and Mann–Whitney U tests were used to test for significant differences between behaviors and participant characteristics because data were non-normal and contained minimal cases (Gliner and Morgan 2009). Given the spread of individual participant PND scores, outliers in the data were examined; two participant estimates were identified as suspected outliers. As recommended by Kruskal (1960), all statistical analyses (and averages) were computed with and without the suspected outlying data to evaluate the impact of the

Table 1 Descriptions of studies which met quality appraisal and review findings

Study	Intervention	*n* gender	Mean age, years (range)	Grade	Diagnosis	Setting description
Increases in appropriate behavior						
Cihak et al. (2010)	Self-monitoring with self-modeling (via static-picture prompts)	2 (M)[e]	11	6th grade	ASD	General education; average class size 27 students; middle school[f]
Edwards et al. (1995)	Self-management and a paired token system	3 (M)	8 (7–9)	3rd, 4th grade	ADHD	Regular classrooms in two rural elementary schools
Glynn and Thomas (1974)	Self-control combined with behavior cuing (specifying 'on-task' behavior at particular times)	8 (M) 1 (F)	(7–8)	3rd grade	TD	3rd grade class, 34 students, Suburban elementary school
Harris et al. (2005)	Self-monitoring	5 (M) 1 (F)	–	3rd, 4th, 5th grade	ADHD	Elementary school classroom
Hughes and Hendrickson (1987)	Self-management	9 (M) 3 (F)	–	4th, 5th, 6th grade	TD	Three regular classrooms (4th/5th grades, elementary school; 6th grade, middle school)
Moore et al. (2001)	Self-management	3 (M)	8	4th grade	TD	28 students; suburban primary school
Rafferty (2012)	Self-monitoring	2 (M) 2 (F)	7 (7–8)	2nd grade	EBD	2nd grade general classroom, 15 students, elementary school
Rafferty et al. (2011)	Self-monitoring	2 (M) 1 (F)	10	5th grade	ADHD[g]	Rural elementary school
Roberts and Nelson (1982)	Self-monitoring	3 (M)	–	3rd grade	TD	Regular classroom setting
Rock and Thead (2007)	Self-monitoring	4 (M) 1 (F)	12 (10–14)	4th, 5th grade	TD ($n = 2$) ADHD ($n = 2$)[g] ASD ($n = 1$)[h]	General classes; 21 students; elementary school
Salend et al. (1988)	Self-managed response cost intervention	1 (M) 1(F)	11 (10–12)	4th, 6th grade	ED ($n = 1$) LD ($n = 1$)	Two mainstream elementary classrooms
Decreases in problem behavior						
Coogan et al. (2007)	Multi-component intervention (self-monitoring, group contingencies, peer feedback, randomization of reinforcers)	5 (M)	12	6th	TD ($n = 3$) ADHD ($n = 2$)	General education classes; middle school[f]

Table 1 continued

Study	Intervention	*n* gender	Mean age, years (range)	Grade	Diagnosis	Setting description
Davies and Witte (2000)	Self-management and peer feedback within a group contingency intervention	2 (M) 2 (F)	9 (8–10)	3rd grade	ADHD	3rd grade classroom; 30 students; urban school
Increases in appropriate behavior/ decreases in problem behavior						
Barry and Messer (2003)	Self-management	5 (M)	12	6th grade	ADHD	28 students; elementary school classroom
Todd et al. (1999)	Self-monitoring	1 (M)	9	4th grade	LD	3rd/4th grade classroom; 29 students; elementary
Vance et al. (2012)	Self-monitoring intervention and differential reinforcement of other behavior (DRO) intervention	1 (M) 2 (F)	10 (10–11)	4th, 5th grade	TD	General education classrooms; 20–28 students

Study	Design	Target behavior[a]	Quality appraisal[b]	Visual analysis[c]	PND M[Mdn][d]	Findings
Increases in appropriate behavior						
Cihak et al. (2010)	Multiple probe across settings, embedded ABAB	Task engagement	Meets with reservations	Moderate evidence	100 [100][1]	Increased task engagement across all students. Students generalized use of self-monitoring involving a static-picture prompt across classrooms
Edwards et al. (1995)	ABAB (fading and follow-up)	Attention to task[a]	Meets standards	Moderate evidence	77.72 [86.65][2]	Increased attention to task during self-management phases across students. Positive behavior changes were generally maintained during intervention fading and follow-up
Glynn and Thomas (1974)	ABAB reversal	On-task behavior	Meets standards	Moderate evidence	71.18 [70.00][3]	Increased on-task behavior across all subjects. Reported that self-management may stabilize behavior without external reinforcement provided that on-task behavior is cued

Table 1 continued

Study	Design	Target behavior[a]	Quality appraisal[b]	Visual analysis[c]	PND M[Mdn][d]	Findings
Harris et al. (2005)	Counterbalance MBD across participants	On-task behavior[a]	Meets with reservations	Moderate evidence	92.5 [100]	Increased on-task behavior across all students when self-monitoring attention. Students demonstrated notable increased stability in on-task behavior
Hughes and Hendrickson (1987)	MBD across participants	On-task behavior	Meets standards	Moderate evidence	64.60 [76.50][4]	Increased time on-task for majority of students. Self-management did not appear to reliably affect two 6th grade students; suggest that self-management may work better in more structured classrooms
Moore et al. (2001)	MBD across participants (fading and follow-up)	On-task behavior	Meets with reservations	Moderate evidence	94.44 [100]	Increased on-task behavior across students and stabilized improved behavior. Generalization was successful with high levels of on-task behavior demonstrated during follow-up
Rafferty (2012)	MBD across participants	On-task behavior[a]	Meets with reservations	Moderate evidence	96.43 [100]	Increased on-task behavior. Increased levels of behavior for target students were consistent with those of TD peers
Rafferty et al. (2011)	MBD across participants	On-task behavior[a]	Meets with reservations	Moderate evidence	100 [100]	Improved on-task behavior for students. For two of the three target students, behavior levels were relatively consistent with those of same-aged peers without ADHD
Roberts and Nelson (1982)	MBD across participants	On-task behavior[a]	Meets with reservations	Moderate evidence	100 [100][5]	Increased the amount of time on-task across all participants. Variability in on-task behavior reduced for two students
Rock and Thead (2007)	ABAB (fading)	Academic engagement (time on-task)[a]	Meets with reservations	Moderate evidence	99 [100][6]	Increased academic student engagement across all students. Increases in engagement were maintained during fading for four students
Salend et al. (1988)	ABAB reversal	On-task behavior	Meets standards	Strong evidence	100 [100]	Increased on-task behavior during self-management phases for both participants

Table 1 continued

Study	Design	Target behavior[a]	Quality appraisal[b]	Visual analysis[c]	PND *M*[Mdn][d]	Findings
Decreases in problem behavior						
Coogan et al. (2007)	ABAB reversal	Inappropriate behavior	Meets with reservations	Moderate evidence	76.67 [80]	Decreased behavior across students upon intervention implementation. Behavior increased upon intervention withdrawal and diminished again when the intervention was reinstated
Davies and Witte (2000)	ABAB reversal	Inappropriate vocalizations	Meets with reservations	Moderate evidence	100 [100]	Decreased talking-out behavior across all students. Group contingency system, promoted positive interdependence in students through a mutual behavioral goal
Increases in appropriate behavior/decreases in problem behavior						
Barry and Messer (2003)	MBD across participant, embedded ABABAB (fading)	On-task-seated On-task-attention Disruptive—loud noise Disruptive—physical[a]	Meets with reservations[7]	Moderate evidence Moderate evidence Moderate evidence Weak/no evidence	94.76 [93.33][8,9]	Increased on-task behaviors and reduced disruptive behaviors. When the intervention was withdrawn, participants returned to baseline levels for all behaviors
Todd et al. (1999)	ABAB design with MBD across class periods (fading)	On-task behavior Problem behavior[a]	Meets with reservations	Moderate evidence Moderate evidence	99.08 [99.08][10]	Increased level and stability of on-task behavior. Decreased problem behavior frequency

Table 1 continued

Study	Design	Target behavior[a]	Quality appraisal[b]	Visual analysis[c]	PND M[Mdn][d]	Findings
Vance et al. (2012)	Non-concurrent MBD across participants with multi-element treatment phase	On-task behavior Disruptive behavior	Meet standards	Moderate evidence Moderate evidence	81.48 [94.45][11]	Increased time spent on-task and decreased time spent actively disruptive found across students with behavioral problems. Self-monitoring found to be moderately more effective than DRO

n number of participants, *M* male; *F* female, *ASD* autism spectrum disorder, *ADHD* attention-deficit/hyperactivity disorder, *EBD* emotional and behavioral disability, *ED* emotionally disturbed, *LD* learning disability, *TD* typically developing

[a] Studies also targeted academic outcomes; [b] based on What Works Clearinghouse; [c] evidence rating for overall study; [d] mean [median]; [e] included three participants, one was omitted from analysis as in seventh grade; [f] included as participants were in primary school grades according to Australian standards; [g] comorbid LD; [h] comorbid moderate intellectual disability

[1] Richard not included as in seventh grade; [2] calculated PND for A1B1 and A1B2 for subjects 1 and 2 in accordance with convention for decreasing slope in second baseline phase; [3] students 2, 3 and 4 AB2 omitted from PND calculations due to inappropriate ceiling data; [4] student 6 and student 8 omitted from PND calculations due to inappropriate ceiling data; [5] Chuck PND omitted from PND calculations due to inappropriate ceiling data; [6] JaShun AB1 omitted from PND calculation due to inappropriate ceiling data; [7] the third and final AB phase comparison for student 5 was omitted from analysis as the final intervention phase contained two data points (minimum of three required for design standards); though this would typically render a classification of *does not meet standards* for the study, it was decided that this study would be included as participant 5 still met standards with reservations when data for the final phase comparison were omitted from evaluation. [8] Student 1 Loud noise A1B1, Student 4 Loud noise A2B2 and Student 5 Loud noise A1B1 omitted from PND calculations due to inappropriate trend in baselines; [9] estimates for physical disruptive behavior not incorporated in this estimate due to weak/no evidence; [10] tier 2 was excluded from calculations as delayed onset of baseline data saw that the verification element of baseline logic was violated due; [11] Melissa disruptive omitted from PND calculations due to inappropriate floor data in baselines. Stacey on-task AB1 omitted from PND calculations due to inappropriate ceiling data. Carlos and Stacey disruptive AB1 omitted from PND calculations due to inappropriate floor data

extreme values. As average estimates and analysis outcomes yielded comparable findings with and without the suspected outliers, these data were retained. We report both mean and median estimates, as medians are less sensitive to the presence of outliers (Leys et al. 2013). Variability was documented through mean standard deviation and median absolute deviation (see Leys et al. 2013 for latter).

To address concerns about PND, we computed effect size only for cases where estimates would fairly represent observed treatment effects as determined by the coding conventions specified by Scruggs et al. (1987; 2013). Thus, estimates were not computed where (a) obvious inappropriate baseline trends were observed in the direction of intended treatment effects, and (b) baseline data contained rogue ceiling or floor data points that would result in a 0 % PND score (i.e., <3 data points or <33 % ceiling or floor data points). Data expected to distort treatment effects were omitted from analyses; these instances are specified in Table 1 footnotes. In ABAB designs where the trajectory of the second baseline gradually trended toward the initial baseline level, resulting in nearly all subsequent intervention data overlapping, comparisons were made between the first baseline and both treatment phases (Scruggs and Mastropieri 2013).

Reliability of Data

Percentage agreement was attained for each step of the described review process. Percentage agreement was calculated by dividing the total number of agreements by the total number of disagreements plus agreements and multiplying by 100 (Cooper et al. 2007). The documented agreements represent initial comparisons; all disagreements were discussed and resolved. *Study Inclusion:* Thirty percent of publications identified in the database search were randomly selected and reviewed by an independent reviewer to assess whether they met inclusion criteria. Agreement was found to be 93.4 % for initial inclusion processes. *Quality Appraisal:* The same independent reviewer coded a 32.2 % random sample of the eligible studies ($n = 10$) against the WWC design standards. Agreement was 90 %. Agreement was also calculated at the criterion level for the design standards. Average agreement was 97.5 %, with agreement for the four individual criteria ranging from 90 % to 100 %. *Visual Analysis:* To assess reliability of this process, 37.5 % of retained studies ($n = 6$) were selected randomly and then coded independently by two of the authors such that a 30 % sample of participants ($n = 21$) were analyzed; this translated to a 27 % sample of the total cases ($nCases = 24$). Average agreement across the visual analysis stages was 96.4 % (range 90.5–100 %). *Effect Size* (*PND*): Reliability computations were again undertaken by two authors. Agreement for PND was computed across five randomly selected studies (31.3 %) such that a 37 % sample of participants ($n = 26$) was analyzed. Every AB phase comparison was computed by both authors for each participant; agreement was 100 %.

Results

Study Inclusion, Selection and Quality Appraisal

The systematic review processes and application of the initial inclusion criteria resulted in the identification of 31 studies, with a total of 134 participants. Outcomes of the design quality appraisal are depicted in Fig. 1. Of the 31 studies, 16 met the WWC design standards and were included in the final data set. Five studies with 29 participants *met the standards,* and 11 studies with 41 participants *met the standards with reservations.* Fifteen studies, involving 64 participants, did not meet the evidence standards and were eliminated from further review.

Table 1 provides an overview of participant descriptive features, settings, experimental design, target behavior, quality assessment category, visual analysis rating, PND estimates, and a description of reported findings for each of the 16 studies.

Participant and Study Descriptive Features

Overall, 70 student participants were included across the studies which met standards with and without reservation, 14 female (20 %) and 56 male (80 %). The mean age of participants was 10 years, 4 months (*range* 7–14 years; age of participants was not provided in 4 studies), and participants were distributed across second grade through sixth grade. Of the 70 participants, 35 (50 %) were classed as typically developing (i.e., no formal diagnosis or "at-risk" status); 25 were diagnosed with attention-deficit/hyperactive disorder (ADHD; 35.7 %), five with emotional and/or behavioral disorders (EBDs; 7.1 %), three with an autism spectrum disorder (ASD; 4.3 %) and two with learning disabilities (LD; 2.9 %). Three participants with ADHD also had comorbid LDs, and one participant with ASD had comorbid intellectual disability. Overall, 35 participants were diagnosed with various disorders.

Study authors reported that student participants presented with a range of problem behaviors, often in combination. Identified problem behaviors included task engagement problems such as inattention- and on-task-related difficulties as well as disruptive problem behavior such as inappropriate talking, vocalizations, noise, talking-out behavior, out-of-seat behaviors, fidgeting, non-compliance, and inappropriate physical contact with other students. Given the array of forms of problem behavior identified across the reviewed studies, outcomes have been conceptually framed in relation to reported target behaviors. That is, self-management interventions were categorized as targeting improvements in appropriate classroom behavior and/or targeting reductions in problem behavior. Eleven studies, including 52 (74.3 %) of the 70 participants, focused on increasing appropriate behavior by targeting task engagement/on-task behavior outcomes. Two studies with nine participants (12.9 %) targeted reductions in inappropriate problem behavior, and three studies with nine participants (12.9 %) targeted the combined increase in appropriate behavior and the reduction in problem behavior. Studies addressing behavior reductions targeted various forms of the aforementioned problem behavior. Overall, data for interventions to increase appropriate behavior were presented for 61 participants and data for interventions to decrease problem behavior were presented for 18 participants.

All studies were conducted in the USA, with the exception of three studies including Edwards et al. (1995), which took place in Canada, and the studies by Moore et al. (2001) and Glynn and Thomas (1974), both of which took place in New Zealand.

Study Characteristics: Research Design, Fading, Response Maintenance, Procedural Fidelity and Functional Behavior Assessment

Six studies employed reversal designs; eight used MBDs across participants; and two utilized MBDs across settings. Four MBDs contained embedded reversal designs, and in some cases, multiple-probe designs were used. Intervention fading data were reported in five studies: Barry and Messer (2003), Edwards et al. (1995), Moore et al. (2001), Rock and Thead (2007) and Todd et al. (1999). Fading of self-management processes typically involved systematically reducing or fading various intervention elements, such as prompts/cues or self-management materials. For these studies, target behavior levels in fading phases were generally consistent with the behavior levels in the intervention phases (i.e., maintained observed behavior improvements). Only Edwards et al. and Moore et al. provided response maintenance data following fading phases; both studies demonstrated response maintenance of target behavior over time after the full removal of the self-management intervention.

Ten of the 16 studies evaluated aspects of procedural fidelity (treatment integrity). While seven of these 10 studies reported outcomes indicative of high fidelity levels, the remaining three studies did not document outcomes of the reported fidelity checks. It is therefore unknown as to what extent intervention components or processes were adhered to in these three studies. While some researchers examined procedural fidelity during intervention training in terms of teacher-driven ($n = 2$) and/or student-driven processes ($n = 4$), others considered fidelity in terms of implementation procedures. Implementation fidelity was considered in terms of teacher-implemented procedures ($n = 3$) and/or student-implemented procedures ($n = 6$), noting whether student participants self-monitored behavior in adherence to the taught procedures.

Two studies incorporated FBAs involving interviews and direct behavior observation processes. In the first, Todd et al. (1999) hypothesized that the participant's problem behavior occurred during large-group or unsupervised work and was a function of peer and teacher attention. Todd et al. used this information to inform the development of a function-based self-management intervention package which effectively addressed targeted problem behavior. Vance et al. (2012) drew on the results of a FBA to hypothesize that participant problem behaviors were maintained by peer social attention. However, Vance et al. investigated a non-function-based self-management intervention, demonstrating that self-monitoring was effective in reducing disruptive behavior even when not informed by the hypothesized behavior function.

Evidence Standards: Visual Analysis

As is shown in Fig. 1, the evidence appraisal for visual analysis was applied to all 16 studies. Overall, 21 visual evidence ratings were assigned across the 16 studies; three studies obtained multiple ratings due to targeting both increases and decreases in behavior. Nineteen study outcomes were found to demonstrate moderate evidence of a functional relation. Only one study (Salend et al. 1988) was found to establish strong evidence for a functional relation. Strong evidence was not often coded as data sets frequently contained insufficient data points (i.e., fewer than 5 per phase) and/or documented inadequate baseline data to meet strong evidence criteria. There was only a single weak/no evidence outcome demonstration, physical disruptive behavior (Barry and Messer 2003). Weak/no evidence was assigned as the ratio of effects relative to non-effects did not satisfy requirements for strong or moderate evidence. In this instance, participant baseline data contained numerous data points at or close to zero; thus, clear treatment effects were not observed as targeted behavior was already reduced for some participants.

Visual evidence ratings were assigned for 89 experimental cases. Experimental cases refer to all instances where participants were assigned an evidence rating for a dependent variable outcome. The number of cases ($n = 89$) is greater than the total number of participants ($n = 70$) as multiple outcomes were measured in three studies. Of the 89 experimental cases evaluated in the reviewed studies, two cases were classified as having strong evidence, 82 as moderate evidence, and five as weak/no evidence.

Replication Standards

Table 2 presents replication ratios for the combined collection of articles that met quality standards with and without reservations. Overall, this body of research included 16 studies meeting standards with and without reservation, undertaken by 15 independent research teams and included 70 participants. This yielded a result ratio of 16-15-70, thus exceeding the replication threshold (5-3-20) for evidence-based practice. Separate ratios for studies meeting standards (5-5-29) and meeting standards with reservation (11-10-41) also exceeded the replication threshold. Though the studies meeting standards *with reservation* are not of the highest design quality according to WWC standards, they provide additional promising evidence for self-management interventions. In terms of research targeting appropriate behavior increase, combined research, research meeting standards and research meeting standards with reservations exceeded the minimum threshold with ratios of 14-13-61, 5-5-29 and 9-8-32, respectively. Combined research targeting problem behavior decrease fell short of the evidence ratio due to insufficient participants (5-5-18); independent ratios for studies meeting standards (1-1-3); and studies meeting with reservation (4-4-15) also failed to exceed the replication threshold.

Looking at participant disability status, combined self-management research (studies that met standards with reservation *and* studies that met standards without reservation) exceeded the 5-3-20 threshold for primary students with ADHD (7-7-25) and typically developing students (7-7-35). The ratio for studies *meeting standards without reservation* (ADHD, 1-1-3; typical developing, 3-3-24) for these two student populations failed to meet the replication threshold. All ratios indicate that there is currently insufficient evidence for student participants with ASD, LD, and EBD (see Table 2). In terms of grade, the threshold was exceeded by combined research targeting participants in grades 3 and 4 (10-10-32) and for combined research targeting participants in grades 5 and 6 (8-8-29). When only considering research that met the standards, the minimum threshold was not satisfied by the ratios for studies targeting grade 3 and 4 students (5-5-18) and grade 5 and 6 students (3-3-11). For student participants in grades 3–4, a shortfall of the replication standards by only two participants was noted. Overall, there was insufficient research targeting participants in grades 1 and 2, and the resulting ratio of 1-1-4 failed to exceed the replication threshold. Studies that considered behavior function did not satisfy the minimum threshold as only one study incorporated a function-based self-management intervention (1-1-1). Studies that evaluated non-function-based interventions (15-14-69) exceeded the minimum threshold with ratios of 5-5-29 and 10-9-40 for studies that met standards and met standards with reservations, respectively.

Quantitative Synthesis: Percentage of Non-overlapping Data (PND)

Study Effects

In total, 11 studies (12 if considering medians) obtained mean PND estimates indicative of a very effective intervention for primary students in regular education settings. Of the remaining five studies, four were interpreted as effective interventions based on means and one study obtained a questionable PND mean (see Table 1). The evidence base revealed that for the most part, very effective outcomes were demonstrated in this body of self-management intervention research with a mean study PND of 90.49 % (Mdn = 95.60 %).

Participant Effects

The average PND across all individual participants revealed a mean ($M = 85.65$ %) and median (Mdn = 95 %), warranting effective and very effective ratings (see Table 3). Of the 67 participants for which PND was computed, 40 (59.7 %) obtained PND values interpreted as very effective; 15 (22.4 %) as effective, eight (11.9 %) as questionable, and four (6 %) as ineffective. Three participants were fully excluded from this analysis due to problematic data in accordance with Scruggs et al.'s (1987, 2013) recommendations. Participants six and eight in Hughes and Hendrickson (1987), and "Chuck" in Roberts and Nelson (1982) were excluded from analyses as their reported data contained rogue ceiling data that resulted in an inappropriate 0 % PND score.

Outcome Effects

Average participant PND values were interpreted as effective (mean) and very effective (median) across all three outcomes categories in the reviewed studies: appropriate behavior increase, problem behavior decrease, and combined increase/decrease. A Kruskal–Wallis test found no significant difference between effects for the three outcome categories. This suggests that self-management may be equally effective across observed behavioral outcomes. See Table 3.

Participant Characteristic

In terms of participant disability status, average PND values were interpreted as very effective for participants diagnosed with ADHD, ASD, LD, and EBD. The average PND for typically developing participants was notably lower than the other groups with a mean classification of effective. A Kruskal–Wallis test revealed a significant difference between the disability status categories, χ^2 (4, $n = 67$) $= 13.50$, $p < .01$. An additional Mann–Whitney U test revealed a significant difference between typically developing participants and all participants with disabilities grouped together, $U = 289.50$, $z = -3.60$, $p < .001$, $r = -0.439$. In terms of grade, no significant difference was found between the three categories (i.e., grades 1 and 2; grades 3 and 4; and grades 5 and 6) with estimates falling within the effective and very effective range. See Table 3.

Behavior Function

The single participant receiving a function-based self-management intervention obtained a PND (99.08 %), indicative of a very effective outcome. On average, PND values were classified as effective for participants ($n = 66$) who received non-function-based self-management interventions ($M = 85.45$ %; Mdn $= 95$ %).

Discussion

This systematic review applied current SCD quality appraisal and evidence evaluation processes to analyze published SCD literature on self-management interventions for primary students in general education classrooms. Overall, the results indicate that there was sufficient high-quality evidence in the literature to classify self-management as an effective evidence-based practice for students with problem behavior in regular primary school settings. Through visual analysis, adequate evidence of functional relations was identified across the 16 studies found to demonstrate adequate methodological rigor (in line with the WWC design standards). Strong effects were observed for self-management interventions addressing problem behavior with most studies and participants obtaining effective or very effective PND estimates. Current findings supported those made by Maggin et al. (2012) who similarly concluded that behavioral self-management may be considered an evidence-based practice across a broader education context. As

Maggin et al. (2012) also found, a large proportion of the relevant studies initially identified in this review's search process failed to demonstrate adequate design quality. Together, these reviews highlight the importance of design quality appraisal in SCD reviews as the findings indicated that self-management SCD literature contains a number of studies of insufficient rigor.

Current results found self-management interventions to be effective in addressing a range of problem behaviors presented by primary students in general education classrooms. As most reviewed studies successfully targeted appropriate behavior increase through applications of self-management, sufficient research was found to meet replication standards without reservation. Although studies targeting behavior decrease also showed self-management to be effective, an insufficient body of high-quality research was available to satisfy the replication standards. Therefore, self-management interventions targeting reductions in problem behavior cannot currently be classified as evidence based. Given the shortfall of evidence targeting problem behavior decreases in this review, future rigorous research on general classrooms with primary students is warranted to further investigate the concurrent effects self-management has on reducing inappropriate (disruptive) behavior and increasing appropriate (task engagement) behavior. This research is justified given that self-management literature purports that these interventions can target increases in appropriate behavior and/or decreases in problem behavior (Busick and Neitzel 2009; King-Sears and Carpenter 1997; Menzies et al. 2009). Although it may be expected that improvements in task engagement will result in simultaneous improvements in non-targeted disruptive behavior, this cannot be confirmed without data collection for a secondary target behavior (McDougall 1998).

Across the data set, effective to very effective self-management outcomes were obtained for participants in all primary school levels. Collectively, analysis of this body of literature suggests that self-management may be tentatively classified as evidence based for students in third through sixth grade; however, further analysis revealed a deficit of high-quality research (meeting standards *without* reservation) across all grades. Current findings indicate that further high-quality research is required before self-management may be confidently identified as an evidence based for students at any primary school level. Such research is particularly warranted for students in lower levels (i.e., grades 1–2) where a notable evidence gap was identified.

Although the combined body SCD research indicates that self-management may be considered evidence based for typically developing students and students with ADHD, this review identified a shortfall of high-quality SCD research targeting both student groups. Results also demonstrated that self-management cannot be considered evidence-based for students with ASDs, LDs, or EBDs; in this setting, there is insufficient high-quality evidence to meet replication standards. Nonetheless, effect size analyses revealed effective outcomes for students with and without disabilities in regular classrooms. Interestingly, effects significantly favored outcomes for students with disabilities over those of typically developing students. These findings indicate that self-management interventions have the potential to promote positive behavior outcomes in inclusive education settings. Additional high-quality research is needed to confirm whether self-management may be classified as evidence-based practice for students with disorders and special needs in regular primary classrooms. Further exploration of this area is warranted as literature suggests improved behavioral self-management may facilitate the successful inclusion of students with disabilities and behavior difficulties (Jull 2009; McDougall 1998).

Gaps in the Evidence Base

This review identified a large gap in the research evidence base exploring self-management in terms of student behavior function. While two studies were found to make use of FBAs to form hypothesized statements of behavior function, only one (Todd et al. 1999) used FBA findings to develop a function-based self-management intervention. Although a very effective outcome was reported in this study, further research is needed exploring possible differential outcomes of self-management interventions based on FBA findings relative to non-function-based interventions. Such research is justified given the general support for function-based interventions (Goh and Bambara 2010).

A second gap concerns the limited reporting of intervention fading and response maintenance data across the studies. Only five studies reported follow-up data on systematic fading procedures after the intervention conditions; findings demonstrated maintenance of behavior change improvements even when the intervention was gradually withdrawn. As even fewer studies in this review collected response maintenance data after fading procedures ($n = 2$), we could not confidently determine whether behavior changes were maintained after the full removal of self-management intervention procedures. One central objective of applied intervention research is to demonstrate behavior change generalization over time (Baer et al. 1968), even after interventions have been partially or fully withdrawn (Cooper et al. 2007). As such, this evidence base would benefit from future research examining behavior response maintenance over time, when formal self-management intervention procedures are faded and/or terminated altogether.

A final notable methodological gap identified in the evidence-based concerns procedural fidelity. Although nearly half the studies ($n = 7$) reported high procedural fidelity, assessment was variable across these studies. Many researchers failed to undertake fidelity checks for all study intervention processes and/or omitted aspects of fidelity data. No study thoroughly reported fidelity for training and implementation processes across both teacher and student led intervention procedures. As self-management interventions often incorporate multiple components, it is important that researchers document the extent to which all intervention components are implemented as intended (see Ledford and Gast 2014).

Limitations

Despite careful application of stringent quality criteria throughout our review process, a number of evidential and methodological limitations should be considered. Our findings, particularly those relating to students with disabilities, must be treated with caution given the relatively small number of participants

Table 2 Replication ratios

	Replication ratio[a]		
	All research combined	Meets standards	Meets with reservation
Overall combination	16-15-70*	5-5-29*	11-10-41
Outcome variable			
Appropriate behavior increase	14-13-61*	5-5-29*	9-8-32
Problem behavior decrease	5-5-18	1-1-3	4-4-15
Disability status			
ADHD	7-7-25*	1-1-3	6-6-22
ASD	2-2-3	–	2-2-3
EBD/ED	2-2-5	1-1-1	1-1-4
LD	2-2-2	1-1-1	1-1-1
TD	7-7-35*	3-3-24	4-4-11
Grade[b]			
Grade 1 and grade 2	1-1-4	–	1-1-4
Grade 3 and grade 4	10-10-32*	5-5-18	5-5-14
Grade 5 and grade 6	8-8-29*	3-3-11	5-5-18
Behavior function			
Function-based intervention	1-1-1	–	1-1-1
Non-function-based intervention	15-14-69*	5-5-29*	10-9-40

ADHD attention-deficit/hyperactivity disorder, *ASD* autism spectrum disorder, *EBD/ED* emotional and behavioral disability/emotionally disturbed, *LD* learning disability, *TD* typically developing

[a] WWC replication ratio *n studies-n teams-n participants.* [b] Five participants from Rock and Thead (2007) were omitted from grade ratios as students were in a grade 4/5 composite and individual participant grade was not specified. All five cases presented with *moderate evidence*

* Meets WWC replication standards ratio

involved in these studies. To ensure greater confidence in the robustness of the current findings, further high-quality research is required to increase the number of participants in specific student subpopulations. Second, this review only included studies investigating applications of self-management in regular classrooms with primary students. Future work should expand the scope of this review to students with problem behaviors in regular high-school and college settings.

Third, inconsistencies and variability in how researchers reported student problem behavior and defined target behaviors across studies made differential analysis of intervention effects in terms of both behavior severity and topography inappropriate. In the future, research examination of these dimensions is warranted. A final and important limitation relates to the current confusion regarding effect size calculation in SCR meta-analyses and systematic reviews. The merits and limitations of numerous metrics, including PND, have been debated extensively, and there continues to be no broadly accepted single effects size metric for SCD research (Shadish 2014). It may be necessary to re-evaluate these findings in the event that a universal approach to effect size calculation is developed.

Table 3 Summary of quantitative synthesis of effect statistics for individual experimental cases

	n	M (Mdn)	SD (MAD)	Description M (Mdn)	Range
Overall	67[a]	85.65 (95)	21.28 (7.41)	Effective (very effective)	0–100
Outcome category					
Appropriate behavior increase	49[a]	84.45 (100)	22.96[d]	Effective (very effective)	0–100
Problem behavior decrease	9	87.04 (95)	16.71 (7.41)	Effective (very effective)	54.17–100
Combination (increase/decrease)	9	90.81 (94.45)	15.84 (6.85)	Very effective (very effective)	50–100
Kruskal–Wallis		χ^2 (2, $n = 67$) = .043, $p = .980^{ns}$, 95 % CI [.977, .983]			
Disability status					
ADHD	25	92.06 (100)	14.80[d]	Very effective (very effective)	46.50–100
ASD	3	98.33 (100)	2.89[d]	Very effective (very effective)	95–100
EBD/ED	5	97.14 (100)	6.39[d]	Very effective (very effective)	85.71–100
LD	2	99.54 (99.54)	.65(.69)	Very effective (very effective)	99.08–100
TD	32[a]	76.79 (80)	25.99 (24.06)	Effective (very effective)	0–100
Kruskal–Wallis		χ^2 (4, $n = 67$) = 13.50, $p < .01$*, 95 % CI [.002, .004]			
Mann–Whitney U[#]		$U = 289.50$, $z = -3.60$, $p < .001$*, 95 % CI [.000, .000], $r = -0.439$			
Grade[^]					
Grade 1–grade 2	4	96.43 (100)	7.14[d]	Very effective (very effective)	85.71–100
Grade 3–grade 4	31[b]	85.92 (90)	16.76 (14.83)	Effective (very effective)	45.85–100
Grade 5–grade 6	27[c]	81.27 (93.33)	27.31 (9.89)	Effective (very effective)	0–100
Kruskal–Wallis		χ^2 (2, $n = 62$) = 1.756, $p = .427^{ns}$, 95 % CI [.418, .437]			

n participants, *M* mean, *Mdn* median, *SD* standard deviation, *MAD* median absolute deviation, *ADHD* attention-deficit/hyperactivity disorder, *ASD* autism spectrum disorder, *EBD/ED* emotional and behavioral disability/emotionally disturbed, *LD* learning disability, *TD* typically developing

[ns] not significant

[#] Mann–Whitney U conducted for TD students and students with disabilities grouped together

[^] Five participants from Rock and Thead (2007) were omitted from grade calculations as students were in a grade 4/5 composite and individual participant grade was not specified

[a] Estimates for three participants omitted due to inappropriate ceiling/floor points; [b] estimates for one participant omitted; [c] estimates for two participants omitted; [d] MAD was found to be 0 as more than 50 % of the data points had the same value

Conclusion and Implications

Identifying evidence-based practices shown to be effective by collections of rigorous research is critical in informing education professionals about which interventions positively impact student outcomes (Cook et al. 2013). Overall, the current review has indicated that self-management may be classified as an evidence-based practice for addressing problem behaviors demonstrated by primary students in general classrooms. Collectively, the findings based on sound high-quality research established that self-management interventions generally show effective to very effective outcomes. While findings also indicated that self-management may promote sustained positive behavior outcomes over time, more rigorous research is needed to confirm long-term maintenance of outcomes.

Despite the fact that behavioral self-management interventions appear to be broadly considered evidence based for primary students in regular classrooms, the findings of this review also suggest that additional high-quality evidence is required to confirm the effectiveness of these interventions for particular outcomes and student subgroups. As discussed, further investigation is warranted exploring self-management interventions targeting (a) reductions in problem behavior, (b) students across primary grade levels, and (c) students with or without disorders or special needs (specifically ASDs, LDs and EBDs). In addition, future researchers are encouraged to consider treatment fidelity and behavior function as these aspects have been largely overlooked or inconsistently reported in the current self-management evidence base. Given the widespread promise for self-management demonstrated in this review, we encourage researchers to conduct more high-quality research investigating these variables to make meaningful contributions to the existing evidence base and help to increase confidence in current findings.

Self-management interventions have the potential to reduce demands on teacher time and resources by shifting some degree of behavior management responsibility from teachers onto students (Briesch and Daniels 2013). This review identified promising evidence of successful outcomes from the implementation of self-management strategies in mainstream classrooms across primary students displaying various problem behaviors. Although this review highlighted a need for additional high-quality research evidence, current findings may encourage teachers to use self-management intervention strategies to target low-level problem behavior and task disengagement difficulties demonstrated by primary students. In addition to conducting additional high-quality self-management research, future researchers also need to explore the evidence in terms of processes for adopting and implementing these strategies in primary classroom settings across various student populations. Such research would prove valuable in developing systematic approaches that may facilitate the implementation of effective classroom-based self-management interventions with fidelity and consistency.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest.

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Chapter 5: Intervention Component Analysis Review

Chapter 4 presents a comprehensive systematic evidence review undertaken to identify and analyse high-quality SCD literature investigating the use of self-management interventions with primary school students in general education classrooms. By including studies which met What Works Clearinghouse (WWC) SCD design standards that document evidence, only studies documenting evidence of functional relations were reviewed.

Establishing internal validity (experimental control) and external validity (generality) is an essential process for developing SCD evidence-bases which demonstrate empirical support for any intervention strategy or practice (Horner, Carr, Halle, McGee, Odom, & Wolvery, 2005; LeLaurin & Wolery, 1992; Maggin, Briesch, Chafouleas, Ferguson, & Clark, 2013). Application of the WWC design standards ensured each article reviewed in Chapter 4 demonstrated internal validity (i.e., displayed evidence of experimental control) (Plavnick & Ferreri, 2013), and that overall, the collection of reviewed studies demonstrated sufficient external validity, or generality, due to adequate experimental replication. Sufficient replication of experimental effects presented across the collection of studies to suggest self-management intervention study findings may be generalised or extended beyond the conditions of individual experiments to other student sub-populations, settings, and/or behaviour (Cooper, Heron, & Heward, 2007; Gast, 2010; Maggin et al., 2013).

While the evidence review process in Chapter 4 saw each SCD study evaluated for internal and external validity, some key external validity research elements were not considered in great detail due to article publication requirements (i.e., the restricted word count), and the scope of the WWC standards. As such the purpose of this chapter is to further investigate the identified self-management evidence-base for critical study elements not considered in Chapter 4. Findings from this investigation have been used to inform the development of a self-management intervention package piloted in Chapter 7.

5.1 Establishing Evidence: Intervention Structure and Implementation Processes

According to Maggin et al. (2013) establishing practice or intervention generality requires researchers to comprehensively consider critical research aspects including participant characteristics, setting features, baseline conditions, and definitions of study variables –specifically the independent variable. Similarly, Horner and Kratochwill's (2012) SCD framework for establishing evidence-based practice (EBP) specifies that any practice should be examined for: (a) operational definitions of procedure(s), (b) competency criteria for intervention implementers (if applicable), (c) the context(s) under which the procedure(s) are appropriate, (d) the population(s) who are intended to benefit from the procedure(s), and (e) anticipated valued outcomes procedure(s) are expected to impact. Despite notable differences, both frameworks encourage examination of *operationally defined independent variables*, thus highlighting the importance of investigating documented implementation processes and intervention elements. Cook and Cook (2013) further emphasise the need to consider practice definitions, suggesting that "operationally defined instructional procedures" (p. 76) be carefully considered along with key EBP elements, including research design, research quality, research quantity, and magnitude of intervention effect.

Identifying *core intervention components* and implementation processes is important in establishing evidence-based interventions and investigating wide-spread strategy implementation across time, settings, populations, and behaviour (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Forman et al., 2013). Simply conducting research on interventions and their outcomes will not translate into successful implementation in practice, or bridge the research-practice gap, we need to know *what* to implement and *how* to best implement it successfully (Davis, Mason, Davis, Mason, & Crutchfield, 2016). Determining the core elements and procedures which comprise effective behavioural interventions (i.e., structure, materials, implementation processes, intervention agents, and time requirements) may in turn increase the likelihood of successful and efficient intervention implementation efforts in future practice (Baer, Wolf, & Risley, 1987; Cook & Cook, 2013; Fixsen et al., 2005; LeLaurin & Wolery, 1992). In establishing EBPs and determining *what works*, identification and analysis of fundamental SCD study elements is a critical process that may inform future research efforts in replicating beneficial intervention outcomes via use of effective intervention procedures with suitable populations in appropriate settings.

5.2 Self-Management Intervention Practices

As noted in previous chapters, self-management interventions take the form of multi-component packages, and are heterogeneous in nature. To date, researchers investigating school-based self-management report that no universally applied self-management intervention exists. This assertion is clearly illustrated in a series of literature reviews which present investigations on intervention *component structure* and *implementation processes.* Table 5.1 contains key findings reported in the reviews published by Briesch and Chafouleas, (2009); Davis et al. (2016); and Fantuzzo and colleagues (Fantuzzo & Polite, 1990; Fantuzzo, Polite, Cook, & Quinn, 1988; Fantuzzo, Rohrbeck, & Azar, 1987).

Fantuzzo and colleagues (1987, 1988, 1990) conducted seminal school-based self-management reviews in which self-management intervention literature was analyzed with the Self-Management Intervention Checklist (SMIC and SMIC-2) rating system[8]. Fantuzzo and colleagues aimed to better define self-management by analysing intervention package structure, and the degree to which students were responsible for implementing self-management processes.

[8] Presented in Chapter 2, Table 2.2

Table 5.1

Self-Management Intervention Component Analyses

Review	No. Studies	Year Range	Average No. SMIC Components	Average No. student managed components (self-managed)	Average % self-managed vs adult managed components	Most frequently managed by students (self-managed)	Most frequently managed by adults
Fantuzzo, Rohrbeck, & Azar (1987)	30	1967-1984	8.80[a]	4 (Range = 1-7)	46% (Self-managed) (Range=11-70%[a]) 54% (Adult-managed)	- Observing - Recording - Administration of Secondary Reinforcer	- Identification of Target Behaviour - Target Behaviour Definition - Goal-Setting - Administration of Primary Reinforcer
Fantuzzo, Polite, Cook, & Quinn (1988)	26	1967-1985	NS	4.2 (Range = 1-7)	% NS (Self-Managed) (Range= 9-64%)	NS	NS
Fantuzzo & Polite (1990)	42	1967-1988	9.60 (Range= 6-11)	4.2	40% (Self-managed) (Range= 9-73%[a]) 60% (Adult-managed)	- Observing - Recording - Evaluation - Administration of Primary Reinforcer	- Identification of Target Behaviour - Target Behaviour Definition - Graphing - Goal-Setting - Prompt for Target Behaviour - Selection of Primary Reinforcer
Briesch & Chafouleas (2009)	30	1988-2008	7.60 (Range= 4-11)	3.77[b] (Range=2-6)	51% (Self- or joint-managed) (Range= 30-75%) 49% (Adult-managed)	- Observation - Recording - Prompt for target behaviour - Graphing	- Identification of Target Behaviour - Target Behaviour Definition - Goal setting - Administration of Primary Reinforcer - Administration of Secondary Reinforcer
Davis, Mason, Davis, Mason, & Crutchfield (2016)	16	1960-2014	7.68 (Range= 4-11)[c]	3.38 (Range=1-6)[c]	44% (Self-managed)[c] (Range= 25-71%) 56% (Adult-managed)	- Observation - Recording - Prompt for target behaviour - Administration of Secondary Reinforcer	- Identification of Target Behaviour - Target Behaviour Definition - Goal Setting - Evaluation - Administration of Primary Reinforcer

Note: Information obtained from respective reviews. Table adapted from Briesch and Chafouleas (2009).
NS =Not specified
[a] Information obtained from Briesch and Chafouleas (2009) as original study did not document
[b] Computed based on figures in Table 2 in Briesch and Chafouleas (2009)
[c] Computed based on figures in Table 3 and 4 in Davis et al. (2016) – based on the 11 packages presented.

5.2.1 Intervention structure. Fantuzzo and Polite (1990) found a “considerable degree of variability” (p. 191) in the way interventions were structured and implemented, identifying that on average intervention contained 9.60 (range 6-11) self-management components, with 60% of reviewed interventions incorporating all 11 SMIC components. Expanding upon Fantuzzo and Polite’s work, Briesch and Chafouleas (2009) used the SMIC-2 rating system to review literature investigating school-based self-management promoting appropriate classroom behaviour. Their findings show that on average reviewed studies included 7.60 (Range 4-11) of the 11 components; revealing an average reduction of two components compared to Fantuzzo and colleagues’ results. These findings were mirrored in a recent review by Davis et al. (2016) which incorporated the WWC standards EBP framework to assess the quality of studies investigating school-based self-monitoring interventions in changing behaviour for students with ASD. Via application of the SMIC-2 framework Davis et al. found the average total number of intervention components to be 7.68 (Range 4-11).

Interestingly, Briesch and Chafouleas’ (2009) findings show that decline in total intervention components was associated with increased average intervention effects. Davis et al. (2016) findings build upon those of Briesch and Chafouleas, in reporting that basic intervention packages have the potential to be as effective as 11-component packages. These recent review findings suggest that elaborate self-management intervention packages may not necessarily be required to obtain greater student outcomes.

Overall, Briesch and Chafouleas (2009) reported 16 unique self-management packages were used across the 30 reviewed studies. Davis et al. (2016) identified 11 unique packages across the 16 studies they reviewed. Based on the collective findings from these reviews it seems that no clear specifications concerning how to best structure effective self-management interventions exist due to substantial intervention variability in past and current literature.

5.2.2 Intervention components. Component analysis undertaken by Fantuzzo and Polite (1990) revealed target behaviour identification, target behaviour definition, observation, recording, and prompting were the components most frequently integrated in self-management packages. Similarly, Briesch and Chafouleas (2009) and Davis et al. (2016) found *all* reviewed intervention packages included target behaviour identification and definition, along with observation and recording components. Further analysis revealed students were primarily responsible for the observation and recording of target behaviour in almost all reviewed interventions, whereas adults were primarily responsible for target behaviour identification and definition (Briesch & Chafouleas, 2009; Davis et al., 2016; Fantuzzo & Polite, 1990). Findings suggest target behaviour identification, behaviour definition, observation, and recording components may form a sub-set of components fundamental to school-based self-management intervention packages.

5.2.3 Intervention management. Although, school-based self-management interventions are designed to empower students by shifting behaviour management control to students (Cole & Bambara, 1992), research shows that interventions include substantial adult involvement. Fantuzzo and Polite (1990) reported that on average, only 40% of components in self-management interventions were managed by students, indicating that most intervention packages are primarily managed by adults (e.g., teacher, researcher, or other agent). Briesch and Chafouleas' (2009) findings reveal a slight shift in the degree of management as students, on average, were responsible for the management of 51% of components. Recently, Davis et al. (2016) identified that on average, only 44% of components were student-managed, reflecting a similar degree of management to that documented by Fantuzzo and Polite over 25 years ago. This research has shown student participants are typically responsible for undertaking more mechanical self-management processes (i.e., self-monitoring), while adult agents tend to be predominantly involved in initial intervention development (i.e., selecting and defining target behaviours, and selecting components) and student training processes (i.e., teaching students how to carry out self-management processes) (Briesch & Chafouleas, 2009; Cole & Bambara, 1992; Fishley & Bedesem, 2014; King-Sears, 1999).

Interestingly, findings in this collection of research suggest that optimal intervention outcomes may be produced via implementation of primarily student-managed packages. Fantuzzo and Polite (1990) documented a positive relationship between the degree of self-management and intervention effectiveness, reporting a "significant positive correlation between the proportion of student-management and the magnitude of treatment effect size ($r = .74$, $p < .001$)" (p. 187). Intervention packages which were over 40% student-managed were generally more effective compared to those which were less than 40% student-managed (Fantuzzo & Polite, 1990). Fantuzzo et al. (1988) similarly identified that primarily student-managed interventions resulted in significantly greater treatment effect sizes compared to adult-managed interventions. Although Briesch and Chafouleas (2009) did not report a strong significant relationship between the degree of student-managed components and effect size, the most recent component analysis review, Davis et al. (2016), supported Fantuzzo and colleagues' findings, reporting greater levels of student management results in stronger intervention effects.

While self-management is widely recognized as a promising intervention that may increase student self-reliance, self-control, and responsibility via strategies which enable students to assume a key role in their own behaviour management (Cole & Bambara, 1992; Fishley & Bedesem, 2014; Sheffield & Waller, 2010) the presented review findings indicate that "self-management" interventions throughout literature contain significant levels of adult involvement. In theory, student-directed self-management strategies promoting positive behaviour change intend to require minimal adult-support, thus reducing necessity for teacher-directed behaviour management strategies. Unfortunately, findings reported by Fantuzzo and colleagues, Briesch and Chafouleas (2009), and Davis et al. (2016) suggest this ideal does not often occur. This finding leads one to question whether past researchers have implemented sub-optimal forms of self-management interventions, and why this has occurred.

5.3 Social Validity and Acceptability

Given self-management interventions under investigation are intended for applied school settings, and require involvement of student *and* adult participants it is necessary to consider whether such strategies are deemed socially valid. Assessing social validity of interventions has been long recognized as a critical process which enables researchers to investigate: (a) social significance of targeted behaviour, (b) appropriateness of intervention procedures, and (c) social importance of intervention outcomes or effects (Baer et al., 1967; Kazdin, 1977; Wolf, 1978). A crucial dimension of social validity concerns the degree to which an intervention or treatment approach is perceived *acceptable* to actual or potential consumers (Carter, 2007; Martens, Witt Elliott, & Darveaux, 1985). As interventions likely have a better chance of being (a) adopted in practice, and (b) implemented effectively *and* correctly, if they are perceived fair, reasonable, and non-intrusive; and are considered appropriate for the given problem (Briesch, Chafouleas, Neugebauer, & Riley-Tillman, 2013; Elliott, 1988; Finn & Sladeczek, 2001; Kazdin, 1980; Martens et al., 1985).

As teachers' decisions to implement any intervention are believed to be based largely upon their judgements of intervention acceptability, feasibility and practicality (Machalicek, O'Reilly, Beretvas, Sigafoos, & Lancioni, 2007; Witt, 1986) collecting social validity information in necessary to gain an understanding of potential implementation barriers, possible pitfalls and the various perceptions stakeholders have concerning the intervention (Schwartz & Baer, 1991). Martens et al. (1985) proposed that the school-based interventions can be designed such that they have a higher likelihood of being adopted and implemented with fidelity if we consider the conditions under which teachers work and evaluate the factors which impact their perception of intervention acceptability. By considering such variables we may develop a better awareness of the optimal intervention types which can be implemented in applied education settings.

5.4 Purpose, Rationale, Aim and Research Questions

The purpose of this study was to investigate the structure and procedures of school-based self-management interventions used to target challenging behaviour displayed by primary school students in general education settings, thereby updating previously published reviews conducted by Briesch and Chafouleas (2009), Fantuzzo and colleagues (1987, 1988, 1990), and Davis et al. (2016). This study applied an adapted version of the framework developed by Fantuzzo and colleagues (1987, 1988, 1990) to systematically code, evaluate, and compare the various self-management intervention packages implemented throughout the evidence-base. Though the SMIC-2 was created over 25 years ago, this framework is arguably still valid and relevant given its standing in current self-management literature (e.g., Briesch & Chafouleas, 2009; Davis et al., 2016; Thompson, Ruhr, Maynard, Pelts, & Bowen, 2013).

Expanding upon Chapter 4, the main aim of this study was to systematically review and map the SCD self-management evidence-base in terms of intervention component structure, management, complexity, implementation processes, training procedures, social validity, and procedural fidelity. A secondary study aim was to use a conservative effect analysis method to examine intervention features (i.e., component structure, management, complexity), student characteristics (e.g., disability status and grade), and targeted behaviour as potential moderators influencing self-management effect size outcomes. Exploratory investigations like this are warranted to identify critical variables which can moderate self-management intervention effectiveness in natural classroom conditions (Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005) and to determine the most successful and acceptable implementation processes. This review has been guided by the following research questions:

Intervention Structure, Management and Complexity

1. How have self-management intervention packages (dependent variables) been structured in the evidence-base? Do self-management interventions contain core components? (*Intervention Component Structure*)
2. Are self-management intervention packages primarily student-managed or primarily adult-managed? (*Intervention Management*)
3. Are interventions primarily complex or basic in nature? (*Intervention Complexity)*
4. Are *intervention structure, management and complexity* potential moderators of self-management behaviour outcomes?

Implementation Processes and Training Procedures

5. How have self-management interventions been implemented throughout the evidence-base? Are there components, beyond those specified in the SMIC-2, required for effective implementation?
6. If undertaken, who and what was involved in student participant training?

Social Validity and Procedural Fidelity

7. How many studies evaluated intervention social validity or procedural fidelity? In those which consider social validity or procedural fidelity what are the outcomes?

Generalisability and Maintenance

8. How have self-management intervention procedures been gradually faded and removed from class settings? (Maintenance outcomes considered in Chapter 4)

5.5 Method

5.5.1 Article inclusion. Studies subject to review in this chapter were identified via a systematic literature search and design quality appraisal screening process as detailed in Chapter 4 (conducted April 2014). This process yielded 16 high-quality SCD research studies investigating the effectiveness of self-management interventions for targeting problem behaviour displayed by primary school students in general education primary school settings. While the previous review concluded that self-management may be classified as an effective evidence-based practice, it did not investigate the structure of successful interventions or the implementation processes required for optimal outcomes. Thus, the 16 studies subjected to review in Chapter 4 comprise the study set reviewed in this chapter.

5.5.2 Coding and analysis. The coding framework applied in this review is based on that used by Bruhn, McDaniel, and Kreigh (2015). In conducting a systematic review on self-monitoring for students with behaviour problems Bruhn et al. (2015) applied a coding procedure to evaluate a collection of studies across 10 categories containing 27 variables. For this review a similar framework has been developed such that study coding involved evaluating information and results across variables relevant to posed aims and research questions. Study variables were classified into 9 different categories: (1) demographic and setting information, (2) dependent variable(s), (3) independent variable(s), (4) implementation process and additional details, (5) intervention training procedures, (6) social validity/ acceptability, (7) procedural fidelity, (8) intervention outcomes, and (9) generalization and maintenance (fading). Coding involved analyzing each study across each coding category, and identifying the presence or absence of specified variables. Where possible, variable information was coded as specified in the protocol in Appendix C. Table 5.2 presents the coding framework, outlining all variables coded and analysed in Study 1 (Chapter 4) and Study 2 (Chapter 5), along with a key to differentiate variables coded in each chapter.

5.5.2.1 Category 1: Descriptive information -Demographic and context/setting. Articles were coded for participant demographic variables including age, gender, grade level, and disability diagnosis. Articles were also coded for school description and class size. Results are presented in Chapter 4, Table 1. In this chapter articles were coded for academic subject (e.g., maths, reading) and lesson format (i.e., whole group work, or individual work lessons).

5.5.2.2 Category 2: Dependent variable(s). Studies were grouped into three dependent variable categories based upon targeted forms of behaviour including: (a) appropriate behaviour increase (e.g., task-engagement, attention, and on-task behaviour improvements), (b) problem behaviour decreases (e.g., disruptive, out of seat, talking-out, and shouting reductions), and (c) combination where studies targeted behaviour from the first and second categories. Though academic outcomes (i.e., productivity, completion, progress etc.) are not the direct focus of this research, targeted academic outcomes were coded.

Table 5.2

Coding Summary: Meta-Analysis (Chapter 4) and Component Analysis (Chapter 5)

Coding Categories	Coding Considerations
1. Descriptive Information: Demographic and Context/Setting[#]	Participants: Number of participants, age, gender, grade level, diagnosis or condition Context/setting: school type, class size, academic subject that intervention was implemented in (i.e., maths, reading) and lesson format (i.e., whole group work, individual work)
2. Dependent Variable/s[#]	- Targeted behavioural dependent variable(s)? - Any other dependent variables or concomitant variables? (i.e., academic or performance outcomes)
3. Independent Variable (Intervention Component Analysis SMIC-2B)[#]	- Intervention description[#] - *Intervention Component Analysis*^ (SMIC-2B analysis – interventions coded for the presence/absence of various self-management components and for the degree of self-management) Component Details^ If present… - What target behaviour was self-monitored by the student participants? - What type of goals were set? - What forms of target behaviour prompt were used? - What forms of self-management prompt/cue device was used? - What form of recording device was used? - What forms of consequences were used? - What form of graphing/charting materials were used?
4. Implementation Process and Additional Intervention Details[#]	- Did the self-management intervention involve any additional independent variable elements?^ - Was self-recording accuracy measured? - Use of feedback^ (Did the intervention involve some form of student feedback? If so what form?) - Function-Based[#] (Was the intervention function-based? i.e., was behaviour function assessed in order to design an intervention to support hypothesised behaviour functions) - Technology^ (Was technology incorporated into the intervention procedure? If so what form of technology and what was its function/purpose?) - Intervention agents (i.e., Who was involved in intervention implementation? Were intervention agents trained in the intervention process?)^
5. Intervention Training Procedures^	- Student training details (i.e., How were student participants trained in self-management procedures? Who trained student participants? Intervention pre-training and/or discrimination training? Duration of training? Setting? Procedures?)
6. Social Validity/Acceptability^	- Was data collected on social validity? If so how was data collected (formal measures or anecdotal feedback)? Who was social validity data collected from? - What were social validity outcomes? - Were target student outcomes compared to a form of comparison peer data?
7. Procedural Fidelity[#]	- Was fidelity data collected?* - Documented fidelity outcomes: To what extent was implementation undertaken as intended?* - When was fidelity measured (during training, during implementation)* - Was fidelity measured for student and adult-implemented variables?* - How was fidelity measured? (i.e., observations, checklists etc)^
8. Intervention Outcomes[#]	- What were the overall study outcomes? (Brief statement reporting visual analysis, effect size, and/or descriptive outcomes)
9. Generalisation and Maintenance (Fading)[#]	- Was behaviour generalisation evaluated? (i.e., Was generalisation data collected?)^ - If so, what form of generalisation data was collected? Across individuals, time (response maintenance), setting (setting/situation generalization) and/or behaviour (response generalization)^ - What was demonstrated in terms of generalisation outcomes?^ - How was generalisation (inc. maintenance and/or fading) programmed for? What did it involve?[#]

*Variable coded and evaluated in Study 1 (the evidence review)

^ Variable coded and evaluated in Study 2 (the intervention analysis)

[#] Variable considered in both studies. These variables were briefly explored in Study 1 but were not considered in great detail due to word limitations; as such these variables are considered in more depth in Study 2

5.5.2.3 Category 3: Independent variable(s) - Intervention component analysis SMIC-2B. An intervention component analysis of interventions applied throughout the reviewed evidence-base was undertaken in this study using an adapted version of the Self-Management Intervention Checklist 2 (SMIC-2) framework developed by Fantuzzo and colleagues (1987, 1988, 1990). The original SMIC-2 (see Chapter 2) contains 11 of the most common strategies (or components) frequently included in self-management interventions used with children. Hereafter the adapted SMIC-2 is referred to as SMIC-2B (see Table 5.3).

Table 5.3

Adapted Self-Management Intervention Checklist (SMIC-2B)

Strategy	Definition
Selection of Target Behaviour[1]	
Definition	Identification of the behaviour to be targeted by intervention.
Question	Is the student involved in selecting the target behaviour?
Definition of Target Behaviour[1]	
Definition	Operationally defining the target behaviour
Question	Is the student involved in creating the operational definition?
Selection of Primary Consequence[2]	
Definition	Choosing the reinforcer to be received contingent upon the performance of a given behaviour (or selecting the punishment to be received if a behaviour expectation or standard is not met)
Question	Does the student help determine what consequence(s) will be used? Does the student determine the amount of consequence that is delivered? (i.e., self-determination)
Goal Setting[1]	
Definition	Determining performance criterion (or standard) for target behaviour (i.e., setting a behavioural performance goal)
Question	Does the student determine or set the performance goal criterion that must be satisfied?
Response Prompt for Target Behaviour (Target Behaviour Prompt)*[3]	
Definition	Use of prompt(s) or cues to engage in a target behaviour; stimuli created to later function as extra cues and reminders for desired behaviour (Cooper et al., 2007)
Question	Does the student put any prompts in place to prompt target behaviour at a later instance?
Prompt or Cue for Self-Management Tactic (Self-Management Cue)*[4]	
Definition	Delivery of prompt(s) or cues to engage in self-management (self- monitoring) tactics
Question	Does the student prompt or cue him/herself to engage in the learnt self-management (self-monitoring) tactics?
Self-Monitoring	
Definition	A procedure whereby a person systematically observes his behaviour and records the occurrence/non-occurrence (Cooper et al., 2007). Self-monitoring is the most common form of self-management, typically comprising: self-observation and self-recording (Cooper et al., 2007; Rafferty, 2010).
Observation (Self-Monitoring)	
Definition	Systematic tracking of target behaviour occurrences; involves observation of one's own behaviour to discriminate between the occurrence/non-occurrence of a target behaviour (Cooper et al., 2007).

	Question	Does the student observe and self-reflect on their own behaviour to determine whether they have displayed the target behaviour?
Recording (Self-Monitoring)		
	Definition	Writing down the frequency of the occurrence of target behaviour; the act of recording observation one has made about his or her own behaviour (Rafferty, 2010)
	Question	Does the child record occurrence of target behaviour
Evaluation[5]		
	Definition	Comparing actual performance of the target behaviour with pre-determined performance goal
	Question	Is the student involved in determining whether their goal was met?
Administration of Generalised Conditioned Consequences		
	Definition	Dispensing of tokens or points contingent upon target behaviour or performance criteria
	Question	Does the student administer generalised conditioned consequences to him/herself contingent on a target behaviour or upon reaching or surpassing performance criteria for target behaviour?
Administration of Primary Consequences		
	Definition	Dispensing or initiating the dispensing of primary reinforcers (or dispensing punishment); contingent delivery of a reward or reinforcer subsequent to performing a specific behaviour or achieving the set goal, standard or criterion
	Question	Does the student administer primary reinforcers to him or herself contingent on performing a specific behaviour, or reaching or surpassing performance criteria for target behaviour?
Graphing or Charting Behaviour		
	Definition	Keeping track of the child's performance across days (e.g., graphing or charting).
	Question	Does the student help chart or graph occurrence of behaviour or performance over time?
Self-Management Materials[1]		
	Definition	Selection, preparation and/or provision of materials and devices to make self-management easy and efficient (Cooper et al., 2007)
	Question	Is the student involved in selecting, creating and/or obtaining self-management materials within the classroom?

*Component shorthand; *Note:* Each component is rated as student-managed, adult-managed, joint-managed or not able to be determined.

[1] Classified as an adult-managed component if no mention of students involvement.

[2] Classified as a student-managed component if the child selects a reinforcer from a menu of reinforcers.

[3] Includes self-instruction; self-generated verbal responses (self-statements), covert or overt, that function as rules or response prompts for a desired behaviour; used to guide a person through a behaviour chain or sequence of tasks (Cooper et al., 2007)

[4] Classified as an adult-managed component if an adult actively delivered prompts during the intervention. Coded as a student-managed component if students were responsible for responding to emitted prompts/cues

[5] Self-evaluation may also be referred to as self-assessment in some articles.

5.5.2.3.1 SMIC-2B development. Two minor alterations were made to the original SMIC-2 framework to ensure that the framework more accurately reflected terminology and principles used within current literature. The first alteration consisted of re-labelling SMIC-2 components. Re-labelling alterations are detailed here in Table 5.4.

Table 5.4

Component Re-Labelling

SMIC-2 Label	SMIC-2B Re-Label
Selection of Target Behaviour	-
Definition of Target Behaviour	-
Selection of Primary Reinforcer	*Selection of Primary Consequence*
Determination of Performance Goal	*Goal Setting*
Instructional Prompt for Target Behaviour	*Reponse prompt for target behaviour*
Observation of Target Behaviour	*Observation (Self-Monitoring)*
Recording	*Recording (Self-Monitoring)*
Evaluation to Determine Whether Performance Goal Was Met	*Evaluation*
Administration of Secondary Reinforcers	*Administration of Generalised Conditioned Consequences*
Administration of Primary Reinforcers	*Administration of Primary Consequence*
Graphing or Charting Behaviour Across Days	*Graphing or Charting Behaviour*

- = SMIC-2B label did not change from SMIC-2 label

Rationale for SMIC-2B label changes:

- *Reinforcer components* were re-labeled to reflect the general use of *consequences.* Original SMIC-2 terminology would suggest self-management interventions only incorporate reinforcement to increase the likelihood of targeted behaviour. While self-management literature often emphasises use of reinforcement (Bedesem & Dieker, 2013; Menzies, Lane, & Lee, 2009; Wilkinson, 2008) self-management interventions may incorporate punishment based consequences to decrease future occurrence of a behaviour (Cooper et al., 2007; Southhall & Gast, 2011).
- *Administration of secondary reinforcers* was re-labeled to *administration of generalised conditioned consequences* to reflect current terminology. The SMIC-2 refers to the administration of secondary reinforcers as the dispensing of tokens or points contingent

on reaching or surpassing a performance criterion (Fantuzzo & Polite, 1990). In recent literature Cooper et al. (2007) suggest token or point reinforcers received contingent upon a certain behaviour may be referred to as *generalised conditioned reinforcers.* According to Cooper et al. (2007) generalised conditioned reinforcers may be incorporated into self-management packages which have inbuilt consequence components based upon the principles of token-economy or response-cost systems. In such packages students are exposed to immediate consequences in the form of receiving (token-economy reinforcers) or losing (response-cost punishers) points or tokens for certain behaviour (Cooper et al., 2007) - students typically exchanging tokens or points for preferred items or activities.

- *Observation of target behaviour* and *recording* components were re-labelled to show these components constitute elements of *self-monitoring.* Literature indicates observation and recording components are the foundation of self-monitoring – a fundamental self-management strategy (Cooper et al., 2007; Menzies et al., 2009; Rafferty, 2010).
- *Determination of performance goal* was labelled *goal setting* to reflect recent terminology (e.g., Bedesem & Dieker, 2013; Menzies et al., 2009; Rafferty, 2010).
- *Instructional prompt for target behaviour* was re-labeled *response prompt for target behaviour* to align with language utilized by Cooper et al. (2007). According to Cooper et al. response prompts are stimuli which function as reminders for desired behaviour.
- Similarly, *evaluation to determine whether performance goal was met* was re-labeled *evaluation* to remain consistent with current terminology (i.e., Cooper et al., 2007; Menzies et al., 2009; Rafferty, 2010).
- *Graphing or charting behaviour across days* was shortened to *graphing or charting behaviour* to reflect the parsimony evident in current terminology (i.e., Bedesem & Dieker, 2013; Menzies et al., 2009).

The second alteration involved the addition of two extra self-management components resulting in a 13-component SMIC-2B framework. The additional components included: *selection, preparation and provision of self-management materials* (henceforth, *self-management materials*), and *prompt for self-management tactics* (henceforth, *self-management prompt*).

Self-management materials was added to the coding system based on the assumption that students require access to certain materials to make self-management interventions easy and efficient (Cooper et al., 2007). Inclusion of this component was judged appropriate given classic (e.g., King-Sears & Carpenter, 1997) and recent (e.g., Menzies et al., 2009; Rafferty, 2010) self-management guidelines have specified that design, preparation, and provision of materials is an integral implementation step. Coding this component involves determining if adult intervention agents assumed control over managing self-management materials or whether students were in some way involved in this task.

The original SMIC-2 (Fantuzzo & Polite, 1990) conceptualised *instructional prompts* as the introduction of a prompt to help students engage in the targeted behaviour. Similarly, Briesch and Chafouleas (2009), referred to instructional prompts as cues to engage in target behaviour. Based on these descriptions, instructional prompts refers to the use of stimuli which function as cues or reminders for *desired behaviour*. According to Cooper et al. (2007) such prompts are known as *response prompts,* and can take on a variety of forms (e.g., visual, auditory, textual, symbolic). Cooper et al. also proposes self-management interventions may include various tactile, visual, and auditory stimuli which function as prompts for self-monitoring. Use of cues to prompt self-monitoring at certain times is documented in past research (see Bedesem & Dieker, 2013; Wilkinson, 2008). For example, a student may be taught to self-monitor their behaviour each time a beep is emitted by an audio timing device. In this instance the beep acts as the prompt in the self-management system. Given the distinction between behaviour response, and monitoring cues, *prompt for self-management tactics* (self-management prompt), was incorporated in the SMIC-2B to allow for the independent coding of prompts that cue self-monitoring.

5.5.2.3.2 SMIC-2B Component Coding and Analysis. Using the SMIC-2, studies were coded across three potential moderators: (1) *intervention component structure* (i.e., components incorporated in the intervention package), (2) *intervention management* (i.e., degree to which students and adults were involved in intervention implementation), and (3) *intervention complexity*. The following four steps guided the coding and analysis process.

First, all intervention packages were coded for *intervention component structure* by recording the presence or absence of each SMIC-2B component. This process enabled the identification of any potential core intervention components; SMIC-2B components were classified *core components* if they were identified across *all* reviewed intervention packages. For statistical analysis intervention packages were grouped according to: (a) number of included components, and (b) intervention structure.

The second step involved coding for *intervention management*. Intervention management refers to the degree to which students, and adults, were involved in, or had control over, intervention components. Intervention management coding involved determining whether each component in the intervention package was primarily adult-managed, primarily student-managed, or jointly-managed. Components were classified as *student-managed* (i.e., self-managed) when students were predominately responsible implementation. Components were classed as *adult-managed* if an adult (e.g., researcher or teacher) was primarily responsible for its implementation, whereas, components were considered *joint-managed* when they were jointly managed by the student and an adult to some degree. If it was not clear who was responsible for a particular component it was coded as not-determined.

The third step involved determining the degree to which intervention packages were self-managed by student participants. The proportion of self-managed intervention components was computed for each intervention package by dividing the number of student-managed components by the total number of included components (Fantuzzo & Polite, 1990). This process was repeated to calculate the proportion of adult-managed, and joint-managed components. Intervention packages were then classified as primarily self-, adult- or joint-managed based on the highest proportion. Interventions were classified as joint-managed if they contained (a) an equal number of adult-managed and student-managed components, or (b) a larger proportion of joint-managed components. Intervention packages were grouped according to the degree of self-management for statistical analysis.

The fourth step involved analysing intervention packages for *structural complexity*. This analysis was exploratory in nature, as complexity has not been formally operationalised in past self-management component analyses. For this analysis, intervention packages were dichotomously coded as *basic* or *complex* based on component structure. *Basic intervention packages* were defined as those incorporating up to seven SMIC-2B components (i.e., the median number of possible components). *Complex interventions* were defined as those including eight or more components up to an including the maximum of 13.

Coding Component Details. Each intervention package was coded for component details that were not captured within the SMIC-2B framework. This involved coding: behaviours monitored by student participants, goals, target behaviour prompt, self-management prompt/cue, recording device/material used, and reinforcement form.

5.5.2.3.3 SMIC-2B component coding reliability. Percentage agreement was attained for SMIC-2B component coding. Percentage agreement was calculated by dividing the total number of agreements by the total number of disagreements plus agreements, and multiplying by 100 (Cooper et al., 2007). Reliability coding was undertaken by the author of this PhD and her primary supervisor, who was taught the SMIC-2B component coding process. Each reviewer independently coded five randomly selected articles included in this review (31.25%) using the SMIC-2B. Average agreement was found to be 90.9%. The reviewers then met to discuss their findings, and resolved differences until they reached 100% agreement.

5.5.2.3.4 SMIC-2B effect size analysis. Given a lack of consensus regarding universally accepted SCD effect metrics (Lenz, 2012; Maggin & Chafouleas, 2013; Parker, Vannest, Davis, & Sauber, 2011; Shadish, 2014, Vannest & Ninci, 2015), use of multiple effect-size metrics has been historically advised for SCD reviews and meta-analyses (Beretvas & Chung, 2008; Kratochwill et al., 2010). Computing multiple effect metrics is recommended as a means of “sensitivity analyses” which facilitates evaluation of intervention outcome consistency across metrics (Kratochwill et al., 2010). As such, Beretvas and Chung’s (2008) “triangulation of metrics” approach (as used by Miller & Lee, 2013) was adopted and three effect metrics were computed in this review. The three metrics were percentage of non-overlapping data (PND) (Scruggs, Mastropieri, & Castos, 1987), the ‘No Assumptions’ standardised mean difference (SMD) (Busk & Serlin, 1992), and Tau-U (Parker et al., 2011).

In line with Chapter 4 statistical analyses, effect sizes were computed using individual student participants as the primary unit of analysis. Participant effects were aggregated to obtain overall effect sizes across analysis variables. For intervention component structure, participant effects were aggregated according to the presence of absence of each SMIC-2B component. For intervention management, aggregate estimates were derived for each intervention category - student-, joint-, or adult-managed. For intervention complexity, effects were aggregated according to use of basic or complex interventions. PND and SMD aggregates were reported in terms of mean and median. Median was computed given it is less sensitive to data outliers (Leys, Ley, Klein, Bernard, & Licata, 2013). Tau-U aggregates were reported in the form of omnibus effects for each variable.

PND. PND was applied in this chapter given its simplicity, widespread use, and its recognition as the most well-known and widely used estimate (Beretvas & Chung, 2008; Scruggs & Mastropieri, 2013; Scruggs et al., 1987). PND was computed using the same method as described in Chapter 4. See page 74 and 80 for calculation method, coding conventions and interpretation guidelines.

SMD. 'No assumptions' SMD was computed given that, along with PND, it is one of the most widely documented and recognized estimates used in SCD meta-analyses (Beretvas & Chung, 2008; Maggin, O'Keefe, & Johnson, 2011). SMD, makes use of all SCD graphed data, is not overly influenced by outliers (Maggin, Swaminathan, Rogers, O'Keeffe, Sugai, & Horner, 2011), produces effect sizes in standard deviations (Gage & Lewis, 2012) and does not hold any assumptions (Campbell & Herzinger, 2010). SMD was calculated by subtracting the mean of the baseline phase from the mean of the intervention phase and dividing by the standard deviation of the initial baseline phase (Busk & Serlin, 1992). Weighted estimates were obtained following the method outlined by Beeson and Robey (2006) to account for uneven baseline data points. As no specific SCD conventions exist for interpreting SMD, effects were interpreted using Cohen's (1988) group design criteria– 0.2, 0.5, and 0.8 being indicative of small-, medium-, and large-effects.

Tau-U. Tau-U is an effect size metric measuring data non-overlap between two phases which produces summary indexes that can be interpreted as *percent of data that improve over time* (Davis et al., 2016; Parker et al., 2011; Vannest, Parker, Gonen, & Adiguzel 2011). Tau-U was computed given that it can control for baseline trends, demonstrates greater statistical power compared to other metrics (i.e., PND, PAND), utilizes all SCD data for calculations, and is robust with small data sets with short phases (Bowman-Perrot, Davis, Vannest, Williams, Greenwood, & Parker, 2013; Davis et al., 2016; Parker, Vannest, & Davis, 2011; Parker et al., 2011; Vannest & Ninci, 2015; Vannest et al., 2016).

In each study an effect size was calculated for all AB phase contrasts; fading and maintenance phases were not considered in this analysis. For studies containing SCDs with more than one AB phase contrast, separate effect sizes were computed and appropriately labeled for each contrast (e.g., A1/B1 and A2/B2 contrasts were computed for ABAB reversal designs, while, Tier 1 AB, Tier 2 AB, and Tier 3 AB contrasts were computed for MBDs). Tau-U effect size calculation involve several steps (modelled off Bowman-Perrott, Burke, Zaini, Zhang, & Vannest, 2016; Bowman-Perrott et al., 2013; Camargo, Rispoli, Ganz, Hong, Davis, & Mason, 2016). First, TauU and its standard deviation (SD_{tau}) values were obtained for each AB contrast by entering digitalised data point values into the TauU online calculator on the *Single Case Research* free website[9] (Vannest et al., 2016). The Single Case Research website provides a video tutorial to guide this process.

Second, phase contrast Tau and SD_{tau} value obtained from the Tau-U online calculator was entered into WinPepi (Abramson, 2011, 2012), a free software package, using the meta-analysis function to aggregate the data using a fixed-effect model and to obtain an effect size, standard error and confidence intervals (CI) for each study. SD_{tau} was entered as a proxy for SE_{tau} in WinPepi at the recommendation of Vannest (personal communication, October, 2016). Finally, omnibus Tau-U, SE_{tau} and CI values were calculated using the same process for each component variable and potential moderator variable. All omnibus effect sizes were computed though selection of the following WinPepi options: (a) Compare 2, (b) Meta-analysis; analysis of stratified data, (c) Others, or proportions or rates with effect sizes/CIs, and (d) Also enter standard error.

Tau-U was interpreted using the criteria proposed by Vannest and Ninci (2015); small change (<0.20), moderate change (0.20-0.60), large change (0.60-0.80) and large to very large change (0.80>). For greater detail concerning the statistical underpinnings of Tau-U please see Parker, Vannest, & Davis, (2011); Parker et al. (2011); Vannest and Ninci, (2015), and Vannest et al. (2016).

Data Extraction. Computation of SMD and Tau-U required graphed data to be converted to raw numerical data sets. Using the computer software DigitizeIt (Bormann, 2010) baseline and intervention data points were extracted in numerical form from each graph in the reviewed SCD studies. DigitizeIt permitted accurate data point extraction from digital

[9] http://www.singlecaseresearch.org/calculators/tau-u

graphs through user-friendly software. The software can be downloaded online (http://www.digitizeit.de/).

Prior to the digitalization process reliability checks were conducted to determine the accuracy of the DigitizeIt program. Reliability checks involved extracting graph data from select studies via DigitizeIt and comparing extracted data to original numerical data to obtain an interobserver agreement (IOA) measure. Five studies were used in this process (31.3% of the study data set); original numerical data had been obtained from study authors for reliability checks[10]. Percentage agreement between the data extracted via DigitizeIt and the original data was calculated via a point-by-point IOA method (Cooper et al., 2007). This involved computing the following for each study:

$$\%\ Agreement = \frac{(total\ number\ of\ data\ point\ agreements)}{(total\ number\ of\ data\ point\ agreements + total\ number\ of\ data\ point\ disagreements)}$$

Data points were classified as an *agreement* if they fell within .5 of each other. For example, an original data point of 23.8 and a DigitizeIt data point of 23.3 would be considered an agreement. Once the percentage agreement had been computed for each study, aggregated percentage agreement was computed by taking average percentage agreement across the five studies. Reliability was 89.8%, suggesting DigitizeIt can accurately extract numerical data.

The following procedures were used during the digitalising process. First, article graphs were converted from PDF files to PNG files using the Snipping Tool® (Windows, 2009). Second, PNG graphs were imported into DigitizeIt and were manually digitalized; this process involved specifying axis scales and selecting individual data points to attain the X/Y values for each point. Finally, data was entered into separate Microsoft Excel® books dedicated to each study; an Excel book spreadsheet was dedicated to each individual

[10] Authors of studies included for review were, where possible, contacted via email with a request for original numerical data sets used to create graphs. Ethics approval was granted by MUHREC for this process. All contacted authors were informed of the nature of this study (i.e., numerical data was required for effect size calculations). Five authors were able to provide their original data sets. Studies used in this process included: Cihak et al. (2010), Davies and Witte (2000), Rafferty (2012), Rafferty et al. (2011), Vance et al. (2012).

participant so data could be arranged systematically. For identification purposes each set of data points was labelled for: study details (i.e., authors, year), participant name or number, graph number, condition (i.e., intervention/baseline), tier (i.e., Tier 1, 2, 3, etc), "X value" and "Y value."

Significance Testing. Non-parametric Mann-Whitney U and Kruskal-Wallis tests were used to test for significant PND and SMD effect size differences between analysis variables (i.e., intervention package structure, management, and complexity), and other variables (i.e., behaviour outcomes and participant characteristics). Non-parametric tests were selected for analysis given that the effect estimate data was found to be not normally distributed.

Statistical significance for Tau-U was determined using 95% CI; a 90%-95% CI is standard for identifying whether change is reliable, indicating a reasonable chance of 5% to 10% error likelihood (Nunnally & Bernstein, 1994 as cited by Bowman-Perrot et al. 2016 and Bowman-Perrot et al., 2013). Statistical significance between Tau-U values was identified by "calculating 83.4% CI to visually test for overlap of upper and lower limits between effect sizes" (Bowman-Perrot et al. 2016, p. 185). According to Payton, Greenstone, and Schenker (2003, as cited by Bowman-Perrot et al. 2016 and Bowman-Perrot et al., 2013) visual comparison of two effects with 83.4% CI is the equivalent of hypothesis testing with a p = .05 criteria – that the difference between two scores occurs by chance no more than 20 times.

Effect Size Reliability. Percentage agreement was attained for effect size computations, and calculated using the Cooper et al. (2007) method described previously. Two researchers completed reliability computations. PND reliability computations are detailed in Chapter 4. Agreement for SMD was computed across six randomly selected studies included for review (37.5%), such that a 45% sample of participants (n=29) was analyzed. Agreement at the study level was computed at 91.7%, and agreement at the participant level was 96.6%. Following initial coding the differences were discussed and resolved. Reliability was not computed for Tau-U.

5.5.2.4 Category 4: Implementation process and additional intervention details. Studies were coded on variables associated with intervention implementation in terms of: additional intervention processes/independent variables, self-monitoring accuracy, feedback (i.e., feedback about the task, the processing of the task, the self as a person, and/or self-regulation in accordance to Hattie and Timperley's (2007) framework), function-based support, technology use, and implementation details (i.e., intervention agents, required resources, and time frames).

5.5.2.5 Category 5: Intervention training procedures. Studies were coded to determine whether the method section provided intervention training descriptive information (YES/NO). Detailed training information was coded across *key training details* and *instructional process* used to teach students self-management strategies. If documented, studies were coded in terms of: who undertook student training (*training agent*), when training occurred (*training scheduling*), how many sessions were completed, and how long did training last (*training count and duration*). Coding involved reviewing training descriptions to determine if the process involved: (1) introducing the target behaviour, (2) introducing the self-management process and materials, and (3) providing practice opportunities. These three processes are core training aspects identified within King-Sears and Carpenter's (1997) seminal 10-step self-management instructional process. Training descriptions were also analysed to determine which training steps (Table 5.5) were undertaken.

Table 5.5

Teaching Students to Use Self-Management: 10-Step Instructional Process

Introduce the target behaviour to be self-managed
1. Name the target behaviour and demonstrate examples and non-example
2. Discuss the benefits of the desired target behaviour
3. Provide opportunity to practice the target behaviour (specify the mastery criterion)
Introduce the self-management procedure and materials
4. Describe the self-management procedures and materials along with the system's benefits
5. Model the self-management system while performing the desired target behaviour
Provide practice and assess mastery
6. Provide guided practice for use of the self-management strategy; role play target behaviour
7. Assess student's mastery of the self-management system with a role-play situation
8. Discuss the specific situation in which self-management will be used
9. Provide independent practice opportunities
10. Assess student's mastery of self-management within the specified situation

Adapted from King-Sears & Carpenter (1997)

5.5.2.6 Category 6: Social validity/acceptability. Coding was undertaken to determine whether participants' social validity judgments were reported in the reviewed studies. This review also involved evaluating how social validity data were collected, with whom and what were the results of the social validity assessment. The social validity coding approach used in this review (described here) has been adapted from the approach used by Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker, (2015).

Articles were rated as to whether they reported social validity data ('yes'/'no'). Next, articles reporting social validity data were coded as reporting anecdotal or formal assessment. *Anecdotal measures* were coded if studies reported approval by target students, teachers, peers, or other relevant stakeholders. *Formal measures* were considered (a) subjective evaluation via rating scales or questionnaires, and/or (b) social comparison. *Subjective evaluation* was coded if participants' views of intervention procedure acceptability, fairness, and reasonability were documented. Like Briesch and Chafouleas (2009) studies were coded as having considered social validity regardless of whether published or unpublished measures were utilised. *Social comparison* was coded if student participants' performance was compared to that of comparison participants (i.e., peer, typically developing child or group performance). If social validity data was documented, further coding determined who provided data (i.e., students participant, teacher, other), and what the data indicated about the intervention overall. Themes in social validity evaluations were coded to evaluate if intervention stakeholders viewed self-management to be a satisfactory or valuable classroom behaviour management strategy. Finally, social validity was coded the domain measured (i.e., goals, procedures, and outcomes) (Wolf, 1978), and the approach used to measure the identified domain.

5.5.2.7 Category 7: Procedural fidelity. Considering *procedural fidelity*[11], or the degree to which an intervention is implemented or carried out as designed, is a fundamental consideration in applied behaviour research (Barnett et al., 2014; Cooper et al., 2007; Gast, 2010; Ledford & Wolery, 2013; Sanetti & Collier-Meek, 2014). Procedural fidelity checks involved coding and evaluating: (a) documentation of fidelity data (YES/NO), (b) the form of fidelity data (i.e., training process, or intervention procedure), (c) for whom was fidelity evaluated (i.e., adults and/or students); (d) how fidelity was measured (e.g., observation, checklists, etc.), and (f) outcomes (i.e., to what extent was the intervention implemented as

[11] Alternatively known as Treatment Integrity

intended; was there any procedure variation). Fidelity data were coded for *training procedural fidelity* (i.e., were intervention training procedures implemented as designed) and *intervention procedural fidelity* (i.e., were intervention processes implemented as designed). Fidelity was also coded for student-implemented variables, and adult-implemented variables.

5.5.2.8 Category 8: Intervention outcomes. Intervention outcomes were coded for visual analysis, effect size, and/or descriptive outcomes as reported by respective studies.

5.5.2.9 Category 9: Generalization and maintenance (Fading). Generalization evaluation involved identifying reports of behaviour change generalization across individuals, time (*response maintenance*), setting (*setting/situation* generalization), and behaviour (*response generalization*) in the reviewed studies (Cooper et al., 2007). Generalization coding involved: (a) determining if generalization data was collected (YES/NO), (b) ascertaining the form of data reported (i.e., response maintenance, setting/situation generalization and/or response generalization), (c) analyzing data outcomes (i.e., did behaviour generalize?), and (d) determining generalisation method procedure?

5.5.3 Moderator outcome analysis. Potential moderators for self-management intervention outcomes were investigated by computing three effect metrics. The effects size comparisons for behaviour outcomes and participant characteristic variables were evaluated across all three effect metrics to determine if outcomes consistently reflected differences in the effect of self-management. If statistically significant differences were obtained between levels, the variable was considered a moderator as it differentially affected student outcomes. Though a moderator outcome analysis was conducted in Chapter 4, the previous review was limited as only one effect metric (PND) was computed. Thus, a more comprehensive moderator analysis was conducted in this chapter to substantiate Chapter 4 outcomes.

5.6 Results

5.6.1 Descriptive information -Demographic and context/setting. Table 5.6 provides summative details regarding descriptive characteristics including gender, grade level, and diagnosis or condition for each of the 70 participants across the 16 reviewed studies. A written description of participant characteristics is provided in Chapter 4. Table 5.7 details the academic subject and lesson form of study experimental sessions.

Table 5.7 reveals five studies conducted experimental sessions during language, spelling, and/or writing lessons. Experimental sessions were also undertaken in maths (n=2) and reading (n=2) lessons. Three studies did not specify the academic subject in which experimental sessions were conducted, whereas the remaining four studies reported experimental sessions were completed in a mixture of academic subjects. Table 5.7 demonstrates experimental sessions were conducted during independent work lessons in four studies, and during independent work lessons including teacher instruction in one study. Three studies were conducted in lessons combining independent and group work, while one study was undertaken only in group work lessons. Seven studies did not explicitly specify lesson format in which experimental sessions were conducted.

Table 5.6

Participant Descriptive Characteristics

	n (Participants)	Percent (%)
Gender		
Male	56	20.0
Female	14	80.0
Grade		
Grade 1	-	-
Grade 2	4	5.7
Grade 3	19	27.1
Grade 4	14	20.0
Grade 4/5[1]	5	7.1
Grade 5	11	15.7
Grade 6	17	24.3
Disability Status		
ADHD	25	35.7
ASD	3	4.3
EBD/ED	5	7.1
LD	2	2.9
TD	35	50.0

NOTE: ADHD attention-deficit/hyperactivity disorder, *ASD* autism spectrum disorder, *EBD/ED* emotional and behavioural disability/emotionally disturbed, *LD* learning disability, *TD* typically developing

[1] Five participants from Rock and Thead (2007) were omitted from the grade statistics as the students were in a Grade 4/5 composite and individual participant grade was not specified

Table 5.7

Context Descriptive Characteristics

	n (Studies)	Studies
Academic Subject		
Language, Spelling, and/or Writing	5	Glynn & Thomas (1974); Harris, Friedlander, Saddler, Frizzelle, & Graham (2005); Moore, Prebble, Robertson, Waetford, & Anderson. (2001); Rafferty, Arroyo, Ginnane, & Wilczynski (2011); Salend, Tintle, & Balber (1988)
Maths	2	Roberts & Nelson (1982); Rock & Thead (2007)
Reading	2	Edwards, Salant, Howard, Brougher, & McLaughlin (1995); Rafferty (2012)
Combination	4	Cihak, Wright, & Ayres (2010)[1]; Hughes & Henderson (1987)[2]; Todd, Horner, & Sugai (1999)[3]; Vance, Gresham, & Dart (2012)[4]
Did not specify	3	Barry & Messer, (2003); Coogan, Kehle, Bray, & Chafouleas (2007); Davies & Witte (2000)
Lesson Format		
Independent Work	4	Edwards et al. (1995); Moore et al. (2001); Rafferty et al. (2011); Rock & Thead (2007)
Group Work	1	Rafferty (2012)
Independent *and* Group Work	3	Hughes & Henderson (1987)[5]: Salend et al. (1988)[5]; Todd et al. (1999)
Teacher instruction *and* independent work	1	Glynn & Thomas (1974)
Did not specify	7	Barry & Messer (2003); Cihak et al. (2010); Coogan et al. (2007); Davies & Witte (2000); Harris et al. (2005); Roberts & Nelson (1982); Vance et al. (2012)

[1] Language arts, reading, maths and social studies; [2] Maths and reading; [3] Reading and project time; [4] Social Studies/Science and maths; [5] Teacher worked with a small group of students while the remainder of the class worked independently

5.6.2 Dependent variable(s). As reported in Chapter 4 dependent variables (DV) included task-engagement or on-task behaviour increase (nStudies = 11), disruptive or problem behaviour reduction (nStudies = 2), or a combination of both (nStudies = 3). The most frequently targeted DV was on-task/task engagement with 14 studies measuring this variable (see Table 1, Chapter 4). Reviewed studies collected data on academic variables including oral reading fluency (Rafferty, 2012), spelling accuracy (Rafferty et al., 2011), maths productivity and accuracy (Roberts & Nelson, 1982; Rock & Thead, 2007), academic performance (Harris et al., 2005), completed and correct assignments (Barry & Messer, 2003), and reading comprehension (Edwards et al., 1995). Cihak et al. (2010) also collected data to measure the number of teacher directed prompts.

5.6.3 Independent variable(s) – Intervention component analysis SMIC-2B. Table 5.8 presents study level analysis findings concerning: (a) intervention component structure, (b) intervention management, and (c) intervention complexity. Table 5.9a presents analysis results for intervention packages in terms of: (a) the number of components, (b) component structure, and (c) component management (i.e., student-, adult- or joint- managed). Table 5.9b presents aggregate analysis results showing the number of interventions incorporating each SMIC-2B component, and the extent to which an intervention component was student-, adult-, or jointly-managed across studies. Effect size outcomes are presented in Table 5.10.

5.6.3.1 Intervention component structure. Component analysis revealed that on average self-management intervention packages incorporated 8.94 (Range = 6-12) SMIC-2B components (Table 5.8). Considering original SMIC-2 framework, 7.50 (Range = 4-11) components were included on average. While no intervention package contained all 13 SMIC-2B components, packages used by Coogan et al. (2007) and Edwards et al. (1995) incorporated 12 components. Further analysis identified that six SMIC-2B components were consistently used in all 16 intervention packages (Table 5.9a and b). Components incorporated in all reviewed packages were: (1) selection of target behaviour, (2) operational definition of the target behaviour, (3) self-management cues, (4) observation, (5) recording, and (6) self-management materials. These six components are henceforth referred to as core components. The following section presents component analysis results concerning non-core components.

Table 5.8

Intervention Component Analysis Results

	n SMIC-2B components[a]	*n* Student-Managed[b]	*n* Joint-Managed[c]	*n* Adult-Managed[d]	*n* Not Determined	Intervention Complexity
Barry & Messer (2003)	10	3 (0.30)	1 (0.10)	6 (0.60)	-	Complex
Cihak et al. (2010)	7	3 (0.43)	-	4 (0.57)	-	Basic
Coogan et al. (2007)	12	2 (0.17)	1 (0.08)	8 (0.67)	1 (0.08)	Complex
Davies & Witte (2000)	11	3 (0.27)	2(0.18)	5 (0.45)	1 (0.09)	Complex
Edwards et al. (1995)	12	4 (0.33)	4 (0.33)	4 (0.33)	-	Complex
Glynn & Thomas (1974)	10	4 (0.40)	1 (0.10)	5 (0.50)	-	Complex
Harris et al. (2005)	7	4 (0.57)	-	3 (0.43)	-	Basic
Hughes & Hendrickson (1987)	6	3 (0.50)	-	3(0.50)	-	Basic
Moore et al. (2001)	7	4 (0.57)	-	3 (0.43)	-	Basic
Rafferty (2012)	7	3 (0.43)	-	4 (0.57)	-	Basic
Rafferty et al. (2011)	6	3 (0.50)	-	3 (0.50)		Basic
Roberts, & Nelson (1982)	7	3 (0.43)	-	4 (0.57)	-	Basic
Rock & Thead (2007)	9	4 (0.44)	2 (0.22)	3 (0.33)	-	Complex
Salend et al. (1988)	11	4 (0.36)	1(0.09)	5 (0.45)	1 (0.09)	Complex
Todd et al. (1999)	11	5 (0.45)	2 (0.18)	4 (0.36)	-	Complex
Vance et al. (2012)	10	3 (0.30)	-	6 (0.60)	1 (0.10)	Complex
Mean	8.94	3.44 (0.40)	.90 (0.08)	4.38 (0.49)	0.25 (0.02)	

[a]Total number of SMIC-2components included in each study; [b]Total number of components managed primarily by student participants; [c]Total number of components managed jointly by both student and adult participants; [d]Total number of components primarily managed by an adult participant (i.e., researcher or teacher)

Note: Value in the brackets demonstrates the proportion of the components managed by either the student, teacher or joint partnership within each study.

Table 5.9a

Intervention Component Analysis Results

	STB	DTB	SPC	GS	TBP	SM-C	SMon-O	SMon-R	Eval.	GCC	APC	GB	SMM	*n*
Barry & Messer (2003)	AM	JM	SM	AM	-	AM	SM	SM	AM	-	AM[1]	-	AM	10
Cihak et al. (2010)	AM	AM	-	-	AM	SM	SM	SM	-	-	-	-	AM	7
Coogan et al. (2007)	AM	AM	AM	JM	AM	AM	AM	SM	AM	SM	ND[2]	-	AM	12
Davies & Witte (2000)	AM	AM	SM	AM	-	SM	JM	SM	AM	JM	ND[2]	-	AM	11
Edwards et al. (1995)	AM	AM	JM	AM	-	SM	SM	SM	JM	JM	SM[1]	JM	AM	12
Glynn & Thomas (1974)	AM	AM	JM	-	AM	SM	SM	SM	-	SM	AM[1]	-	AM	10
Harris et al. (2005)	AM	AM	-	-	-	SM	SM	SM	-	-	-	SM	AM	7
Hughes & Hendrickson (1987)	AM	AM	-	-	-	SM	SM	SM	-	-	-	-	AM	6
Moore et al. (2001) [+]	AM	AM	-	-	-	SM	SM	SM	-	-	-	SM	AM	7
Rafferty (2012)	AM	AM	-	-	AM	SM	SM	SM	-	-	-	-	AM	7
Rafferty et al. (2011)	AM	AM	-	-	-	SM	SM	SM	-	-	-	-	AM	6
Roberts, & Nelson (1982)	AM	AM	-	-	AM	SM	SM	SM	-	-	-	-	AM	7
Rock & Thead (2007)^	AM	AM	-	JM	JM	SM	SM	SM	SM	-	-	-	AM	9
Salend et al. (1988)	AM	AM	JM	AM	-	SM	SM	SM	ND	SM	AM[2]	-	AM	11
Todd et al. (1999)	AM	AM	AM	AM	-	SM	SM	SM	SM	SM	JM[1]	-	JM	11
Vance et al. (2012)	AM	AM	ND	AM	-	SM	SM	SM	AM	-	AM[1]	-	AM	10

Table 5.9b

Intervention Component Analysis Results

	STB	DTB	SPC	GS	TBP	SM-C	SMon-O	SMon-R	Eval.	GCC	APC	GB	SMM
Studies incorporating component - *n* (%)	16 (100%)	16 (100%)	8 (50%)	8 (50%)	6 (38%)	16 (100%)	16 (100%)	16 (100%)	8 (50%)	6 (38%)	8 (50%)	3 (19%)	16 (100%)
Student-Managed - *n* (%)	-	-	2 (25%)	-	-	14 (87.5%)	14 (88%)	16 (100%)	2 (25%)	4 (67%)	1 (13%)	2 (67%)	-
Adult-Managed - *n* (%)	16 (100%)	15 (94%)	2 (25%)	6 (75%)	5 (83%)	2 (12.5%)	1 (6%)	-	4 (50%)	-	4 (50%)	-	15 (94%)
Joint-Managed - *n* (%)	-	1 (6%)	3 (38%)	2 (25%)	1 (17%)	-	1 (6%)	-	1 (13%)	2 (33%)	1 (13%)	1 (33%)	1 (6%)
Not Determined - *n* (%)	-	-	1 (13%)	-	-	-	-	-	1 (13%)	-	2 (25%)		

Note (Table 5.9 a & b). STB = Selection of Target Behaviour; DTB = Definition of Target Behaviour; SPC = Selection of Primary Consequence; GS = Goal Setting; TBP = Target Behaviour Prompt (or Response Prompt for Target Behaviour); SM-C = Self-Management Cue (or Prompt/Cue for Self-Management Tactic); SMon-O = Self-Monitoring Observation; SMon-R = Self-Monitoring Recording; Eval. = Evaluation; GCC = Administration of Generalised Conditioned Consequences; APC = Administration of Primary Consequences; GB = Graphing (or charting) Behaviour; SMM = Self-Management Materials

Note (Table 5.9a). n = number of components; SM=Self-Managed; AM=Adult-Managed; JM=Joint Managed; PM=Peer Managed; ND=Not Determined

^ Intervention procedures for Rock & Thead (2007) obtained from Rock (2005) as instructed by the authors

+ Goal setting and evaluation included as part of the generalisation enhancement program in this study, not incorporated in the initial implementation of self-management thus not coded

Form of consequence: [1]Administration of positive reinforcement to increase desired behaviour; [2]Administration of negative punishment to decrease undesired behaviour

Note (Table 5.9b). n = number of studies; % = percentage of studies incorporating the specified component

Table 5.10

Intervention Component Structure Analysis: Effect Size Results

			PND		SMD		Tau-U			
	*n*Studies	*n*Participants PND/SMD/Tau-U	*M*	*Md*	*M*	*Md*	ES	SE	CI_{95}	$CI_{83.4}$
Target Behaviour Prompt										
Present	6	27/28/28	85.36	90	2.85	2.34	0.86	0.04	0.78-0.95	0.80-0.92
Absent	10	40/41/42	85.85	100	2.55	2.26	0.84	0.03	0.78-0.91	0.80-0.88
Mann-Whitney U			U= 473.00, z= -.907, p=.367^{ns} 95% CI [.357, .376], r= - 0.111		U= 525.50, z= -.593, p=.562 ^{ns} 95% CI [.552, .571], r= - 0.071					
Goal Setting and Evaluation										
Present	8	28/28/28	90.28	99.54	2.93	2.28	0.88	0.03	0.81-0.94	0.84-0.92
Absent	8	39/41/42	82.32	89	2.50	2.26	0.85	0.05	0.75-0.95	0.78-0.92
Mann-Whitney U			U= 460.00, z= -1.158, p=.245^{ns} 95% CI [.237, .254], r= - 0.141		U= 497.00., z= -.941, p=.347^{ns} 95% CI [.337, .356], r= - 0.113					
Consequence: Selection and Admin.										
Present	8	32/32/32	83.55	90	2.67	2.28	0.84	0.03	0.78-0.90	0.80-0.88
Absent	8	35/37/38	87.57	100	2.68	2.27	0.88	0.05	0.78-0.97	0.81-0.95
Mann-Whitney U			U= 402.50, z= -2.095, p=.034* 95% CI [.031 .038], r= -0.256		U= 580.00, z= -.144, p=.889 ^{ns} 95% CI [.883, .895], r= 0.017					

Administration of GCC										
Present	6	24/24/24	81.47	82.83	2.37	2.26	0.86	0.04	0.78-0.94	0.80-0.92
Absent	10	43/45/46	87.98	100	2.84	2.33	0.85	0.03	0.78-0.91	0.81-0.89
Mann-Whitney U			*U*= 349.50, *z*= -2.307, *p*=.022* 95% CI [.019, .025], *r*= - 0.282		*U*=496.00, *z*= -.554, *p*=.579 ^{ns} 95% CI [.569, .588], *r*= - 0.067					
Graphing/Charting										
Present	3	11/11/11	88.23	100	2.31	2.29	0.91	0.07	0.77-1.00	0.81-1.00
Absent	13	56/58/59	85.14	95	2.75	2.27	0.84	0.03	0.79-0.90	0.80-0.88
Mann-Whitney U			*U*= 288.00, *z*= -.0.359, *p*=.729 ^{ns} 95% CI [.720, .737], *r*= -0.044		*U*= 300.00, *z*= -.311, *p*=.760^{ns} 95% CI [.751, .768], *r*= - 0.037					

Note. *n*Studies =Number of studies which applied intervention packages containing or omitting the specified component/s; *n*Participants= number of participant cases exposed to intervention which contained the indicated component/s (The number of cases differ slightly across effect sizes due to removal of outliers. Estimates represent results after the removal of three PND outliers and one extreme SMD outlier from the data set). Present = effect computed based on participant cases in studies which incorporated the specified component in the applied intervention; Absent = effect computed based on participant cases in studies which did not incorporate the specified component in the applied intervention ^{ns}= not significant *=significant

5.6.3.1.1 Target Behaviour Prompt (TBP). TBPs were integrated in six of the 16 reviewed intervention packages. Packages used in Cihak et al. (2010), Coogan et al. (2007), Glynn and Thomas (1974), Rafferty (2012), Roberts and Nelson (1982), and Rock and Thead (2007) involved creating and displaying stimuli in the students' classroom which functioned as an extra cue to remind the student of the target behaviour throughout intervention sessions. Average effect estimates (Table 5.10) for participants subjected to packages including TBPs (PND, *M*=85.36%, *Md* =90; SMD, *M*=2.85, *Md* = 2.34) were comparable to those subjected to packages omitting TBPs (PND, *M*=85.85%, *Md*=100; SMD, *M*=2.55, *Md*=2.26). Effects were interpreted as *effective* (PND) and *strong* (SMD) irrespective of whether TBP inclusion or exclusion. Mann-Whitney U tests revealed no significant difference in PND and SMD effect size suggesting comparable effects irrespective of whether this component was incorporated or not. Very large Tau-U effects were obtained for intervention packages using (0.86, CI_{95} [0.78, 0.95]) and not using (0.84, CI_{95} [0.78, 0.91]) TBPs. Packages incorporating TBPs produced a slightly larger effect than packages which did not, however overlapping $CI_{83.4}$ indicate no statistically significant difference in the effects.

5.6.3.1.2 Goal setting and evaluation. Goal setting and evaluation components were integrated in half of the reviewed intervention packages (n=8; 50%). All packages incorporating goal-setting also included an evaluation element to determine if students met set goals. On average, students subject to interventions including goal setting/evaluation obtained higher effect estimates (*Very Effective* PND, *M*=90.28%, *Md*=99.54%; *Strong* SMD, *M*=2.93, *Md*=2.28) compared to those subject to packages which did not (*Effective* PND, *M*=82.32%, *Md*=89%; Strong SMD, *M*=2.50, *M*d=2.26). Mann-Whitney U revealed no significant difference in effect between interventions incorporating and omitting these components. Tau-U effects were very large effects for packages including (0.88, CI_{95} [0.81, 0.94]) and omitting (0.85, CI_{95} [0.75, 0.95]) goal setting/evaluation components. Packages containing goal setting and evaluation components produced a slightly larger effect than packages which omitted these components, however no statistically significant difference was found due to non-overlapping $CI_{83.4.}$

5.6.3.1.3 Consequences: Selection and administration of primary consequence and administration of generalised conditioned consequence (GCC). Analysis revealed eight (50%) self-management intervention packages incorporated consequence-based components.

Intervention packages incorporating consequence components consistently paired the SMIC-2B components selection *and* administration of primary consequence. Of the packages incorporating consequence selection and administration, six also incorporated the SMIC-2B component, administration of generalised conditioned consequences (GCC).

Average PND effect outcomes yielded by self-management interventions incorporating consequence components were significantly different through the Mann-Whitney U test. Students exposed to intervention packages including primary consequence selection and administration had a significantly lower average PND outcome (*M*= 83.55%; *Md*=90.00%) than those exposed to packages omitting these components (*M*= 87.57%; *Md*=100%). No significant difference was identified for the SMD outcome. Effects were respectively interpreted as *effective* (PND) and *strong* (SMD) irrespective of consequence components inclusion. Interventions including consequence selection and administration (0.84, CI_{95} [0.78, 0.90]) obtained slightly smaller Tau-U effects than those omitting these components (0.88, CI_{95} [0.78, 0.97]). This suggests interventions without inbuilt consequence components demonstrate a greater magnitude of change; however overlap between $CI_{83.4}$ shows no statistically significant difference.

Packages including a GCC had a significantly lower average PND outcome (*M*= 81.47%; *Md*=82.83%) than packages omitting this component (*M*=87.98%; *Md*=100%). This pattern was reflected by SMD estimates with packages incorporating GCCs yielding a smaller SMD average (*M*=2.37; *Md*=2.26) than those which omitted a GCC (M= 2.84; Md= 2.33). The SMD difference was however not found to be significant (Table 5.10). Tau-U results reveal very large effects for packages including (0.86, CI_{95} [0.78, 0.94]) and excluding (0.85, CI_{95} [0.78, 0.91]) GCCs. Slightly larger effects were obtained for packages including GCCs, however $CI_{83.4}$ overlap shows no statistically significant difference in effects.

5.6.3.1.4 Graphing or Charting Behaviour. Only identified in three intervention packages (Edwards et al., 1995; Harris et al., 2005; Moore et al., 2001), graphing is the least frequently used SMIC-2B component. Average effect estimates for participants subject to intervention packages containing charting (PND, *M*=88.23%, *Md*=100%; SMD, *M*=2.31, *Md*=2.29) were comparable to those yielded for participants exposed to interventions omitting this component (PND, *M*=85.15%, *Md*= 95.00%; SMD, *M*=2.75, *Md*=2.27). Mann-Whitney U revealed no significant difference in effect size. Tau-U effects for interventions incorporating graphing (0.91, CI_{95} [0.77, 1.00]) were slightly larger than interventions excluding this component (0.84, CI_{95} [0.79, 0.90]). The overlap between $CI_{83.4}$ shows no statistically significant difference in effects.

5.6.3.2 Intervention management. Table 5.8 presents an overview of the degree of intervention management for package proportion of student-, adult- and joint-managed components. Analysis revealed that across the reviewed packages an average of 3.44 (40%) components were self-managed by student participants (Range =2-5; Range% =17-57%). Conversely, an average of 4.38 (49%) included components across interventions were managed by adults (Range = 3-8; Range% = 27-67%). A relatively smaller proportion of the interventions were identified as joint-managed with an average of approximately one component (.90 component; 8%; Range = 0-4; Range% = 0-33%). Of the 16 packages reviewed, nine were considered *primarily adult-managed*, as they contained a larger proportion of components identified to have been managed by teachers or researchers. Only four of the 16 studies were identified as *primarily self-managed* by student participants. Three studies were identified as *joint-managed*, with an equal portion of adult- and student self-managed components.

Effect size analyses revealed applying primarily student-managed interventions tended to demonstrate the most effective outcomes on average (Table 5.11). Very effective (i.e., PND>90%), large (i.e., SMD>2) and very large (i.e Tau-U>0.96) average outcomes were consistently demonstrated across the four primarily student-managed intervention studies. Primarily adult-managed intervention studies obtained PND outcomes spanning from effective to very effective (range: 76.67% - 100%); consistently large SMD outcomes (range: 1.50-7.00) and Tau-U outcomes ranging from large to very large (range: 0.74-1). Studies applying joint-managed packages displayed a similar pattern with mean PND ranging from questionable to very effective (range: 64.60%-100%); consistently large SMD outcomes (range: 1.53-3.87) and large to very large Tau-U outcomes (range: 0.66-0.87).

Participant level analyses also presented favorable outcomes for primarily student-managed interventions (Table 5.12). Mean PND and SMD outcomes show very effective and strong estimates for participants subject to student-managed interventions; PND and SMD were respectively 95.49% (*Md*=100) and 2.78 (*Md*=2.74). Smaller effect estimates were found for cases subject to adult-managed interventions (PND, *M*=86.89%, *Md*=93.89; SMD, *M*=2.96; *Md*=2.33) and joint-managed (PND, *M*=73.63%, *Md*=83.83%; SMD, *M*=1.96, *Md*=1.88) interventions. A Kruskal-Wallis Tests revealed no significant differences between the estimates across the three self-management intervention categories. A very large Tau-U omnibus effect of 0.97 (CI_{95} [0.84-1.00]) was obtained for cases subject to student-managed packages. Despite outcomes showing large and very large effect sizes, smaller effects were obtained for cases subject to joint-managed (0.77, CI_{95} [0.65-0.89]) and adult-managed (0.85, CI_{95} [0.78-0.91]) packages. Overlap between $CI_{83.4}$ indicates no statistically significant difference between; (a) primarily student- and adult-managed packages, and (b) joint- and adult-managed packages. A statistically significant difference presented between participants subject to student-managed packages and those subject to joint-managed interventions as determined by no $CI_{83.4}$ overlap.

Results to follow consider the degree to which each SMIC-2B component was managed by key participants (see Tables 5.8, and 5.9 a and b for results).

5.6.3.2.1 Selection and definition of target behaviour. Adults were found primarily responsible for selecting (ratio adult/total =16/16; 100%) and defining (ratio adult/total =15/16; 95%) target behaviour across all interventions. Only the package applied by Barry and Messer (2003) involved students in defining targeted behaviour. Barry and Messer’s definition process was considered joint-managed as discussions were held between students and the teacher so students could describe problem behaviour and describe how they should behave in the classroom.

5.6.3.2.2 Self-management materials. Self-management materials were largely managed by adults (ratio adult/total =15/16; 94%) across studies. Adults were generally responsible for creating and/or providing students with self-management prompting devices and recording sheets/cards. Todd et al. (1999) trialed the only package which involved the student participant in material organization; this component was classified joint-managed as the student and adult both played a role in introducing materials into the classroom.

5.6.3.2.3 Target behaviour prompt (TBP). With the exception of one study in which the TBP was identified as joint-managed (Rock & Thead, 2007), adults were primarily responsible this component (ratio adult/total =5/6; 83%).

5.6.3.2.4 Self-management cue (SM-C). SM-Cs were largely student-managed (ratio student/total =14/16; 87.5%) as students were primarily responsible for prompting themselves to engage in self-management tactics in response to emitted prompts or cues. Two studies incorporated adult-managed SM-Cs. Coogan et al. (2007) implemented a multi-component intervention which involved the teacher prompting students when to move a pin on the group-monitoring board (signifying a loss of a team point), and when to self-record a check on their individual self-monitoring materials. Students in Barry and Messer's (2003) study were similarly prompted by the classroom teacher every 15-minutes to record behaviour.

5.6.3.2.5 Self-monitoring: Observation and recording. Students were largely responsible for conducting observations to determine the presence or absence of targeted behaviour (ratio student/total =14/16; 88%) and were always responsible for recording behaviour observations (ratio student/total =16/16; 100%). Two studies involved adult- and jointly-managed observation components. The package applied by Coogan et al. (2007) involved the teacher identifying occurrences of disruptive behaviour via observation prior to prompting students to self-record when they engaged in inappropriate behaviour. Self-observation was classified as joint-managed within the intervention applied by Davies and Witte (2000) as student participants and the classroom teacher were partially responsible for observing target behaviour occurrence/non-occurrence. Student participants self-observed and self-recorded their behaviour on the group monitoring card and an individual card, while the teacher observed students' behaviour to monitor student self-monitoring processes (Davies & Witte, 2000).

5.6.3.2.6 Goal setting and evaluation. Adults were primarily responsible for setting goals (ratio adult/total =6/8; 75%), and evaluating whether goals were met (ratio adult/total =4/8; 50%). For instance, an author of Vance et al. (2012) evaluated whether students accurately self-recorded on seven of the eight intervals each session; an adult-set goal. Similarly, Barry and Messer (2003) reported participant goals were established by the teacher based on the classroom average for each target behaviour - the teacher also determined whether goals were met at the end of each day. Packages used by Coogan et al. (2007) and Rock and Thead (2007) involved students and adult agents jointly setting goals. Packages used by Rock and Thead, and Todd et al. (1999) had student participants self-evaluate to determine whether set goals had been achieved. Edwards et al. (1995) reported participant students met with a teacher assistant to evaluate together whether students' target behaviour exceeded the goal criterion for each lesson. It could not be determined who was responsible for self-evaluation in the study by Salend et al. (1988).

5.6.3.2.7 Consequences: Selection and administration of primary consequence and administration of generalised conditioned consequence (GCC). Typically packages containing consequence components involved student or adult participants selecting a desired reinforcer prior to self-monitoring, and then delivering the elected consequence after meeting a set goal criterion. Barry and Messer (2003) had students create a reinforcer menu containing student-selected desirable things and activities; reinforcers were administered following self-management sessions, when the teacher determined students had met set goals. Responsibility of consequence component implementation varied across reviewed interventions. Consequence selection was primarily jointly-managed task with students and teachers often collaborating to determine reinforcers (ratio joint/total =3/8; 38%). In other packages responsibility for selecting reinforcers was shared across students (ratio student/total =2/8; 25%) and adults (ratio adult/total =2/8; 25%). Analysis showed GCCs were primarily managed by students independently (ratio student/total =4/6; 67%), or with adult assistance (ratio joint/total =2/6; 33%). In terms of reinforcer administration, adults were primarily responsible (ratio adult/total =4/8; 50%).

5.6.3.2.8 Graphing or charting behaviour. Graphing was a primarily student-managed component (ratio student/total=2/3; 67%). Harris et al. (2005) had students graph the number of instances they self-recorded on-task behaviour during a spelling study period noting that graphing may be connected with possible motivational or feedback effects. Moore et al. (2001) similarly taught students to tally and graph the number of ticks (i.e., self-recorded on-task behaviour) they accumulated in intervention sessions on a graph. Moore et al. later combined graphing with goal-setting and self-evaluation components in a generalisation phase where the researcher and students reviewed graphed data to establish future goals. Students continued to fill graphs out each day after self-recording; a plotted goal criterion was used to evaluate if set goals had been attained. Moore et al. suggested that combining self-charting with goal-setting enabled students to become aware of how close they were to achieving set goals. Edwards et al. (1995) incorporated charting in the form of a jointly-managed wall-chart that was used to tally points earned by students for self-recording on-task behaviour. Graphs were analysed and tallied at the end of the week to determine if students demonstrated sufficient levels of on-task behaviour to satisfy the set goal, and thus earn a reinforcer. Here, charting seems integral to connecting generalised condition reinforcers (i.e., point system), goal-setting, evaluation and administration of reinforcement components in the self-management package.

5.6.3.3 Intervention complexity. Across the 16 studies, nine different intervention packages were identified. The reviewed collection of interventions contained seven basic intervention packages (i.e., seven or less components) and nine complex packages (i.e., eight or more components) (Table 5.8). Two identified packages were applied across three studies; these two packages are referred to as Package 1 and 2.

Package 1 incorporated the six identified core components (target behaviour selection, target behaviour definition, self-management cues, observation, recording, and self-management materials) and the target behaviour prompt component. Analysis revealed this basic package consistently yielded very effective PND, strong SMD and very large Tau-U effect estimate outcomes in the three studies trialling its effectiveness (Cihak et al. 2010; Rafferty, 2012; Roberts & Nelson, 1982) (Table 5.11). Further analysis revealed Package 1 as a primarily adult-managed package (Table 5.9 a and b). Across all three studies adult agents managed four of the seven components (selection, definition, prompt of target behaviour, and environmental manipulation) while students self-managed three components (observation, recording, and self-management prompt). Slight variations of Package 1 were implemented in four other studies. Rafferty et al. (2011) and Hughes and Hendrickson (1987) used a basic joint-managed intervention package incorporating only the six core components, whereas Harris et al. (2005) and Moore et al. (2001) implemented a basic primarily student-managed intervention including the six core components and a student-managed charting component. Harris et al., Moore et al., and Rafferty et al. all demonstrated very effective outcomes (PND range = 92.2-100; SMD range = 2.23-3.87; Tau-U range = 0.87-1.00), while Hughes and Hendrickson demonstrated notably smaller estimates (PND, 64.60; SMD, 1.53; TauU, 0.66). Upon removal of two outliers the PND for Hughes and Hendrickson increased to 79.75.

Package 2 consisted of 11 components and was applied in Davies and White (2000), Salend et al. (1988), and Todd et al. (1999). This complex package incorporated all SMIC-2B components with the exception of target behaviour prompt and charting. Intervention agents responsible for SMIC-2B component implementation varied across the studies which applied Package 2. Some consistency was evident as all three studies had adults select and define the target behaviour, and set goals, while students were responsible for self-recording and using self-prompts for self-management (Table 5.9a). Package 2 consistently brought about very effective outcomes across the three studies (PND range = 99.08-100; SMD range = 2.19-4.44; all three Tau-U = 1.00). The remaining six studies implemented a range of complex interventions, each incorporating nine or more components (Range 9-12 components) (See Table 5.8 and 5.9a).

Effect size analysis at the participant level suggested that outcomes for complex (PND, M=85.63, SMD, M=2.75) and basic (PND, M=85.67, SMD, M=2.59) packages are relatively comparable with no significant difference (Table 5.12). Very large Tau-U omnibus effects were obtained for cases subject to complex (0.85 (CI_{95} [0.79-0.91]) and basic (0.85, CI_{95} [0.74-0.95]) intervention packages. Overlap between $CI_{83.4}$ indicates no statistically significant difference between basic and complex intervention outcomes.

Table 5.11

Effect Size Results: Study Effects

Study	Degree of Management	PND *M*[*Mdn*]	SMD*	Tau-U*		
				ES	SE	CI_{95}
Barry & Messer (2003)	Adult-managed	94.76 [93.33]	4.79 [4.81]	0.83	0.06	0.72-0.94
Cihak et al. (2010)	Adult-managed	100 [100]	7.00 [7.00]	1	0.13	0.75-1.25
Coogan et al. (2007)	Adult-managed	76.67 [80.00]	1.81 [1.88]	0.89	0.09	0.66 -1.12
Davies & Witte (2000)	Adult-managed	100 [100]	2.19 [2.18]	1	0.12	0.76-1.24
Edwards et al. (1995)	Joint-managed	77.72 [86.65]	2.39 [2.29]	0.87	0.10	068-1.06
Glynn & Thomas (1974)	Adult-managed	71.18 [70.00]	2.19 [2.43]	0.74	0.07	0.61-0.78
Harris et al. (2005)	Student-managed	92.50 [100]	2.23 [1.94]	0.95	0.13	0.70-1.20
Hughes & Hendrickson (1987)	Joint-managed	64.60 [76.50]	1.53 [1.47]	0.66	0.08	0.50-0.83
Moore et al. (2001)	Student-managed	94.44 [100]	2.87 [2.74]	1	0.20	0.60-1.39
Rafferty (2012)	Adult-managed	96.43 [100]	2.98 [2.94]	1	0.16	0.77-1.41
Rafferty et al. (2011)	Joint-managed	100 [100]	3.87 [3.87]	0.87	0.18	0.52-1.22
Roberts, & Nelson (1982)	Adult-managed	100 [100]	2.91 [1.78]	0.91	0.20	0.53-1.29
Rock & Thead (2007)	Student-managed	99 [100][6]	3.28 [3.09]	0.96	0.09	0.78-1.15
Salend et al. (1988)	Adult-managed	100 [100]	4.44 [4.44]	1	0.17	0.67-1.33
Todd et al. (1999)	Student-managed	99.08 [99.08]	3.37 [3.37]	1	0.16	0.69-1.30
Vance et al. (2012)	Adult-managed	81.48 [94.45]	1.50 [1.61]	0.80	0.08	0.64-0.96

*Representative of *absolute effect size values.* Coogan et al. (2007) and Davies & Witte (2000) effect sizes are represented in absolute terms of change rather than reflecting *decreases* in the targeted behaviour. Study effect sizes for Barry & Messer (2003); Todd et al. (1999) and Vance et al. (2012) also represent aggregated effects based on absolute values.

Table 5.12

Intervention Management and Intervention Complexity Analysis: Effect Size Results

	*n*Studies	*n*Participants PND/SMD/Tau-U	PND		SMD		Tau-U			
			M	*Md*	*M*	*Md*	ES	SE	CI_{95}	$CI_{83.4}$
Degree of Management										
Primarily Student-Managed	4	15/15/15	95.49	100	2.78	2.74	0.97	0.06	0.84-1.00	0.89-1.00
Joint-Managed	3	16/17/18	73.63	82.83	1.96	1.88	0.77	0.06	0.65-0.89	0.69-0.85
Primarily Adult-Managed	9	36/37/37	86.89	93.89	2.96	2.33	0.85	0.03	0.78-0.91	0.81-0.89
Kruskal-Wallis			$\chi 2$ (2, n=67) = 5.65, *p*=.059 ^{ns}, 95% CI [.051, .060]		$\chi 2$ (2, n=69) = 4.16, *p*=.128 ^{ns}, 95% CI [.121, .134]					
Complexity										
Basic	7	30/32/33	85.67	100	2.59	2.24	0.85	0.05	0.74-0.95	0.78-0.92
Complex	9	37/37/37	85.63	93.33	2.75	2.29	0.85	0.03	0.79-0.91	0.81-0.89
Mann-Whitney U			*U*= 467.00, *z*= -1.176, *p*=.241^{ns} 95% CI [.232, .249]		*U*= 546.00., *z*= -.554, *p*=.578^{ns} 95% CI [.568, .587]					

*Note. n*Studies =Number of studies which applied intervention packages containing or omitting the specified component/s; *n*Participants= number of participant cases exposed to intervention which contained the indicated component/s (The number of cases differ slightly across effect sizes due to removal of outliers. Estimates represent results after the removal of three PND outliers and one extreme SMD outlier from the data set).

^{ns}= not significant *=significant

5.6.3.4 Component details. Intervention components were found to vary substantially cross self-management interventions. The following section details the form of target behaviour, goal setting, target behaviour prompts, self-management cues, recording, consequences, and graphing/charting components implemented across the reviewed studies.

5.6.3.4.1 Student-monitored target behaviour. In most studies (n=11) student participants were taught to self-monitor variations of task engagement, attention or on-task/off-task behaviour. Two studies involved teaching participants to self-monitor talking-out (Davies & Witte, 2000), and inappropriate behaviour (Coogan et al., 2007). Barry and Messer (2003) taught student participants to monitor a combination of target behaviour. Student participants were taught to monitor both behaviour and academic outcomes in Harris et al. (2005) (i.e., on-task and spelling accuracy) and Rock and Thead (2007) (i.e., attention and number of problems completed). Table 5.13 details self-monitored targeted behaviour.

Table 5.13

Student-Monitored Target Behaviour

Target Behaviour	Study
On-Task/Off-Task[1]	Cihak et al. (2010); Edwards et al. (1995); Glynn & Thomas, (1974); Hughes & Hendrickson, (1987); Moore et al. (2001); Rafferty, (2012); Rafferty et al. (2011); Roberts & Nelson, (1982); Salend et al. (1988); Todd et al. (1999); Vance et al. (2012)
Undesired Behaviour	Coogan et al. (2007); Davies & Witte (2000)
Desired and Undesired Behaviour	Barry & Messer (2003)[2]
Behavioural and Academic Behaviour	Harris et al. (2005); Rock & Thead, (2007)

[1]Also inclusive of attention and task engagement
[2] Study involved students self-monitoring target behaviour by answering questions: (a) was I in my seat or where I needed to be to complete my class work? (b) Was I paying attention by working on the assignment or listening to the teacher? (c) did I complete my assignments, (d) did I play or fight with my classmates in the classroom?, and (e) did I talk loudly or make noise in class?

5.6.3.4.2 Goal setting. Goal and associated evaluation components were classified as *performance-based* (i.e., frequency of a target behaviour, or proportion of time spent displaying a target behaviour), and *accuracy-based* (i.e., the degree to which a student's self-recordings matched ratings conducted by an adult). This categorisation was adopted from Briesch and Chafouleas (2009). Current findings show performance goals were most prominent having been used by six of the eight studies including goal setting (i.e., Coogan et al., 2007; Davies & Witte, 2000; Edwards et al., 1995; Rock & Thead, 2007; Salend et al., 1988; Todd et al., 1999). Of the remaining two studies, one utilised an accuracy-based goal (Vance et al., 2012), while the other used both performance and accuracy based goals (Barry & Messer, 2003).

5.6.3.4.3 Target behaviour prompt. Analysis revealed three forms of target behaviour prompts (TBPs) were used to remind students of their target behaviour throughout intervention phases; visual (i.e., pictorial or photographic), verbal, and written prompts.

Rock and Thead's (2007) intervention contained visual representation and reflective self-talk TBPs. A self-monitoring booklet containing photographs of student participants self-modelling desired target behaviour goals was used by Rock and Thread to aid students in differentiating between desired and undesired behaviour throughout intervention. While photos served as continuous TBPs, students were taught to use self-talk to reflect upon behaviour goals; combining visual and verbal TBPs cued students to remember targeted behaviour. Rafferty (2012) used self-monitoring cards and a poster made by the teacher's aide to remind students of targeted behaviour. The poster contained written instruction and visual images depicting processes required to engage in desired on-task behaviour. Processes included: (1) sit up, (2) look at the speaker, (3) answer the questions, (4) note key information and (5) track the talker. The same written processes and images were printed on students' self-monitoring cards, which also served to cue desired behaviour during intervention. Cihak et al. (2010) prompted students to engage in desired behaviour via a slide-show viewed on an electronic handheld device, which functioned as an antecedent TBP. The slide-show accessed contained static-pictures of the student self-modelling task engagement (i.e., writing, reading, watching, and listening to teacher).

In Roberts and Nelson's (1982) study prompt cards containing visual cues were given to students for use throughout intervention to prompt desired on-task behaviour. Prompt cards illustrated a child working on-task paired with a smiling face, and a second off-task child paired with a crossed-out frowny face. Glynn and Thomas (1974) used a two-sided chart presenting written prompts to cue students to engage in quiet attending during teacher instruction (side 1) and active responding during work periods (side 2). This TBP component was presented during the second intervention phase to aid student in differentiating the on-task behaviour required for certain classroom situations. In Coogan et al. (2007) the definition of inappropriate behaviour was written on the classroom board throughout the study. This TBP provided a cue reminding students of the inappropriate behaviour they were trying to reduce.

5.6.3.4.4 Self-management cues. All studies incorporating SM-Cs in the form of audio, tactile, visual, behaviour, or verbal prompts (see Table 5.14). With nine studies utilising audio prompts, this form of cue was most prominent. Audio prompts involve a device emitting short audio tones at specified time intervals to cue self-observation and self-recording. Two studies had students wear tactile prompting devices which delivered self-monitoring cues throughout intervention sessions via discrete vibrations emitted at fixed intervals (i.e., 2-mins).

Two studies incorporated verbal self-management cues (Barry & Messer, 2003; Coogan et al., 2007) where teachers verbally prompted students to monitor their behaviour. The teacher in Barry and Messer's study also pointed to a written prompt schedule on the black board to cue student self-monitoring. Salend et al. (1998) used a package where students' off-task behaviour functioned as the self-monitoring prompt. Students crossed-out a circle on their monitoring card each time they engaged in off-task behaviour. Davies and Witte (2000) used students' behaviour to cue self-monitoring; students self-recorded behaviour each time they caught themselves engaging in inappropriate vocalisation. The teacher recorded behaviour on the group chart if students failed to record behaviour; students were then required to self-report on their individual data sheets. Cihak et al. (2010) used electronic visual prompts to cue self-monitoring. Handheld electronic devices presenting a static-picture slideshow functioned as the self-monitoring prompt; students self-recorded behaviour each time a picture appeared on the device (every 30 seconds).

Table 5.14

Self-Management Prompt/Cue

Type of Prompt	Study
Audio	Edwards et al. (1995); Glynn & Thomas, (1974); Harris et al. (2005); Hughes & Hendrickson, (1987); Moore et al. (2001); Rafferty et al. (2011); Roberts & Nelson, (1982); Rock & Thead, (2007); Todd et al. (1999)
Tactile	Rafferty, (2012); Vance et al. (2012)
Verbal	Barry & Messer (2003); Coogan et al. (2007)
Behaviour (Self-Prompt)	Davies & Witte (2000); Salend et al. (1988)
Visual	Cihak et al. (2010)

5.6.3.4.5 Recording. All studies reported that students engaged in self-monitoring components by using some form of self-recording sheet or card. Self-recording tools are used by students to self-record an observed target or non-target behaviour; this typically involves using a pencil or pen, and a self-recording sheet or card created for the purpose of self-monitoring. Information concerning what self-recording materials looked like was not provided for all reviewed intervention packages; seven studies provided minimal to no descriptive detail concerning the tool used. Conversely, seven studies provided some description of the self-recording tool used, and two studies provided a description and an image of what the tool looked like. This extracted information demonstrates that no two studies made use of the same recording tool (see Table 5.15).

Table 5.15

Self-Recording Materials

Recording Card Description	Study
Self-recording sheet or card (description provided)	Barry & Messer (2003); Cihak et al. (2010); Davies & Witte (2000); Glynn & Thomas, (1974); Rafferty et al. (2011); Roberts & Nelson, (1982); Salend et al. (1988)
Self-recording sheet or card (description and picture provided)	Rafferty, (2012); Rock & Thead, (2007)
Self-recording sheet or card (minimal or no description provided)	Coogan et al. (2007); Edwards et al. (1995); Harris et al. (2005); Hughes & Hendrickson, (1987); Moore et al. (2001); Todd et al. (1999); Vance et al. (2012)

5.6.3.4.6 Consequences-Generalised condition consequence (GCC). Studies applying packages containing GCCs typically had students receive a primary consequence dependent upon the number of tokens or points accumulated or remaining after a session/day. Of the six interventions incorporating GCCs, two embodied principles typical of token-economy strategies, showing that recorded symbols may function as GCCs within self-management interventions. Todd et al. (1999) taught their student to self-record a plus symbol on a self-monitoring card each time he self-observed desired classroom behaviour, and a zero when problem behaviour was self-observed. The student was taught to self-recruit praise each instance he recorded three plus symbols. Glynn and Thomas (1974) similarly taught students to self-record checks for being on-task and had students exchange accumulated checks (secondary reinforcer) for free time (primary reinforcer) following each lesson.

Conversely, three of the six interventions incorporating GCCs embodied response-cost principles (i.e., Coogan et al., 2007; Davies & Witte, 2000; Salend et al., 1988) where students lost points or tokens for displays of certain target behaviour. For example, Salend et al. (1988) had students cross out a circle (token) each time they engaged in off-task behaviour - students were assigned a pre-determined number of circles per session and received a reinforcer if they had any circles remaining at sessions end. The final study including GCCs combined token-economy and response-cost systems. Edwards et al. (1995) implemented an intervention where students earned stickers valued at five-points (reinforcer) after displaying a specified on-task behaviour level, and received a sticker signifying loss of two points (punishment) if they did not display the specified level. In the four aforementioned studies students lost tokens or points each time the undesirable target behaviour occurred during self-management sessions; this process reflects a negative punishment contingency. Following each session or day students earned a reward contingent upon having a certain number of tokens or points; a contingency representative of positive reinforcement.

5.6.3.4.7 Consequences-Primary consequences. The eight intervention packages including primary consequence selection and administration all drew upon principles of positive reinforcement. Participants received rewards, typically after an intervention session or at the end of the day or week, to increase the likelihood of a desired target behaviour. Of the eight packages incorporating consequence components, seven (i.e., Barry & Messer, 2003; Coogan et al., 2007; Davies & Witte, 2000; Edwards et al., 1995; Salend et al., 1988; Todd et al., 1999; Vance et al., 2012) incorporated goal-based contingencies of reinforcement where rewards were delivered upon meeting set behavioural goals. In Glynn and Thomas (1974) the primary reinforcer was delivered contingent upon behaviour self-recordings. In the absence of an explicit behaviour goal, free time was delivered according to how many ‘checks’ (self-recorded points) each student had after each lesson - students with more ‘checks’ were allocated more free time.

Intervention packages applied by Coogan et al. (2007), Davies and Witte (2000), Edwards et al. (1995), Salend et al. (1988), and Todd et al. (1999) delivered reinforcement based upon achieving a performance-based goal or standard. An accuracy-based reinforcement contingency was used by Vance et al. (2012) and involved providing participants with reinforcement on the basis of them accurately reporting their behaviour at least 87.5% of the intervals per session. The intervention package used by Barry and Messer (2003) incorporated accuracy- and performance-based reinforcement contingencies. Further analysis revealed that most studies containing goal-setting and evaluation also contained consequence components. Rock and Thread (2007) was the only study in which a goal-setting and evaluation component was not paired with reinforcement. Table 5.16 shows the type and form of reinforcers applied across the intervention packages incorporating the selection and administration of primary consequence component. Tangible reinforcers were most commonly applied; utilised in seven intervention packages. Activity, edible, and social reinforcers were respectively incorporated in six, five, and four packages.

Table 5.16

Reinforcers

	Reinforcer Physical Properties	Reinforcer Descriptor
Barry & Messer (2003)	Edible, Tangible, Activity	Food, small action figures, preferred activities
Coogan et al. (2007)	Edible, Tangible, Activity, Social	Free time at end of class, time to talk with friends, prize from prize box, candy, extra points on test, free homework pass, game time
Davies & Witte (2000)	Tangible, Activity, Social	Material, social and activity reinforcers
Edwards et al. (1995)	Edible, Tangible, Activity, Social	Range of possible rewards: Computer games, physical activities in gym, time spent with administrative officer who delivered a sticker, playing with blocks, participating in arts center, selecting a special recess snack, playing card games with teacher assistant, food based treat, novelties, scented pencils
Glynn & Thomas (1974)	Activity	Free time in the activity room
Salend et al. (1988)	Edible, Tangible, Activity	Edible, tangible and activity reinforcers
Todd et al. (1999)	Tangible, Social	Teacher praise, stickers and class rewards
Vance et al. (2012)	Edible, Tangible	Lollies, Sports Cards

5.6.3.4.8 Graphing or charting behaviour. Limited detail concerning the processes and materials was provided in the three studies which included graphing/charting in the intervention. Edwards et al. (1995) reported that after each lesson students' earned points were entered on students' wall chart. The chart was used to establish students' on-task behaviour percentage and to determine the type of consequence delivered. Similarly, Moore et al. (2001) reported use of a cumulative bar graph to record the students' tallied number of ticks (based on number of on-task self-recordings) after each intervention session. In Harris et al. (2005)

graphing involved students graphing the number of times “yes” was self-recorded to indicate the number of on-task behaviour self-observations during intervention sessions.

5.6.4 Implementation process and additional intervention details.

5.6.4.1 Additional independent variable elements. Thirteen reviewed studies used self-management interventions in isolation (See Table 5.17). Self-management interventions were classified as ‘isolated’ if they incorporated SMIC-2B components with no other independent variable elements. The three remaining studies incorporated SMIC-2B components in a broader, multi-component package. Cihak et al. (2010) combined self-monitoring components with self-modelling, while Coogan et al. (2007) and Davies and Witte (2000) implemented multi-component packages which paired self-monitoring/-management with group contingencies and peer-feedback or peer-monitoring elements. The two latter studies generally involved groups of students monitoring behaviour and working towards a common outcome together, rather than an individual student.

5.6.4.2 Recording accuracy. Participant self-recording accuracy was measured in seven studies (43.75%) (Barry & Messer, 2003; Edwards et al., 1995; Hughes & Hendrickson, 1987; Rafferty, 2012; Robert & Nelson, 1982; Salend et al., 1998; Vance et al., 2012). Though inconsistencies were observed in the recording accuracy measurement processes utilised across studies, processes typically involved undertaking comparisons and identifying agreements/disagreements between student and teacher recorded data. Recording accuracy results were observed ranging from 71.4-100%.

Table 5.17

Intervention Descriptions

Study	Study Description	Details
Barry, & Messer, 2003	Self-Management	Self-management techniques to monitor academic performance, on-task behaviour and disruptive behaviour.
Cihak, et al., 2010	Self-Monitoring with Self-Modelling	Self-modelling static-picture prompts via a handheld computer to facilitate self-monitoring
Coogan, et al., 2007	Multi-component intervention with Self-Monitoring	Group contingencies including self-monitoring, peer feedback, and the randomisation of reinforcers
Davies & Witte, 2000	Self-Management and Peer Feedback within a Group Contingency	Self-management and peer-monitoring strategies embedded within a group contingency
Edwards, et al., 1995	Self-Management	Self-management of on and off-task behaviour paired with a token system
Glynn & Thomas, 1974	Self-control (aka. Self-Management)	Behavioural self-control procedures composed of self-assessment, self-recording, self-determination, and administration of reinforcement. Behaviour curing involved specifying and prompting for on-task behaviour at certain times.
Harris, et al., 2005	Self-Monitoring	Self-monitoring of attention and self-monitoring of performance
Hughes & Hendrickson, 1987	Self-Monitoring	Self-recording procedure to monitor attention to task
Moore, et al., 2001	Self-Management	Self-management intervention involving self-recording with goal setting
Rafferty, 2012	Self-Monitoring	Self-monitoring strategy (SLANT) plus a tactile prompting. SLANT: (1) Sit Up, (2) Look at the speaker, (3) Answer the question, (4) Note key information, (5) Track the talker.
Rafferty, et al., 2011	Self-Monitoring	Self-monitoring – modified procedures based on the procedures described by Hallahan, Lloyd, Kosiewicz, Kauffman, and Graves (1979)
Roberts, & Nelson, 1982	Self-Monitoring	Self-monitoring of attention and of academic accuracy
Rock & Thead, 2007	Self-Monitoring	Self-monitoring strategy (ACT-REACT); self-monitoring of attention and self-monitoring of performance. ACT-REACT: (1) Articulate you academic and behavioural goals, (2) Create a self-monitoring work-plan to record your academic and behavioural performance, (3) Take pictures of your behavioural goals using self-modelling, (4) Reflect on your academic and behavioural goal attainment after each class, (5) Evaluate your academic and behavioural process over time, and (6) ACT again continuously.
Salend, et al., 1988	Self-Management	Self-managed, free-token, response-cost system OR student-managed response-cost system mediated by free tokens
Todd, et al, 1999	Self-Monitoring	Multi-component package including self-monitoring, self-evaluation and self-recruitment of reinforcement.
Vance, et al., 2012	Self-Monitoring[1]	Study examined the effectiveness of two non-function based interventions: self-monitoring and differential reinforcement of other behaviour (DRO)

[1]Did not classify this as a multi-component intervention as DRO effectiveness was evaluated independently to self-monitoring effectiveness.

5.6.4.3 Feedback. Feedback was incorporated in eight studies in three differing forms: training feedback, self-monitoring accuracy feedback, and behaviour or performance feedback. Four studies provided formative corrective feedback throughout training processes (Davies & Witte, 2000; Hughes & Hendrickson, 1987; Rafferty, 2012; Roberts & Nelson, 1982), while two studies (Edwards et al., 1995; Vance et al., 2012) incorporated *self-monitoring accuracy feedback* (i.e., an adult provides students with feedback regarding monitoring accuracy). After examining students' self-recording sheets Vance et al. provided students feedback via reinforcement delivered contingent upon meeting a set self-recording accuracy criterion. When students' failed to meet criterion, no feedback reinforcement was provided and students were subject to booster training (Vance et al.). Edwards et al. (1995) had the teacher and teacher assistants observe each intervention session to determine if students delivered appropriate consequences after self-observation. Edwards et al. had students compare self-recordings with the teacher assistant following each session, suggesting the accuracy feedback may have been provided.

Four studies referenced use of *behaviour or performance feedback* where an agent delivers feedback regarding students' observed behaviour or performance. Coogan et al. (2007) reported the teacher corrected student inappropriate behaviour (feedback) and instructed students to self-record when inappropriate behaviour was demonstrated, if not done independently. The intervention also incorporated constructive peer behaviour feedback at times (Coogan et al.). Similarly, behaviour feedback was delivered in Davies and Witte's (2000) intervention via (a) the teacher providing participants with corrective behaviour feedback if inappropriate behaviour was demonstrated, and (b) student peers delivering feedback on what was done well and what could be improved upon. Edwards et al. (1995) had students praised (feedback) by an adult at the end of every session for on-task behaviour, while Todd et al. (1999) utilized self-recruited feedback where the student participant requesting performance feedback from the teacher.

Analysis revealed that some form of feedback was actively incorporated in eight of the 16 reviewed studies. According to Hattie and Timperley's (2007) feedback framework, *feedback about the task* was provided in six interventions which involved adults providing students with corrective feedback in relation to self-monitoring recordings and/or behaviour performance. Training feedback or *feedback about the processes underlying tasks* was utilised in four reviewed studies. As self-monitoring is the basis of all self-management strategies *self-regulation feedback* is incidentally inherent within all reviewed interventions. Hattie and Timperley propose this form of feedback involves students monitoring, directing, and regulating their own actions towards a goal or outcome. *Feedback on the self as a person* was not identified in any study.

5.6.4.4 Function-based support. As reported in Chapter 4 two studies conducted functional behavioural assessments (FBA) to determine what maintained participants' target behaviour (Todd et al., 1999; Vance et al., 2012). Both studies conducted functional assessment interviews and direct observations following the guidelines by O'Neill, Horner, Albin, Storey, Sprague, and Newton (1997) (i.e., Functional Assessment Interview and Functional Assessment Observation). Both studies found student behaviour occurred as a function of attention (peer and teacher -Todd et al.; peer – Vance et al.). One study utilised FBA results to design a function-based self-management intervention (Todd et al.).

5.6.4.5 Technology. This analysis involved determining the extent to which technology (i.e., electronic or technological devices) was incorporated in self-management packages and how it was utilised. Twelve studies integrated technology which functioned as prompting devices that cued students self-monitoring. Analysis revealed no form of modern technology was used in any study for self-recording purposes; all packages used classic paper or pencil recording tools of some variety. Seven studies delivered audio cues via a tape player or walkman (Edwards et al., 1995; Glynn & Thomas, 1974; Harris et al., 2005; Hughes & Hendrickson, 1987; Moore et al., 2001; Rafferty et al., 2011; Todd et al., 1999), while two studies used timing devices (i.e., travel alarm clock, Rock & Thead, 2007; kitchen timer, Roberts & Nelson, 1982). Interventions implemented by Rafferty (2012) and Vance et al. (2012) incorporated MotivAiders® intended to function as tactile self-monitoring cues through discrete vibrations. Motivators are small, electronic, pager-like devices which can be set to vibrate on a prescribed schedule (MotivAider, 2000); students are taught to self-record target behaviour each time the Motivator vibrates. In the study conducted by Cihak et al. (2010) self-monitoring was cued via a handheld electronic computer (HP iPAQ Mobile Medial Companion) presenting a static-picture slideshow. Each handheld computer demonstrated a presentation showing photos of students self-modelling task engagement behaviour every 30 s. Students self-recorded target behaviour each time a photo was displayed on the device screen.

5.6.4.6 Implementation agents. Given analysis revealed all intervention packages involved adult-managed intervention elements, further analysis was undertaken to ascertain the roles of classroom teachers. Due to insufficient detail analysis did not ascertain the extent to which teachers and researchers were individually responsible for adult-managed SMIC-2B components and other implementation aspects. For this analysis studies were coded if information explicitly specified teachers were involved in the management of an intervention component or implementation process (See Figure 5.1). The selection and/or referral of student participants (nStudies =10), student intervention training (nStudies = 8) and selection and/or description of problem classroom behaviour (nStudies = 6) were the elements most frequently managed by teachers. Notably, teachers were also commonly involved in the provision of intervention materials (nStudies =5) and the collection of behaviour observation data (nStudies = 5) throughout intervention implementation. Figure 5.1 demonstrates the remaining elements which teachers were involved in. Aside from Coogan et al. (2007) none of the reviewed studies explicitly mention training teacher implementation agents in the process of how to implement self-management strategies in classroom contexts. Conversely, three studies note that teachers were trained in how to undertake the specified observation approaches (Edwards et al., 1995; Rafferty et al., 2011; Rafferty, 2012).

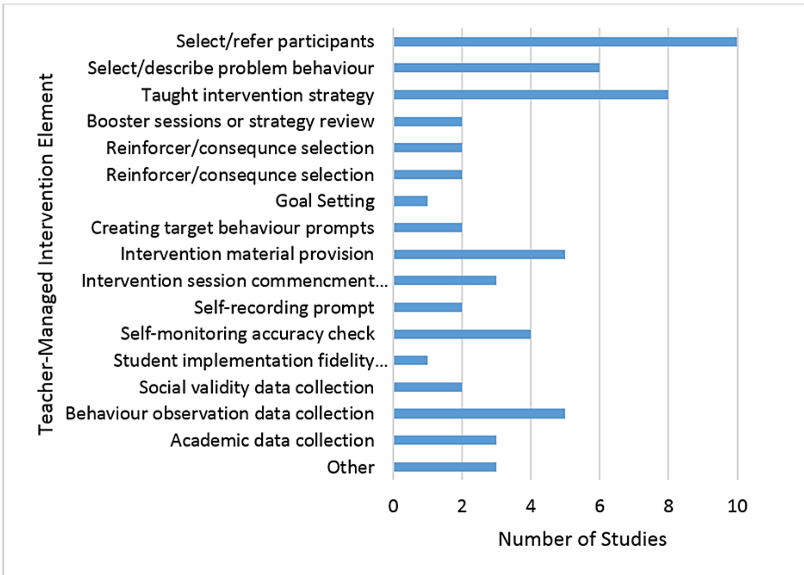

Figure 5.1. Teacher Managed Intervention Elements.

5.6.5 Intervention training procedures. The training procedures used to teach students self-management intervention strategies were described by 14 studies. Two studies did not provide training procedure information (Cihak et al., 2010; Glynn & Thomas, 1974). Of the 14 studies, six reported classroom teachers were responsible for training students, and five indicated training was run by an experimenter, author or researcher. Remaining studies reported training was run by a behaviour support coordinator (Todd et al., 1999), a teacher or study co-author (Rafferty et al., 2011), and a special education teacher or study co-author (Harris et al., 2005). Eleven studies scheduled training sessions after baseline phase, prior to the intervention phase, while one study (Barry & Messer, 2003) conducted training prior to baseline. Of the 14 studies which described training processes two (Harris et al.; Hughes, & Hendrickson, 1987) did not report when training sessions occurred, two studies (Coogan et al., 2007; Davies & White, 2000) did not specify duration, and four studies (Harris et al.; Rafferty et al.; Salend et al., 1988; Vance et al., 2012) did not specify session duration or the number of training sessions conducted. Training varied widely in duration (10 to 60 minutes) and number of sessions (one to multiple sessions over 5-days) across the 10 studies which reported such details; see Table 5.18. Three studies applied formal training programs adopted from published self-management intervention literature (Barry & Messer, 2003; Moore et al., 2001; Rafferty et al.). In addition to initial training sessions, Davies and Witte (2000) reported students were given a “booster session” on the day intervention commenced, and Vance et al. (2012) indicated students were subject to five additional training sessions during the intervention when they did not accurately self-record. Key training details for each study are presented in Table 5.18.

Table 5.18

Self-Management Intervention Key Training Details

Study	Training Procedures Described	Training Agent	Training Scheduling	Training Count and Duration	Notes
Barry, & Messer 2003	Yes	Teacher	Prior to baseline	20-minute training for each student and 1 hour (practice)	Training procedures based on Koegel, et al., 1995.
Cihak, et al. 2010	No	-	-	-	-
Coogan, et al. 2007	Yes	Teacher	Prior to intervention	One-day training session	-
Davies & Witte 2000	Yes	Teacher	After baseline	One training session	Training followed with a "booster session" on the day of intervention
Edwards, et al. 1995	Yes	Teacher	After baseline	Five days; 20-minute practice sessions	-
Glynn & Thomas 1974	No	-	-	-	-
Harris, et al. 2005	Yes	Special education teacher (2nd author)	-	-	-
Hughes & Hendrickson 1987	Yes	Experimenter	-	30-minute session	-
Moore, et al. 2001	Yes	Researcher	After baseline (first day of intervention)	10-minute session (with each student)	Training procedures based on Lloyd, et al., (1996).
Rafferty 2012	Yes	Teacher	After baseline	60 minute instructional session	-
Rafferty, et al. 2011	Yes	Teacher (who was also a co-author)	After baseline	-	Training procedures based on Hallahan, et al., (1979).
Roberts, & Nelson 1982	Yes	Research Assistant	After each students' respective baseline	Two sessions (45 minutes combined)	-
Rock & Thead 2007	Yes	First author	After first baseline	30-minutes, two sessions	-
Salend, et al. 1988	Yes	Teacher	After baseline	-	-
Todd, et al. 1999	Yes	Behavioural support co-ordinator	After baseline	15-minutes, two sessions	-
Vance, et al. 2012	Yes	First author	After Tier 1 baseline	-	Five additional training sessions run during intervention phase when students did not accurately record behaviour

- = absent in article/not detailed

Eleven studies detailing student training procedures introduced participants to the self-management target behaviour, whereas three studies (Edwards et al., 1995; Rock & Thead, 2007; Vance et al., 2012) did not detail how (or if) students were introduced to target behaviour. Five studies stated target behaviour was described or operationally defined to students, while six studies reported behaviour discrimination training occurred. Discrimination training generally involved operationally defining target behaviour, *and* some form of instruction in which students distinguish between target behaviour examples and non-examples. Across the six studies this training involved quizzes (i.e., Davies & Witte, 2000), provision of examples (i.e., Roberts & Nelson, 1982), modelling (i.e., Rafferty et al., 2011), role-play (i.e., Hughes & Hendrickson, 1987), or a combination of the aforementioned (i.e., Salend et al., 1988; Todd et al., 1999). Two studies (Harris et al., 2005; Hughes & Hendrickson) reported training involved discussing the benefits or importance of engaging in target behaviour, and three studies (Hughes & Hendrickson; Salend et al.; Todd et al.) reported students were provided with the opportunity to practice target behaviour.

Of the fourteen studies which introduced students to the self-management intervention, five introduced participants to the self-management procedures and materials (Barry & Messer, 2003; Hughes & Hendrickson, 1987; Rafferty, 2012; Salend et al., 1988; Todd et al., 1999), and two informed students of self-management benefits (Harris et al., 2005; Rafferty, 2012). The remaining studies did not indicate if self-management intervention processes and/or benefits were formally described to students. Eight studies had adult intervention agents model the self-management system to student participants (Barry & Messer; Hughes & Hendrickson; Moore et al., 2001; Rafferty, 2012; Rafferty et al., 2011; Rock & Thead, 2007; Salend et al.; Todd et al.). One study taught student participants to operate the handheld computer used in intervention, but did not indicate how the system itself was introduced and taught to students (Cihak et al., 2010). Five studies did not provide clear details describing training processes, only indicating, with minimal detail, that students were taught the self-management strategy (Davies & Witte, 2000; Edwards et al., 1995; Harris et al., 2005; Roberts & Nelson, 1982; Vance et al., 2012).

Nine of the 14 studies providing training information reported students were given self-management practice opportunities. One study (Rafferty, 2012) reported students were provided guided independent practice opportunities. Five studies detailed active student practice was provided, however did not specify if practice was guided or independent (Barry & Messer, 2003; Edwards et al., 1995; Hughes & Hendrickson, 1987; Moore et al., 2001; Rafferty et al., 2011). Three studies reported practice was undertaken in the form of role-play (Davies & Witte, 2000; Salend et al., 1988; Todd et al., 1999). Corrective feedback was provided to students throughout practice in three studies (Barry & Messer; Hughes & Hendrickson; Rafferty, 2012), and practice mastery criteria were applied in two studies (Edwards et al.; Rafferty et al.). A mastery quiz was utilized in two studies to evaluate students' understanding of target behaviour and intervention system (Coogan et al., 2007; Davies & Witte). No article reported that adult intervention agents informed student participants as to which situations self-management would be implemented. Five studies did not specify whether practice occurred at all (Coogan et al., 2007; Harris et al., 2005; Roberts & Nelson, 1982; Rock & Thead, 2007; Vance et al., 2012). Table 5.19 provides a summary of the intervention processes detailed across reviewed studies.

Table 5.19

Self-Management Intervention Training Details

Study	Training Details						
	Introduce TB[a]	Details	Introduce SM system[b]	Details	Practice Opportunities	Details	No mention of…
Barry, & Messer 2003	X	-Teacher defined and modelled TB -Students requested to described TBs	X	-Teacher modelled self-recording process; -Introduced recording form	X	-Students practiced self-monitoring and received feedback from teacher	- DTr - Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Form of practice (guided vs independent) - Practice mastery assessment and/or criterion
Cihak, et al. 2010	-	-	-	Only specified that participants were taught how to operate the handheld computer utilised	-	-	Did not detail self-management training procedures for student participants or adult intervention facilitators.
Coogan, et al. 2007	X	-Teacher operationally defined TB	X	-Teacher taught strategy via practice and role play	-	-Students completed oral quiz to test understanding of TB and intervention system (required 90% correct)	- DTr - Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Practice opportunities (guided or independent)
Davies & Witte 2000	X	-Teacher operationally defined TB and explained to students -Students completed quiz to measure understanding of TB -Students required to differentiate TB and non-TB (**DTR**)	X	-Teacher taught strategy to students	X	-Students engaged in practice role play using the strategy -Students completed a quiz to assess understanding of TB AND the strategy (required 90% correct)	- Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Teacher modelling SM system - Practice opportunities (independent)

Edwards, et al. 1995	-	-	X	-Teacher taught SM strategy	X	-Students practiced strategy -Students required to engage in accurate recording for three consecutive days (90% accurate)	- Defining TB to students and/or DTr - Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Teacher modelling SM system - Form of practice (guided vs independent)
Glynn & Thomas 1974	-	-	-	-	-	-	Did not detail self-management training procedures for student participants
Harris, et al. 2005	X	-Special ed. teacher discussed importance of TB and defined TB	X	-Special ed. teacher informed students the SM strategy was intended to help them engage in TB -Taught SM strategy	-	-	- DTr - TB practice - Described SM procedures - Teacher modelling SM system - Practice opportunities (guided or independent) - Practice mastery assessment and/or criterion
Hughes & Hendrickson 1987	X	-Experimenter introduced TB (discussed examples and non-examples) -Discussed importance of target behaviour -Students role-played TB examples and non-examples (**DTR**)	X	-Experimenter introduced SM procedure and taught students to use strategy -Experimenter modelled the strategy and answered questions	X	-Students practiced procedure for 15-minutes -Experimenter provided corrective feedback	- Discussing SM systems benefits - Form of practice (guided vs independent) - Practice mastery assessment and/or criterion
Moore, et al. 2001	X	-Researcher defined TB to students	X	-Researcher modelled use of the self-recording sheet to show SM processes	X	-Students practiced strategy -Student understanding of the procedures were checked by observing student practice	- DTr - Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Form of practice (guided vs independent) - Practice mastery criterion

Rafferty 2012	X	-Teacher discussed TB with students	X	-Teacher introduced SM strategy and taught steps -Discussed how the strategy could help engage in TB -Introduced SM devices and materials -Teacher modelled the strategy	X	-Strategy practice (student guided practice opportunities with corrective feedback) -Student independent practice (two sessions)	- DTr - Discussing TB benefits TB practice - Practice mastery assessment and/or criterion
Rafferty, et al. 2011	X	-Teacher defined TB -Modelled examples and non-examples of TB (**DTR**)	X	-Teacher showed how to use in SM	X	-Student verbally described and performed each intervention step -100% accuracy required for three consecutive trials	- Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Teacher modelling SM system - Form of practice (guided vs independent)
Roberts, & Nelson 1982	X	-Assistant provided students with examples and non-examples of TB (**DTR**)	X	-Assistant taught students to use SM strategy	-	-Assistant praised for accurate self-monitoring	- Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Teacher modelling SM system - Practice opportunities (guided or independent) - Practice mastery assessment and/or criterion
Rock & Thead 2007	-	-	X	-First author taught and modelled the steps of the ACT-REACT self-monitoring procedure (Rock, 2005).	-	-	- Defining TB to students and/or DTr - Discussing TB benefits - TB practice - Discussing SM systems benefits - Practice opportunities (guided or independent) - Practice mastery assessment and/or criterion

Salend, et al. 1988	X	-Teachers described TB -Teachers demonstrated examples and non-examples of TB (**DTR**) -Students required to distinguish between examples and non-examples of TB (**DTR**) -Students modelled examples and non-examples of TB (**DTR**) -Proficiency required for distinguishing TB (**DTR**)	X	-Teachers introduced strategy -Teachers explained and demonstrated intervention system -Teachers role played the intervention system	X	-Teachers and students role played the intervention system to evaluate student understanding of TB and the intervention	- Discussing TB benefits - Discussing SM systems benefits - Practice opportunities (independent) - Practice mastery criterion
Todd, et al. 1999	X	-Support co-ordinator trained student to label TB and to discriminate between examples and non-examples of TB via instruction and role-play (**DTR**)	X	-Support co-ordinator taught student to use the strategy via instruction and role-play	X	-Support co-ordinator taught student to use the strategy via instruction and role-play	- Discussing TB benefits - Discussing SM systems benefits - Form of practice (guided vs independent) - Practice mastery assessment and/or criterion
Vance, et al. 2012	-	-	X	-Author trained students SM procedure	-	-	- Defining TB to students and/or DTr - Discussing TB benefits - TB practice - Described SM procedures - Discussing SM systems benefits - Teacher modelling SM system - Practice opportunities (guided or independent) - Practice mastery assessment and/or criterion

X = present in article/details provided, - = absent in article/not detailed

TB = Target Behaviour; DTR = Discrimination Training; SM = Self-Management

[a] Training processes involved introducing students to the behaviour to be self-managed (target behaviour)

[b] Training processes involved introducing students to the self-management process and materials

5.6.6 Social validity. Tables 5.20 and 5.21 respectively present study and aggregated social validity data. Overall nine of the 16 reviewed studies reported social validity data. Across the nine studies 12 reports of social validity data were presented, with some studies reporting multiple forms of data. Seven studies collected subjective evaluation data via questionnaire, ratings scale, or interview measures, four collected anecdotal social validity data, and two obtained social comparison data. Of the studies presenting subjective evaluation data, only three evaluated the social validity domains suggested by Wolf (1978); goals, procedures, and outcomes. One study, presenting anecdotal data, evaluated all domains. Four studies evaluated both procedures and outcomes via subjective evaluation. Six studies had students provide social validity data. Three studies had teachers provide subjective evaluations, while one study had teacher assistants do so. All studies with anecdotal data presented responses provided by teachers.

Regarding social validity evaluation outcomes, the goals, procedures, and outcomes of self-management interventions were generally viewed as important, satisfying, and acceptable. While participants generally liked the intervention procedures used, some studies (i.e., Harris et al., 2005; Rafferty et al., 2011) reported student complaints about the strategy implemented. See Table 5.20 for specific information concerning reported social validity outcomes. In the two studies containing social comparison data, participants′ performance was considered to improve to a level comparable to that of their peers′ performance.

Table 5.20

Social Validity Information: Study Level

Study	Reported	Form	With Whom	Results
Barry & Messer (2003)	No	-	-	-
Cihak et al. (2010)	Yes	Subjective Evaluation (FM)	Teacher; Target Students	- Teachers completed the IRP-15; students completed Likert scale measure - Teacher and student data revealed that the goals, procedures, and outcomes of the self-management intervention were perceived to be important, satisfying and acceptable.
Coogan et al. (2007)	Yes	Anecdotal; Subjective Evaluation (FM)	Teacher; Target Students	- Teachers completed the IRP-15 and students completed the Student Post-Intervention Acceptability and Importance of Effects Survey (Grades four-six) - Teacher data revealed goals, procedures, and outcomes of the intervention were perceived to be important, satisfying and acceptable. Teacher verbalized that she liked the strategy. - Student data revealed intervention procedures were perceived to be moderately acceptable overall.
Davies & Witte (2000)	No	-	-	-
Edwards et al. (1995)	Yes	Subjective Evaluation (FM)	Teacher Assistants; Target Students	- Students reported that self-monitoring was enjoyable, useful, and acceptable in terms of procedures and helped them to work better.
Glynn & Thomas (1974)	No	-	-	-
Harris et al. (2005)	Yes	Anecdotal; Subjective Evaluation (FM)	Target Students	- Students subject to a student interview post intervention to obtain data on perceived efficacy of intervention, preferences and recommendations as well as other feedback. - Students reported that they liked intervention procedures and believed the strategy helped them to stay on-task. Some students criticized the strategy stating it was boring, distracting or ineffective.
Hughes & Hendrickson (1987)	No	-	-	-
Moore et al. (2001)	Yes	Anecdotal	Teacher	- Teacher reported that the intervention was non-invasive and unobtrusive. The teacher also reported overall positive change in target students.

Rafferty (2012)	Yes	Social Comparison	Peers	- Data revealed that target student on-task behaviour increased to levels comparable to comparison peers after the intervention was implemented
Rafferty et al. (2011)	Yes	Anecdotal; Subjective Evaluation (FM); Social Comparison (FM)	Teacher; Target Students; Peers	- Teacher viewed intervention to have satisfying outcomes and acceptable procedures. - Target students indicated intervention helped them pay more attention to work. Students also felt more prepared for tests and thought they scored better after starting intervention. One student felt embarrassed about wearing the headphones and sometimes felt the tones were distracting- but did see intervention value and wanted to continue use in future. - Data revealed the gap between the target students' on-task levels and those of the comparison peers decreased after the intervention was implemented
Roberts, & Nelson (1982)	No	-	-	-
Rock & Thead (2007)	Yes	Subjective Evaluation (FM)	Target students	- Students subject to a student interview post intervention based on Levendoski and Cartledge's (2000) student questionnaires - All students indicated that they liked using the intervention, they thought that they did more work when using it, and they wanted to continue using it.
Salend et al. (1988)	Yes	Subjective Evaluation (FM)	Teacher	- Post intervention 12 elementary teachers observed an intervention demonstration. Teachers were surveyed to determine their perceptions of the effectiveness and feasibility of the strategy - Teachers agreed that the procedures is an effective way to manage behaviour and that they would use the intervention themselves
Todd et al. (1999)	No	-	-	-
Vance et al. (2012)	No	-	-	-

Note. Reported = was social validity data documents; Form = what form of social validity data was collected; From whom = whom provided social validity data; Results = what overall outcomes were obtained from social validity data;
FM = Formal Measure; - = absent in article/not detailed

Table 5.21

Aggregated Social Validity Information

	Frequency	Domains of Social Validation			Consumer		
		Goals	Procedures	Outcomes	Student	Teacher	Other
None-reported	7	-	-	-	-	-	-
Anecdotal	4	1	4	3	-	4	-
Subjective Evaluation	7	3	7	7	6	3	1
Social Comparison	2	-	-	-	-	-	

Other = Teacher Assistant

5.6.7 Procedural fidelity. As noted in Chapter 4, 62.5% (n=10) of the 16 reviewed studies measured some form of procedural fidelity or integrity. Three studies collected procedural fidelity data during training conditions *and* implementation conditions (Barry & Messer, 2003; Cihak et al., 2010; Vance et al., 2012); one study considered fidelity data during training only (Rafferty et al., 2011), and six studies considered fidelity data during intervention conditions (Coogan et al., 2007; Davies & Witte, 2000; Edwards et al., 1995; Hughes & Hendrickson, 1987; Rafferty, 2012; Salend et al., 1988). Table 5.22 presents further fidelity details. Three studies considered data for student training steps, and one study took data for both forms of training steps. Two studies collected implementation fidelity data for both student and adult participants to measure whether all participants implemented the self-management intervention as taught. Five studies reported implementation fidelity data was collected for student-managed procedures, and two studies considered implementation fidelity data for adult-managed procedures. Researchers (n=4), teachers (n=1), or both (n=3) collected fidelity data. Two studies did not specify the agent who collected fidelity data. Procedural fidelity data was often collected via procedural checklists or protocols (n=4); recording accuracy data was collected via use of a recording form in one study. Five studies did not specify the tool used to collect fidelity data. Seven studies yielded some form of treatment fidelity quantitative index (e.g., percentage adherence or accuracy) showing fidelity outcomes were indicative of high fidelity levels, while three studies considered fidelity but did not report any quantitative index.

Table 5.22

Fidelity Data

Study	Fidelity	Agent and Tool	Fidelity Outcome
Barry & Messer (2003)	TF(S), IF(S)	Teacher and Researcher Completed; TNS	Student self-monitoring adherence – students recorded in every intervals (100%); No measure of recording accuracy
Cihak et al. (2010)	TF(S), IF(A)	Teacher and Researcher Completed; TNS	Teacher implementation adherence (100%);
Coogan et al. (2007)	IF(A,S)	ANS; Protocol	Teacher implementation adherence (94%)
Davies & Witte (2000)	TF(A)	Researcher Completed; Checklist	No reported outcome for teacher implementation adherence
Edwards et al. (1995)	IF(S)	Teacher and Researcher Completed; TNS	Most students were reported to self-monitor behaviour accurately; no reported outcome for student implementation adherence
Glynn & Thomas (1974)	-		-
Harris et al. (2005)	-		-
Hughes & Hendrickson (1987)	IF(S)	Researcher Completed; Recording Form	Student self-monitoring accuracy (Average 86.7%; Range 80-100%)
Moore et al. (2001)	-		-
Rafferty (2012)	IF(A,S)	Researcher Completed; Checklists	Student self-monitoring adherence (100%); Student self-monitoring accuracy (71.4-100%); Teacher implementation adherence (100%)
Rafferty et al. (2011)	TF(A,S)	Teacher Completed; Checklists	Students were observed to implement procedures correctly during training
Roberts, & Nelson (1982)	-		-
Rock & Thead (2007)	-		-
Salend et al. (1988)	IF(S)	ANS; TNS	Student intervention adherence and self-monitoring accuracy (Range 0-100; Average 70.6)
Todd et al. (1999)	-		-
Vance et al. (2012)	TF(S), IF(S)	Researcher Completed; TNS	Students training fidelity (min. 85% integrity); Student self-monitoring accuracy (min. 87.5%)

Note Fidelity. TF = training condition fidelity reported; IF = intervention condition fidelity reported; (A) = adult fidelity steps reported; (S) student fidelity steps reported; Q = fidelity quantitative index reported; - = no procedural fidelity data reported

Note Agent and Tool. Specified who collected fidelity data and to tool used. TNS = Tool Not Specified; ANS = Agent Not Specified

5.6.8 Intervention outcomes. Overall, all 16 studies reported some level of target behaviour improvement. A statement of reported intervention outcomes has been presented under the findings column in Chapter 4, Table 1. The meta-analysis results presented in Chapter 4 reflect upon visual analysis and effect size intervention outcomes.

5.6.9 Generalisation and maintenance (fading). Analysis revealed generalization data was collected across seven of the reviewed studies (Barry & Messer, 2003; Cihak et al., 2010; Edwards et al., 1995; Moore et al., 2001; Rafferty, 2012; Rock & Thead, 2007; Todd et al., 1999). *Setting/situation generalization* was considered in three studies (Cihak et al., 2010; Rafferty, 2012; Todd et al. 1999) which investigated if target behaviour change occurred in a generalization setting or situation which differed from the initial intervention setting (Cooper et al., 2007). Here generalization was evaluated by asking students to monitor their behaviour in additional class settings (i.e., Cihak et al.; Todd et al.) or identifying if behaviour change spontaneously occurred in another academic lesson which contained target behaviour prompts (i.e., Rafferty, 2012). Desired target behaviour change occurred in generalization situations and were generally consistent with behavior change in the intervention setting. Fading data or response maintenance data, was collected in five of the reviewed studies (Barry & Messer, 2003; Edwards et al., 1995; Moore et al., 2001; Rock & Thead, 2007; Todd et al., 1999). Response maintenance was typically examined by evaluating the degree to which participants maintain performance of the target behaviour after a portion or all of the intervention components were removed. Fading of self-management processes typically involved the gradual, systematic removal or fading of various intervention elements, such as prompts/cues or self-management materials. For these studies, target behavior levels in fading phases were generally consistent with the behavior levels in the intervention phases. Only Edwards et al. (1995) and Moore et al. (2001) provided response maintenance data following complete intervention removal; both studies demonstrated response maintenance of target behavior over time after the full removal of the self-management intervention.

5.6.10 Moderator outcomes. The results of exploratory analyses undertaken to investigate the influence of target outcomes (i.e., purpose of intervention), participant disability diagnosis and participant grade level variables (potential moderators) on intervention effectiveness are presented in Table 5.23.

Table 5.23

Intervention Component Structure Analysis: Effect Size Results

			PND		SMD		Tau-U			
	*n*Studies	*n*Participants PND/SMD/Tau-U	*M*	*Md*	*M*	*Md*	ES	SE	CI_{95}	$CI_{83.4}$
Overall	16	67/69/70	85.65	95	2.66	2.27	0.86	0.03	0.81-0.91	0.82-0.90
Outcome Category										
Appropriate behaviour increase	11	49/51/52	84.45	100	2.65	2.40	0.84	0.03	0.77-0.91	0.80-0.88
Problem behaviour decrease	2	9/9/9	87.04	95	1.98	2.12	0.93	0.07	0.79-1	0.83-1.00
Combination (increase/decrease)	3	9/9/9	90.81	94.45	3.54	3.37	0.83	0.04	0.75-0.92	0.77-0.86
Kruskal-Wallis			$\chi2$ (2, *n*=67) = .043, *p*=.980 ns, 95% CI [.977, .983]		$\chi2$ (2, *n*=69) = 3.705, *p*=.163 ns, 95% CI [.156, .170]					
Disability Status										
ADHD	7	25/24/25	92.06	100	2.84	2.28	0.87	0.04	0.80-0.95	0.81-0.93
ASD	2	3/3/3	98.33	100	5.78	6.57	0.99	0.15	0.70-1.00	0.78-1.00
EBD/ED	2	5/5/5	97.14	97.14	3.52	4.47	1	0.14	0.80-1.00	0.81-1.00
LD	2	2/2/2	99.54	99.54	3.28	3.38	1	0.13	0.74-1.00	0.82-1.00
TD	7	32/35/35	76.79	80	2.14	1.88	0.79	0.04	0.70-0.87	0.73-0.85
Kruskal-Wallis			$\chi2$ (4, *n*=67) = 13.50, *p*<.01*, 95% CI [.002, .004]		$\chi2$ (4, *n*=69) = 14.20, *p*<.01*, 95% CI [.001, .002]					

Mann-Whitney U			*U*= 289.50, *z*= -3.60, *p*<.001*, 95% CI [.000, .000], *r*=-0.439		*U*= 350.00, *z*= -2.94, *p*<.001*, 95% CI [.002, .0003], *r*=-0.354					
Grade[1]										
Grade 1-grade 2	1	4/4/4	96.43	100	2.98	2.94	1	0.16	0.77-1	0.78-1.00
Grade 2-grade 4	11	31/32/32	85.93	90	2.50	2.36	0.86	0.04	0.78-0.94	0.80-0.92
Grade 5-grade 6	8	27/28/29	81.27	93.33	2.73	2.19	0.81	0.04	0.74-0.88	0.75-0.86
Kruskal-Wallis			$\chi 2$ (2, *n*=62) =1.756, *p*=.427 ^{ns}, 95% CI [.418, .437]		$\chi 2$ (2, *n*=64) =1.513, *p*=.472 ^{ns}, 95% CI [.462, .481]					

*Note. n*Studies =Number of studies which applied intervention packages containing or omitting the specified component/s; *n*Participants= number of participant cases exposed to intervention which contained the indicated component/s (The number of cases differ slightly across effect sizes due to removal of outliers. Estimates represent results after the removal of three PND outliers and one extreme SMD outlier from the data set).

^{ns}= not significant *=significant

[1]Cases from Rock & Thead (2007) were excluded from the year level comparisons no grade level was specified for participants

EBD = emotional and behavioural difficulties; TD = typically developing; LD = learning disability; ASD = autism spectrum disorder; ADHD = attention defici/hyperactivity disorder

5.6.10.1 Target dependent variable outcomes. Outcomes of all three effect sizes revealed self-management outcomes were effective to very effective for interventions targeting appropriate behaviour increases, inappropriate behaviour decreases, or both. PND and SMD analyses show that interventions targeting both outcomes (PND M=90.81%, Md= 94.45%; SMD 3.54) were slightly more effective than interventions targeting either of these outcomes independently. Kruskal-Wallis analyses revealed no statistically significant differences across target behaviour outcomes (i.e., increase appropriate behaviour, decrease inappropriate behaviour, or both) for PND and SMD effects. While the overlap between $CI_{83.4}$ similarity suggest no statistically significant difference, regarding target behaviour outcome, Tau-U outcomes show interventions targeting inappropriate behaviour decreases (0.93, CI_{95} [0.79, 1.00]) were slightly more effective than those targeting other outcomes.

5.6.10.2 Disability diagnosis. Tau-U outcomes suggest that greater self-management outcomes were obtained for students with LD (1, CI_{95} [0.74, 1.00]) and EBD/ED (1, CI_{95} [0.80, 1.00]). PND and SMD outcomes respectively show that LD (PND M=99.54%) and ASD (SMD 5.78) disability categories obtained greatest outcomes. Interestingly, effect analyses revealed self-management was slightly less effective for typically developing students across all three effect metrics (PND M=76.79%, Md= 80%; SMD 2.14; Tau-U ES=0.79, CI_{95} [0.70, 0.87]). Analysis of all three effect sizes revealed self-management outcomes were very effective for students participants diagnosed with ADHD, ASD, LD, and EBD. By comparison typically developing student outcomes were classified as effective (PND) and large (SMD and Tau-U). Kruskal-Wallis tests for PND and SMD revealed a significant difference between disability status categories, while a Mann-Whitney U test revealed a significant difference between typically developing participants and all participants with disabilities. Overlap between $CI_{83.4}$ suggest no significant difference, regarding outcomes across student disability status categories.

5.6.10.3 Grade level. All three effect size metrics indicate that self-management was slightly more effective for Grade 2 students (PND M=96.43%, Md= 100%; SMD 2.98; Tau-U ES = 1, CI_{95} [0.77, 1.00]) than for students in Grades 3/4 students (PND M=85.93%, Md= 90%; SMD 2.50; Tau-U ES = 0.86, CI_{95} [0.78, .94]) and 5/6 students (PND M=81.27%, Md= 93.33%; SMD 2.73; Tau-U ES = 0.81, CI_{95} [0.74, 0.88]). All computed outcomes ranged from effective to very effective across grade levels. Kruskal-Wallis analyses revealed no significant difference between grade level categories for PND and SMD outcomes. The overlap between $CI_{83.4}$ for all three grade categories suggest no statistically significant difference, regarding outcomes across grade level.

5.7 Discussion

This review systematically mapped and analysed a collection of high-quality SCD studies investigating behaviour self-management interventions used by primary school students in general education classroom settings. With the intention of extending past intervention analysis reviews (e.g., Briesch & Chafouleas, 2009; Davis et al., 2016; Fantuzzo and colleagues, 1987, 1988, 1990) this chapter explores self-management intervention composition and implementation processes. Studies were specifically reviewed for intervention structure, management, complexity, implementation procedures, training procedures, social validity, and procedural fidelity. This review also analysed investigated potential moderators of effect size including intervention characteristics, student characteristics, and/or targeted behaviour.

5.7.1 Key findings, results interpretation, and recommendations for future research

5.7.1.1 Intervention component structure, management, and complexity. Consistent with previous review findings the current component analysis revealed minimal consistency across reviewed intervention packages in terms of included components, the degree of student involvement, and the level of complexity.

5.7.1.1.1 Intervention component structure. The current review found no universal self-management intervention package across the 16 studies reviewed. Overall nine package variations were identified across the evidence-base illustrating considerable variability in intervention composition. Current findings reveal no intervention contained all SMIC-2B components, contrasting Fantuzzo and Polite (1990) review findings which identified over 60% of self-management interventions contained all SMIC-2 components. Interestingly, recent reviews show it is increasingly uncommon to identify SCD studies which apply self-management packages containing all SMIC-2 components. Aligning with current review findings (i.e., Briesch & Chafouleas, 2009; Davis et al., 2016) this review shows recent interventions include slightly fewer components on average compared to earlier review findings (i.e., Fantuzzo & Polite, 1990). This suggests that in recent years researchers have become less inclined to implement component-heavy packages to yield effective behaviour change outcomes.

With reference to *core components,* findings in this review suggest school-based self-management interventions are primarily built upon self-monitoring processes as they consistently contain six core components including *target behaviour selection*, *target behaviour definition*, *self-management cue management*, *target behaviour observation*, *target behaviour recording*, and *arranging self-management materials*. Interestingly, little change has occurred in terms of core components over time as Briesch and Chafouleas (2009), Davis et al. (2016), and Fantuzzo and Polite (1990) also identified behaviour selection, behaviour definition, observation, and recording components as core components. Conceptually, this may be explained by the fact that self-monitoring processes are the foundation of existing self-management theoretical perspectives and models (see Chapter 2). Although theories (e.g., Social Cognitive Theory of Self-Regulation; Operant Model; Cognitive-Mediational Theory; Multiple-cuing stimuli model) developed to explain self-management reactivity mechanisms are notably distinct in structure, consistency exists across existing theories in that self-monitoring processes are viewed as critical in producing self-management reactive effects.

At the component level, PND, SMD, and Tau-U effect sizes revealed self-management packages yielded effective to very effective outcomes regardless of non-core component inclusion or omission. No statistically significant difference was evident between packages containing and omitting these components. It is possible that nonsignificant values may have resulted from the small number of studies/cases in the current review. This finding highlights the need for future research in this area. Interestingly, PND outcomes revealed a significant difference between packages including and omitting all three consequence components, with packages containing these components yielding slightly smaller average effect sizes. This finding supports research (e.g., Nelson, Hayes, Spong, Jarrett, & McKnight, 1983; Reid, Trout, & Schartz, 2005; Sheffield & Waller, 2010) which suggests inclusion of consequence components, particular reinforcement, may not be critical in obtaining successful self-management outcomes.

As this study, along with recent research (e.g., Bruhn et al., 2015; Fishley & Bedesem, 2014) presents mixed results regarding the inclusion of consequences/reinforcement, future research should further investigate whether consequence component inclusion greatly improves self-management outcomes, or adds little additional benefit. *Motivating operations* can be investigated as a variable of interest which may account for inconsistent results concerning reinforcement components. As motivating operations are considered environmental variables which may increase or decrease the reinforcing effectiveness of select stimuli, and the frequency of behaviour which has been reinforced by that stimulus (Cooper et al., 2007), it is possible that unidentified motivating operations may unknowingly reduce the effectiveness of selected stimuli as reinforcers.

5.7.1.1.2 Management. Analysis findings reveal truly student-directed self-management interventions are not applied throughout the reviewed school-based SCD literature. Despite the title "self-management", most interventions are classified "primarily adult-managed" as adults are, on average, assigned a greater degree of component management responsibility relative to students self-managers. As possible explanation for this is that the SMIC-2B (Table 5.3) includes both *preparatory* (i.e., required completion pre- or post-session), and *active* (i.e., require completion during session) self-management components. Adults generally assumed responsibility for preparatory components (e.g., behaviour selection and definition, material arrangement), and only occasionally assisted students in active component implementation. Conversely, students were typically assigned greatest responsibility for active core components (e.g., self-management cue, observation, and recording), and rarely assisted adults in preparatory components. Given this pattern, it may be suggested that future research is warranted to closely investigate preparatory elements central to self-management interventions. Such research may consider how students may be supported by adults in assuming greater responsibility and independence for the broader aspects of self-management interventions.

Given the current analyses revealed no significant differences between adult-, joint-, and student-managed intervention outcomes, the findings of this review align with those of Briesch and Chafouleas (2009), who similarly report that the degree of student involvement in self-management interventions does not significantly impact upon intervention outcomes. Although this finding contrasts past review findings which indicate higher levels of student involvement may be associated with greater self-management intervention outcomes (e.g Davis et al. 2016; Fantuzzo & Polite, 1990), it does suggest *no* apparent gains are evident in implementing primarily adult-directed self-management interventions. In light of the mixed findings reported across the self-management literature additional research is required to further investigate the degree of adult and student involvement which is required to yield optimal self-management intervention outcomes. Bearing in mind the intent of self-management interventions is to facilitate greater student independence and behavioural responsibility (Hoff & Sawka-Miller, 2010; Maag, 1999), future research is also warranted to work towards increased use of primarily student-managed self-management interventions.

Mirroring past review findings (e.g., Briesch & Chafouleas, 2009; Davis et al., 2016) component level analysis reveal adults are principally responsible for target behaviour selection, and definition. This finding supports Briesch and Chafouleas' (p. 111) assertion that "students continue to play an insignificant role, as to the *what* and *why* of empirical self-management studies." Current findings further supported past findings in showing adults were predominately responsible for goal-setting, evaluation, target behaviour prompt, and consequence components (i.e., selection and delivery) when incorporated in intervention packages. Expanding upon past findings, this review also demonstrated that adults are largely responsible for self-management materials in all reviewed packages. Further reflecting past review findings, current review findings reveal student participants are primarily responsible for all active self-monitoring components (i.e., self-management cues, observation, and recording). Additionally, students were also predominately responsible for the administration of GCCs and graphing components in the small number of reviewed studies which included these components.

5.7.1.1.3 Complexity. With regard to package structure, most reviewed interventions were considered complex in nature, containing eight or more SMIC-2B elements. Interestingly, findings suggest there may be minimal additional benefit in applying complex self-management interventions, as packages including components beyond the core self-monitoring components may not necessarily yield significantly greater effects. Current results support past review findings (Briesch & Chafouleas, 2009; Davis et al., 2016; Fantuzzo & Polite, 1990; Fishley & Bedesem, 2014) in showing that student-managed, self-monitoring components may form the foundation of effective, basic self-management packages. It may thus be suggested that simple, streamlined packages, primarily comprised of self-monitoring components, are all that is required to effectively improve student behaviour in classrooms.

Findings revealed most complex packages (8+ SMIC-2B components) were also classified as primarily adult-managed packages; seven of the 10 identified complex packages were considered primarily adult-managed. This is possibly due to the elaborate nature of complex intervention packages which may require additional adult assistance, particularly for more complicated intervention elements like goal-setting and consequence components. Further research is needed to determine with greater certainty whether this so. Additional research is also required to investigate whether use of basic self-management packages should be advocated for over complex packages. Such research will be worthwhile as basic interventions not only hold the potential to simplify implementation processes for teachers, but may lead to the development of self-management interventions which may have higher social validity and a greater potential for treatment integrity.

5.7.1.2 Implementation processes and intervention detail. Analysis of training and implementation processes identified no universal approach to applying school-based self-management interventions exits. However, findings revealed some noteworthy results for future consideration.

While most studies effectively applied self-management interventions in isolation, three studies suggest SMIC-2B components can be successfully integrated with self-modelling, group contingency, and peer-feedback or peer-monitoring elements in more elaborate multi-component packages. Though review findings suggest implementation of complex packages may not be required for greater self-management outcomes, research is yet to determine whether self-management components can enhance outcomes of alternative intervention approaches.

Historically, research presents mixed views on the relationship between self-monitoring accuracy and the degree of behavior change. While some researchers suggest recording accuracy is required for desirable behaviour change (Ardoin & Martens, 2004; Baskett, 1985; McDougall, 1996), other researchers argue that effective self-management outcomes are not reliant upon high self-monitoring accuracy (Agran, Sinclair, Apler, Calvin, Wehmeyer, & Hughes, 2005; Hallahan, Lloyd, Kosiewicz, Kauffman, & Graves, 1979). As recording accuracy influence has yet to be firmly established (Bedesem, 2012) it is surprising to find less than half of the reviewed studies investigated self-monitoring accuracy. Interestingly, Harris et al. (2005) intentionally omitted student accuracy measurement due to adopting the view of past researchers (e.g., DuPaul & Stoner, 2002; Hallahan et al. 1983; Hallahan, Lloyd, & Stoller, 1982 as cited in Harris et al., 2005) who claim accurate recording is not required for desired self-management outcomes. This implementation question warrants further attention.

As feedback is considered “one of the most powerful influences of learning and achievement” (Hattie & Timperley, 2007, p. 81), future research should also consider the role of feedback in self-management intervention implementation. One appealing aspect of self-management strategies lies in the belief that students will rely less on teachers for behaviour management purposes once they can self-manage independently. Hattie and Timperley’s (2007) feedback framework suggests students rely less upon adults as they can efficiently obtain self-regulation feedback via self-management processes, and thus require less feedback from external sources (i.e., teachers). While self-regulatory feedback is inherent within self-management strategies, this review shows alternative forms of feedback are minimally, and inconsistently applied across intervention packages. Further research explicitly investigating the role and necessity of *task* and *process feedback* in self-management is warranted, as such feedback holds important implications for training processes, and potentially enhancing students’ understanding and application of self-management strategies. Given that feedback may function as a reinforcement or punishment under certain circumstances (Hattie & Timperley, 2007) it is also important to consider the reinforcing and punishing effect various forms of feedback may have within the context of self-management interventions.

Consistent with past research findings (Bruhn et al., 2015; Mechling, 2007), this review revealed classic recording and prompting devices are often incorporated in self-management packages. Prior to 2010, audio devices commonly functioned as self-monitoring prompts across reviewed studies, while tactile prompting devices (i.e., MotivAiders) and handheld electronic computers were more common in studies conducted in 2010 or after. Interestingly, no modern technology changes were identified with respect to recording tools as all interventions utilised classic paper or pencil recording methods. Advancements in prompt technology may reflect developments made in the broader technology field in recent decades. Given recent prominence of technology in education (Edyburn, 2013) and the promise of technology in self-management strategies (Mechling, 2007), further research investigating the extent to which modern technology can effectively function as self-management assistive technology is needed. Potential benefits of such research are discussed in greater detail in Chapter 6.

Further high-quality research investigating school-based self-management is needed to clearly differentiate the implementation responsibilities of researchers and classroom teachers as the reviewed research has unfortunately failed to provide sufficient detail to ascertain required involvement of key implementation agents. Moreover, reviewed studies provided minimal information regarding how to train teachers in implementation and observation strategies. Given no reviewed study has adequately detailed adult involvement or training processes, the current self-management evidence-base will provide little assistance to novice researchers and teachers in effective self-management intervention replication.

5.7.1.3 Intervention training procedures. Authors across 88% of the reviewed studies acknowledged some form of student self-management training was conducted by teachers or researchers, typically after baseline conditions. Despite variability in structure and processes, training consistently involved (a) introducing students to target behaviours, (b) modelling the self-management strategy, and (c) allowing students to practice the strategy. Some training processes also incorporated feedback and mastery measurement. Though past research suggests self-management involves simple training processes, along with minimal time and resources (i.e., Fishley & Bedesem, 2014; Sheffield & Waller, 2010) this conclusion cannot be confidently drawn in the current review due to varying descriptive detail documented across reviewed studies. In a bid to identify optimal or consistent forms of self-management training in future researchers should clearly document all training processes in detail. In this endeavor researchers are encouraged to consider training tactics proposed by King-Sears (2008), and McDougall (1996).

5.7.1.4 Social validity. Social validity analysis was promising, in that most studies collected social validity data, and documented findings which revealed applied self-management interventions were generally perceived as important, satisfying, and/or acceptable to student participants and teachers involved. This review identified a gap in the evidence-base concerning a lack of consistent and comprehensive social validity evaluation. While findings suggest researchers broadly evaluated social validity goals, procedures, and outcomes validation domains proposed by Wolf (1978) only one study reported on all three domains. Varying forms of social validity data were collected across the reviewed studies.

With the most common form being student participant subjective evaluation, it seems researchers have favored analysis of student participant views over those of adults who facilitate intervention implementation in classroom settings. With only the two most recently published studies (Rafferty et al., 2011; Rafferty, 2012) having reported student behaviour comparison data it is evident that social comparison data has not been frequently used as a means of evaluating social validity in the reviewed studies. Efforts should be made to collect social comparison data, as this form of measurement can determine whether target student behaviour change is considered more (or less) socially acceptable during intervention relative to the typical behaviour of non-targeted students in the applied setting. Overall, researchers are encouraged to investigate domains of social validity more broadly, and to consider the perceptions of *all* intervention users (i.e., students *and* teachers) in order to investigate intervention acceptability and potential barriers to implementation.

5.7.1.5 Procedural fidelity. As noted in Chapter 4, a methodological gap exsits in that less than half of the reviewed studies report any form of procedural fidelity data. This finding lends further support to previous review findings (e.g., Briesch & Chafouleas, 2009; Sheffield & Waller, 2010) which show that more recent self-management intervention literature has yet to consistently evaluate the extent to which interventions are conducted as planned. Current findings show fidelity analysis approaches varied across study procedures evaluated (i.e., training and/or intervention; adult and/or student), who collected data, measurement tools, and the extent to which findings were documented. Lack of consistent fidelity data is concerning as it can lead to questions regarding the extent to which interventions were implemented as specified. As procedural fidelity is a fundamental research element which holds implications for school-based research and practice (Barnett et al., 2014; Cooper et al., 2007; Noell et al., 2014) researchers are encouraged to pay greater attention to this element in future.

5.7.1.6 Generalisation and maintenance (fading). Current findings suggest future self-management investigation require greater focus on generalisation and maintenance as less than half of the reviewed studies presented data on these elements. Only three studies programmed for generalisation across settings, while five studies actively programmed for response maintenance by gradually removing intervention elements from the classroom setting. Given limited generalisation and maintenance analyses in the evidence-base it is difficult to confidently comment on the extent to which students may *generalise* behaviour changes across different settings, and *maintain* behaviour changes over time after interventions have been withdrawn. Despite promising generalisation and maintenance findings, this review reveals additional high-quality research is required to further investigate the use and effectiveness of self-management interventions across school settings and over time.

5.7.1.7 Outcome moderators. An important goal of this research was to investigate whether target behaviour, student disability, or student grade variables influenced intervention effect size outcomes via statistical analysis. Statistical comparison results show effect sizes did not significantly differ across groups based on grade and targeted outcomes. This result, contrasts and supports findings presented by Davis et al. (2016), who identified significant differences across age groups, and no significant differential effects on targeted outcomes in their meta-analysis of self-monitoring interventions for students with ASD in school-based settings. Aligning results regarding target outcomes variables may suggest self-management interventions can result in effective behaviour outcomes irrespective of the behaviour targeted. Conversely, contrasting age/grade findings may be explained by slight variation in student populations and grade/age variable grouping in each review. While this review included primary school students (i.e., Grades 1 to 6), Davis et al. broadly included students of primary and secondary school age (i.e., Pre-kindergarten to Grade 12). Grade/age variable grouping differed as this review grouped students in-line with typical Australian education system grades (i.e., Grade 1 and 2, Grade 3 and 4, Grade 5 and 6), whereas Davis et al. grouped the age variable: pre-kindergarten to Grade 2, Grade 3 to 5, Grade 6 to 12. Davis et al. reported effect sizes were significantly greater for elementary students (i.e., Grade 3 to 5).

In terms of disability status, findings reveal effect sizes significantly differed based on student disability diagnosis. This suggests that self-management interventions may produce greater behaviour outcomes for students with disability diagnoses over typically developing students. Determining why this is the case is difficult at this stage. It is possible that students with disabilities may represent a group of students who receive greater adult support in general education primary settings. Benefits from greater adult support may result in greater training and intervention outcomes. Moreover, students with disabilities may have a greater scope for behaviour improvements.

5.7.2 General limitations. Four key limitations exist in this current review. The first limitation concerns unclear and/or intermittent omission of information required to comprehensively code all analysed variables across the reviewed studies. Inter-study reporting variation, writing style, and scientific journal text limits may account for inconsistent and/or limited reporting of details pertaining to variables coded and analysed in this review. Unfortunately, this limitation restricted exhaustive coding and analysis of descriptive information (e.g., setting details, lesson format), degree of management, and implementation and training process (e.g., who was responsible, what was involved) variables across some reviewed studies. Further school-based research may consider the analysis and coding framework detailed in Table 5.2 when determining what intervention aspects, design elements and implementation features to detail in their final reports.

The second limitation relates to SCD effect size computations. Although SCD effect metrics PND, SMD, and Tau-U were justified for use within the triangulation analysis used in this review, each metric holds unique, well-known limitations. As full review of each metric along with associated strengths and weaknesses is beyond the scope of this review, readers are referred to the following articles: Franco and Olive (2008), Gage and Lewis (2012); Parker, Vannest & Davis (2011), Parker et al. (2011), Rakap (2015), and Vannest and Ninci (2015). Future research should continue to investigate SCD effect size metrics, in an effort to resolve enduring SCD effect size limitations which have long plagued this area of research.

The third limitation concerns the collection of interobserver agreement (IOA) data. As noted in Chapter 4 percentage agreement IOA data was collected for study inclusion processes, quality appraisal processes, and PND effect size computation. Although, additional IOA data was collected in this chapter for SMIC-2B component coding, and effect size computation (SMD), IOA data was not collected for all coded variables. As such, researchers are encouraged to plan for collection of adequate IOA data for all coding and analytic processes in future meta-analytic reviews. Given the pace at which SCD research is published, the final limitation relates to the publication dates of reviewed studies. As the reviewed studies were all identified in April 2014, and were published 2012 or earlier, the collection of literature may be considered outdated when this PhD is reviewed in 2017. Despite the aforementioned limitations, current review findings have solid implications for implementing and research self-management interventions in future.

5.7.3 Implications and conclusion. Although findings of this review reveal minimal uniformity across intervention structure, management, and complexity, the findings hold implications for future applied research and practice.

At the intervention level, future research should continue to broadly investigate core SMIC-2B components which may form the basis of school-based self-management intervention packages. Such research will aid in the advancement of broad self-management intervention structure investigations to more refined analysis of optimal, parsimonious self-management package applications. Investigations should consider preparatory and active core components when endeavoring to construct future self-management packages. Three identified core components (i.e., behaviour selection, behaviour definition, material arrangement) may be considered preparatory elements in that they require completion pre-intervention and/or pre-intervention sessions. Conversely, three identified core components (i.e., self-management cue, observation, and recording) may be considered active components as they require participants to actively engage in self-monitoring processes. While self-management strategies can incorporate an array of SMIC-2B components, this review supports past research in showing active self-monitoring components are inherent within self-management strategies (Briesch & Chafouleas, 2009; Bruhn et al., 2015; Davis et al., 2016; Sheffield & Waller, 2010; Southhall & Gast, 2011). This finding suggests having students actively engaged in self-observation and self-recording is fundamental to self-management.

Though, some reviewed studies effectively implemented complex or primarily adult-managed self-management intervention packages, current findings reveal little to no additional benefit in using elaborate packages with high adult-involvement. Considering the varied nature of reviewed self-management intervention packages, no firm recommendations can be made regarding the value of including or omitting non-core SMIC-2B components. Thus, future researchers are encouraged to conduct further research on intervention structure via systematic SCD studies investigating individual component inclusion and management responsibility (e.g., Finn et al., 2015). Given the ideal of having students independently self-manage, future research investigating ways to reducing adult involvement in self-management strategies is warranted. Current findings suggested *basic self-management packages*, comprised primarily of *student-directed core components*, can be effectively implemented within general education classroom settings to bring about positive behaviour change. Results of this review also suggest that reducing the number of included components may also reduce the level of adult-involvement in self-management intervention packages. Thus, researchers and education professionals may effectively apply packages comprised principally of self-monitoring core components in an effort to keep packages uncomplicated and primarily student-directed.

The *research-practice gap* has long seen researchers encouraged to publish interventions studies, along with recommendations and guidelines detailing how to implement evidence-based interventions effectively in everyday practice (Cook & Odom, 2013; Fixsen, Blase, Naoom, & Wallace, 2009; Forman et al., 2013; Kratochwill & Shernoff, 2003). Unfortunately, firm conclusions concerning optimal self-management implementation and training procedures cannot be offered based upon the reviewed evidence-base. Given implementation and training processes vary substantially in terms of detail documented in the reviewed studies, this may prove a barrier to those wanting to expand this research area or implement strategies in practice. Current review findings suggest future research efforts should target applications of streamlined self-management intervention implementation and training guidelines.

5.7.4 Proposed research agenda for self-management research in primary school settings. Conducting further high-quality SCD research investigating school-based self-management interventions may prove valuable for developing streamlined primarily student-directed self-management strategies which can effectively improve student behaviour *and* actually reduce behaviour management demands placed on teachers in classroom settings. Furthermore, continued research in this area may aid the development of self-management intervention implementation and training guidelines for researchers and practitioners. Future researchers may consider to proposed research agenda to follow in efforts to develop simple, primarily student-driven self-management packages which may enable students to manage their behaviour independently in general education classroom contexts. Based on current findings, future research should endeavor to investigate:

1. Applications of basic packages containing the six identified core components with minimal additional components (i.e., 7 or less SMIC-2B components in total).
2. Applications of basic packages which are primarily student-directed. Such research should aim to allow students greater responsibility in *preparatory core components.*

3. The necessity of non-core SMIC-2B components which have been minimally included across the reviewed evidence-base (i.e., target behaviour prompts and graphing or charting).
4. The necessity of non-core SMIC-2B components in isolation or in combination with other intervention components. In particular systematic investigation should consider if self-management interventions continue to be effective if consequence-based components are consistently omitted from packages.
5. The influence of student recording accuracy on intervention outcomes.
6. The role feedback plays in enhancing training and intervention outcomes.
7. The extent to which technology may enhance self-management interventions.
8. The extent to which self-management interventions can be implemented with accuracy.
9. Self-management training methods, considering duration, resources, and trainer skills, with the aim of developing optimal training procedures which may consistently be applied across research and practice applications.
10. Generalisation and maintenance effects of self-management interventions

Chapter 6: Methodology Narrative- Self-Management Intervention

The purpose of this chapter is to outline how this PhD endeavoured to expand and advance upon the published high-quality self-management literature. This chapter aims to introduce a novel self-management strategy designed with the intent of: (a) extending the evidence-base reviewed in Section 2 (Chapters 4 and 5), and (b) modernising traditional self-management such that it may become increasingly relevant and socially acceptable for modern, 21st century classroom settings. It begins with a statement of intention, a rationale for further self-management research, and an overview of a self-management intervention package to be investigated in this PhD. Next, this chapter presents a brief review of literature investigating technology-supported self-management, followed by an introduction of a *novel technology-based self-management intervention strategy.* Findings from the reviews (Chapters 4 and 5), along with literature reporting self-management technology advancements (reviewed in this chapter), have informed the technology-supported self-management intervention package, outlined in this chapter, and piloted in Chapter 7. This chapter offers a detailed implementation framework developed to guide researchers and education professionals through intervention training and implementation processes for the proposed technology-based strategy and describes how researcher-teacher collaboration was used to develop and apply the technology-based self-management strategy piloted in Chapter 7.

6.1 Expanding the self-management intervention evidence-base

A systematic review of existing research evidence (Study 1, Chapter 4), and intervention structure and implementation processes (Study 2, Chapter 5), revealed notable limitations and gaps in published high-quality SCD literature investigating self-management interventions in general education settings. As such, further *high-quality* SCD research investigating self-management interventions targeting the problem behaviour of primary students in general education classroom settings is warranted to address shortfalls and to further strengthen the evidence-base. Figure 6.1 details specific features in need of attention in future research.

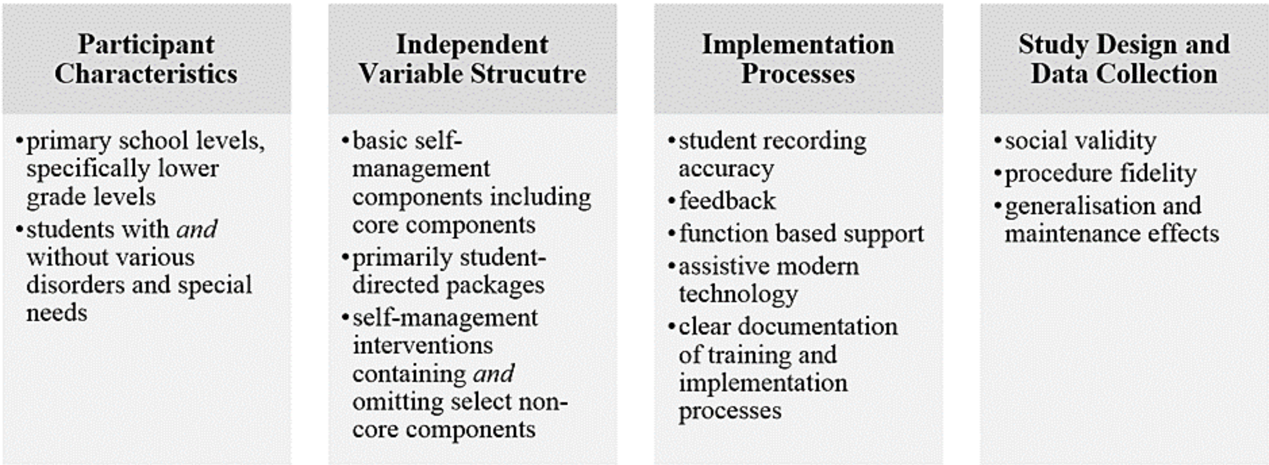

Figure 6.1. Evidence shortfalls to be addressed in future research

Figure 6.1 shows further high-quality evidence is needed to investigate effects of self-management interventions targeting students across primary grade levels, specifically in *lower* primary grade, and disability sub-categories. Despite an abundance of research on self-management exploring a range of differently structured packages, Chapter 5 findings reveal simple, primarily student-directed self-management interventions are infrequently investigated in published literature. Given Chapter 5 results suggest *basic* self-management packages may be as effective as *complex* packages, and the prominent amount of *adult-directed* self-management packages evident throughout the reviewed literature, further research investigating the effects of basic, primarily *student-directed* self-management packages is warranted. In terms of implementation processes, future research should consider student recording accuracy, behaviour feedback, behaviour function, assistive modern technology, and documenting clear training and implementation procedures, as these elements have been largely overlooked or inconsistently considered in the evidence-base. Furthermore, future SCD research methodology should assess social validity, procedure fidelity, and generalisation and maintenance effects, as these research elements have not been consistently incorporated.

This chapter introduces a customised self-management intervention package designed to address the *independent variable structure* and some *implementation process* shortfalls. Efforts to address *participant* and *study design/data collection* shortfalls are detailed in the Chapter 7 pilot intervention study.

6.1.1 Keeping it simple and student-directed! A major appeal of self-management interventions lies in the idea that student-users can become independent, self-reliant, self-regulated individuals who exert responsibility over their *own* behaviour management (Bruhn, Vogelgesang, Schabilion, Waller, & Fernando, 2015; Fishley & Bedesem, 2014; McDougall, Morrison, & Awana, 2012; Wilkinson, 2008). Moreover, such interventions are thought to be simple to implement, not resource intensive, and less invasive than other teacher-managed interventions (Briesch & Chafouleas, 2009; Fishley & Bedesem, 2014; Rafferty, 2010). Interestingly, the SMIC-2B component analysis in Chapter 5 suggests that students may not always play a significant role in the implementation of self-management interventions in primary school classroom settings, as reviewed intervention packages were often heavily adult-managed and quite complex. This finding aligns with those of previous self-management reviews (Briesch & Chafouleas, 2009; Fantuzzo & Polite, 1990) which have similarly identified that adults play a notable role in the implementation of self-management interventions. In light of this, I endeavoured to advance the existing evidence-base by investigating a *basic, student-directed* self-management package comprised primarily of *core self-management components* (as identified in Chapter 5).

Figure 6.2 shows the self-management package designed to actively assign greater behaviour management responsibility to student-users such that they may become principal agents of their own behaviour change. According to SMIC-2B coding conventions, the proposed intervention package is considered *basic* and *primarily student-managed* as it contains seven self-management components, and largely places management responsibility on student users. As demonstrated in Figure 6.2 student participants are responsible for the management of four components; whereas adult involvement is required for three components. *Non-core* SMIC-2B components, were omitted from the proposed package on the basis that they were predominately adult-managed throughout the reviewed evidence-base.

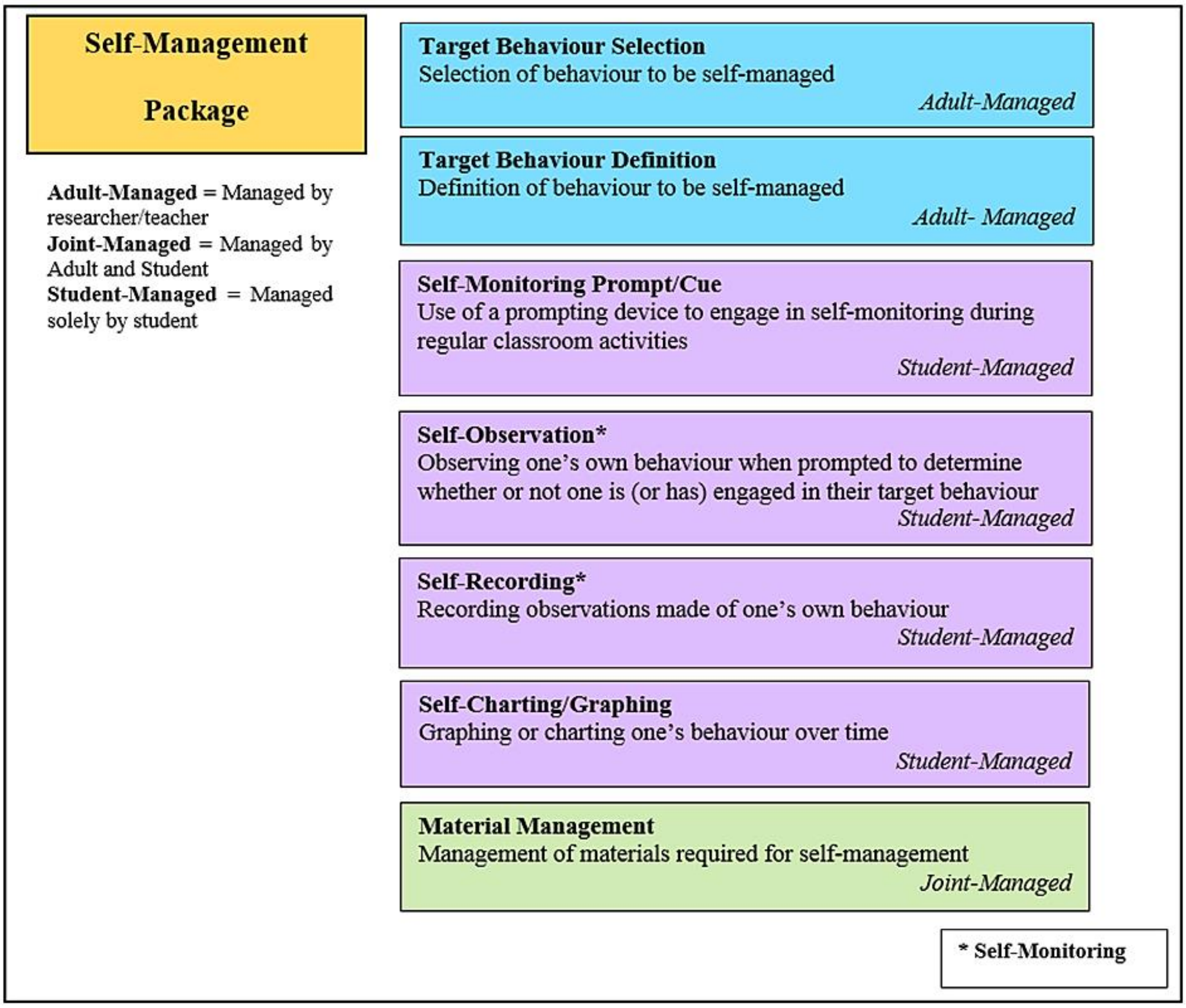

Figure 6.2. Self-management intervention package: Components and participant involvement
Adopted from Rafferty (2010) – incorporating information from Cooper et al., (2007); King-Sears & Carpenter (1997); Maag (1999)

Omission of non-core SMIC-2B components was justified as Chapter 5 effect analyses and past research findings suggest use of consequence/reinforcement components (e.g., Amato-Zech, Hoff, & Doepke, 2006; Fishley & Bedesem, 2014; Nelson, Hayes, Spong, Jarrett, & McKnight, 1983; Reid, Trout, & Schartz, 2005; Sheffield & Waller, 2010) and goal-setting components (e.g., Lee & Tindal, 1994; Moore, Prebble, Robertson, Waetford, & Anderson, 2001; Sagotsky, Patterson, & Lepper, 1978) may not be vital for positive behaviour gains as *little* to *no* additional benefit would likely occur from inclusion of these components. The proposed intervention package aligns with past literature which suggests successful self-management, at the most basic level, is founded on self-monitoring strategies, where students are simply taught to observe and record their own behaviour when prompted (Briesch & Daniels, 2013; Bruhn, McDaniel, & Kreigh, 2015; Sheffield & Waller, 2010). In light of the factors which have been linked to teachers' decisions to use intervention in education settings (i.e., acceptability, effectiveness, time and resources required, theoretical orientation of intervention, and ecological intrusiveness) (Mitchem & Young, 2001; Witt, 1986) simple, uncomplicated self-monitoring based packages, such as the one proposed here, may be attractive.

6.1.1.1 Why include graphing? Graphing (or charting), the only *non-core component* in the proposed intervention package, was included as self-graphing enables active student involvement in the evaluation of their own progress (Briesch & Chafouleas, 2009; Finn, Ramasamy, Dukes, & Scott, 2015; Rankin & Reid, 1995). Research suggests the addition a self-graphing component can result in slight behavioural improvements beyond those achieved from basic self-monitoring packages (e.g., DiGangi, Maag, & Rutherford, 1991; Finn et al., 2015), and can provide students with immediate feedback, which may be reinforcing and/or motivating (Anderson & Wheldall, 2004; Bruhn, McDaniel et al., 2015; Bruhn, Vogelgesang et al., 2015; Menzies, Lane, & Lee, 2009). Yet, an evident need for further research on self-management incorporating student-managed graphing elements exists as Chapter 5 revealed only three of the 16 studies reviewed investigated interventions incorporated a self-graphing component.

6.2 Self-Management and Technology: A Review of Literature

Self-management interventions incorporate a wide range of prompting mechanisms (e.g., visual, tactile, auditory prompts) which cue self-managing individuals to observe and record their behaviour utilising self-monitoring tools (e.g., paper and pencil, wrist counters, tally counter) (Bedesem & Dieker, 2013; Bruhn, McDaniel et al., 2015; Joseph & Konrad, 2009; Mechling, 2007). Historically, self-management research has largely investigated interventions which rely on overt audio self-monitoring prompts emitted from various devices (e.g., timers, stopwatches, tape players, and walkmen), and classic paper and pencil recording systems (Bruhn, McDaniel et al., 2015; Mechling, 2007). Unfortunately, these time-honoured self-management tools are often associated with low social validity as they are considered impractical, obtrusive, disruptive, restrictive and/or socially distracting in modern general education contexts (Amato-Zech et al., 2006; Crutchfield, Mason, Chambers, Wills, & Mason, 2014; Finn et al., 2015; Rosenbloom, Mason, Wills, & Mason, 2016). In class settings audio prompts and paper or pencil recording tools can be particularly distracting to peers, perceived as stigmatizing or aversive to student users, difficult to use in situations where students need to move freely around class (e.g., may hinder free movement), cumbersome for adult facilitators to organise, and/or difficult to keep track of (Amato-Zech et al., 2006; Briesch & Daniels, 2013).

Modern technological developments have been embraced by researchers in recent efforts to eliminate use of cumbersome paper or pencil recording methods *and* distracting audio-cues in self-management interventions (Bruhn, McDaniel et al., 2015; Mechling, 2007). Emerging research has focused largely on exploring alternative technology-based devices, or assistive technology devices, which support prompting and/or recording for self-monitoring. *Assistive technology devices* have been defined by the Individuals With Disabilities Education Improvement Act (IDEA, 2004) as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customised, that is used to increase, maintain, or improve the functional capabilities of a child with a disability" (20 U.S.C. 1401). For this PhD assistive technology, as a self-management tool, is more broadly defined as any technology device or application used to support self-management processes with the intent of simplifying implementation procedures, and enhancing behavioural outcomes of students with and without disabilities in all educational settings. Modern innovations in high-tech handheld technology has researchers investigating the potential of self-management strategies incorporating tablets, cell phones, and iPad devices which serve to function as efficient, user-friendly, discrete, minimally obtrusive, flexible, and automated prompting *and* recording devices (Bruhn, McDaniel et al., 2015; Mechling, 2007).

6.2.1 Technology supported self-monitoring prompts. This section reviews research conducted in the past two decades, investigating various visual- and tactile-prompts for self-monitoring incorporated in school-based behaviour self-management.

6.2.1.1 Visual-prompts. Using a self-monitoring/self-modelling intervention incorporating a handheld computer (HP iPAQ Mobile Media Companion) displaying static-picture prompts Cihak, Wright, & Ayres (2010) successfully increased task engagement for three middle-school students diagnosed with ASD, and decreased teacher directed prompts in a general education setting. Handheld computers, loaded with a PowerPoint presentation containing photos of student participants self-modelling task-engagement behaviours (i.e., writing, reading, and watching and listening), were used to cue paper-based self-monitoring of academic engagement - every 30-sec students observed and recorded “yes” or “no” to indicate if they were demonstrating task engagement. This intervention was viewed as socially acceptable by both students and teachers.

6.1.1.2 Tactile-prompts. A tactile-cuing device often utilised throughout the self-management literature, is the MotivAider (MotivAider ®[12]; MotivAider, 2000). The MotivAider is an electronic pager-like device that provides silent vibration prompts on a programmed interval schedule. A number of studies (Amato-Zech et al., 2006; Boswell, Knight, & Spriggs, 2013; Legge, DeBar, & Alber-Morgan, 2010) used self-monitoring with MotivAider prompts to improve on-task behaviour with diverse student populations presenting with various special needs. All three studies were conducted in special education classrooms. More recently, Briesch and Daniels (2013) extended these promising findings to a general education setting, showing that three typically developing middle-school students improved on-task behaviour through MotivAider-cued self-monitoring.

Another tactile prompting device evident in the self-management literature is the WatchMinder (WatchMinder®[13]), a digital wristwatch that vibrates at pre-selected fixed or random intervals. WatchMinders may also function as visual prompting devices, displaying pre-selected messages on the watch-face each interval. Anderson and Wheldall (2003) established the effectiveness of tactile-cued self-monitoring with WatchMinders to improve on-task behaviour for three primary school students with various disabilities. Along with programing WatchMinders to emit vibration prompts, Anderson and Wheldall also set the watches to display visual prompts (i.e., “PAY ATTN”) each interval. Similarly, Finn et al. (2015) used WatchMinder-cued self-monitoring to successfully increase on-task behaviour for four elementary students with ASD and language impairments. Both studies were conducted in special education settings.

In the aforementioned studies, students used MotivAiders or WatchMinders as a tactile-cue, set to vibrate on interval-schedules, cuing students to self-monitor and record if

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[12] http://habitchange.com/
[13] http://www.watchminder.com/

they were on-task, working, or paying attention each interval. These studies consistently reported tactile-prompted self-monitoring was effective in improving student on-task behaviour, and MotivAider and WatchMinder devices were effective in cuing students to self-monitor. In addition, tactile-cued self-management strategies were viewed as highly socially valid by teacher and student participants: acceptable, easy to use, student-friendly, manageable, discrete, and perceived as non-intrusive by student users (Amato-Zech et al., 2006; Anderson & Wheldall, 2003; Boswell et al., 2013; Finn et al., 2015; Legge et al., 2010). Authors broadly suggest tactile-cuing technology may be particularly feasible for inclusive *and* general education given that such devices are easily portable, and can deliver discrete vibration prompts (Amato-Zech et al., 2006; Finn et al., 2015; Legge et al., 2010).

6.2.2 Research gap… Although visual and tactile prompt device studies have demonstrated promising use of such technology to address audio prompt barriers, the aforementioned studies all required students to self-record behaviour using paper or pencil tools. In a review of self-monitoring studies published from 2000 to 2012, Bruhn McDaniel et al., (2015) reported that 22 of the 41 SCD studies reviewed, incorporated some form of technology to prompt self-monitoring, while, only two studies made use of technology for recording. These findings show that while an emerging literature base is considering the use of technology-supported prompts, basic paper-pencil recording tools remain the cornerstone of self-recording.

6.2.3 All-inclusive self-management assistive technologies. In a new wave of investigation, researchers focus on investigating *all-inclusive self-management assistive technologies* which function to support *both* prompting *and* recording aspects of self-management. Assistive technology of this nature may offer a socially valid efficient, practical, unobtrusive, discrete, and automated tool for collecting data and monitoring intervention progress, contrasting paper-based self-monitoring that require manual data collection and analysis (Crutchfield et al., 2014; Rosenbloom et al., 2016; Vogelgesang, Bruhn, Coghill-Behrends, Kern, & Troughton, 2016). To date, at least four self-management interventions involving innovative all-inclusive assistive prompting and recording technology have been investigated. Table 6.1 presents an overview of the four assistive technologies, and is followed by a review of SCD literature investigating use of this technology.

6.2.3.1 Handheld computer self-management. In 2008, Gulchak demonstrated successful self-management incorporating a handheld computer to improve on-task behaviour for a primary school student with emotional behavioural disorder in a self-contained school classroom. Following an audible (chime) prompt emitted by the computer every 10-minutes, the student self-recorded on the device whether he was on-task or not using self-monitoring forms displayed on screen. At the end of each intervention session, the student evaluated a recorded data summary accessed on the handheld computer, and graphed data onto a spreadsheet to keep track of progress. A functional relation was established between the intervention and behaviour, with on-task behaviour improving from a mean of 67% at baseline to 94% during intervention.

6.2.3.2 CellF-Monitoring. Bedesem (2012) investigated the effects of an innovative self-monitoring procedure utilising cell-phones - *CellF-Monitoring*. The CellF-Monitoring strategy (Bedesem, 2012), involves students receiving *self-monitoring cues* via text message (i.e., “are you on task?”), which prompt students to *observe* their behaviour and *record* (1 for “Yes” or 2 for “No”) via text message responding to text cues. Text messages are sent to students at fixed intervals and exchanged via private Twitter accounts. Bedesem established a functional relationship between CellF-Monitoring and behaviour for two middle school students receiving special education services in an inclusive setting. Both participants demonstrated notable improvements in on-task behaviour during intervention with increases of 36% and 32% for Participants 1 and 2’s respectively. Social validity data show teachers “liked the intervention procedures and did not view the intervention device as a distraction to the student participants or their peers” (Bedesem, 2012, p. 41). Moreover, students “liked the CellF-Monitoring procedure and it helped them stay on-task” (p. 41).

Table 6.1

All-Inclusive Self-Management Assistive Technologies

	Handheld computer self-management	**CellF-Monitoring**	**SCORE IT**	**I-Connect**
Study Authors	Gulchak, 2008*	Bedesem, 2012*	Bruhn, Vogelgesang et al., 2015*; Vogelgesang et al., 2016	Wills & Mason, 2014*; Crutchfield et al., 2014; Rosenbloom et al., 2016
Intervention Description	Self-monitoring strategy using a handheld computer	Self-monitoring strategy incorporating a cell phone	Self-monitoring using a non-commercial app for self-monitoring	Self-monitoring using an android-compatible self-monitoring application for handheld tablets and cell-phones
Device	Palm Zire 72 handheld computers running PalmOS v5.2.5	Cell Phone (Virgin Mobile Kyocera Jax)	Apple iPad	Samsung Galaxy Tablet; Samsung Galaxy Smartphone
App/Software	HanDBase	Twitter Messaging HootSuite	SCORE IT^	I-Connect^
Self-Management Features	**Prompt:** Handheld computer delivered audio prompt - device calendar programed to emit alarm (chime) on an fixed interval schedule Audio Prompt	**Prompt**: Cell phone delivered text messages prompts [TWEETS] programed for fixed interval delivery via Twitter accounts. Visual/Tactile Prompt	**Prompt**: iPad delivered audio cue (three beeps) via the app on a fixed interval schedule Audio Prompt See Note 1	**Prompt**: Tablet or smartphone delivered text cues via the app on a fixed interval schedule. Application offers flashing screen (visual), chime tone (audio) or vibration (tactile) prompt options. Visual/Audio/Tactile Prompt
	Recording Tool: HanDBase software used to create custom self-monitoring forms. Students self-recorded the occurrence or non-occurrence of a target behaviour using the custom made forms on the handheld computer	**Recording Tool**: Students self-recorded the occurrence (1=Yes) or non-occurrence (2=No) of a target behaviour using the cell phone text message function.	**Recording Tool**: Students self-recorded whether their behaviour met class expectations (0 = never, 1 = a little, 2 = sometimes, 3 = a lot, and 4 = always) on the SCORE IT app when prompted.	**Recording**: Students self-recorded whether they were engaged in target behaviour ("yes") or not ("no") via the I-Connect app on the device.

	Other: Student evaluated recorded data summarising the number of on-task intervals recorded. Data was then graphed onto a spreadsheet to keep track of progress.		**Other:** - SCORE IT allows teachers to rate student behaviour following student rating. The app allows student and teacher ratings to be viewed concurrently, providing an opportunity for teachers to provide behaviour feedback. - SCORE IT automatically derives a Percentage of Positive Behaviour (PPB) for student users following each session - SCORE IT allows users to enter a daily PPB goal - Following sessions users can view a graph on SCORE IT to determine whether their PPB has met their gaily goal. This feature may be used as a criteria for reinforcement	**Other:** I-Connect self-management intervention package can involve I-Connect being used in conjunction with a school-based mentor who meets weekly with students to review monitoring of target behaviour.
Usage	Student keep handheld computer at desk	Did not specify where the cell-phone was kept for intervention	Bruhn, Vogelgesang et al. (2015) – students initially left seat to self-monitor using SCORE IT. This was deemed distracting, thus tablets were placed within reach of students mid-way through intervention.	Students kept devices on their desk or workspace during intervention in all studies
Technology Features	- Recorded information saved automatically. - Students can run report on handheld computer which summarises on-task behaviour intervals	Intervention programed via Twitter Social Media accounts (managed on third party application – HootSuite).	- Intervention programed via SCORE IT app - Stores all data so it can be reviewed at later date	Application data sent to a secure password protected database via a wireless network

*Strategy developers

^Purpose designed self-monitoring apps

Note 1: Bruhn, Vogelgesang et al. (2015) did not make use of the prompting feature, having students self-record at the end of each lesson

6.2.3.3 SCORE IT. More recently, Bruhn, Vogelgesang et al. (2015) and Vogelgesang et al., (2016) investigated a non-commercial iPad self-monitoring application -SCORE IT. SCORE IT interventions (Bruhn, Goin, & Hasselbring, 2013) involve students using a self-management intervention incorporating the SCORE IT app on an Apple iPad to monitor, record, and evaluate classroom behaviour (i.e., Be Ready, Be Respectful, Be Responsible). Bruhn, Vogelgesang et al. had students self-record using SCORE IT after each 20-min instructional session, while Vogelgesang et al., opted to have students record following audio prompts (three beeps) emitted from SCORE IT (every 10-min). Both interventions had students rate the extent to which they perceived their behaviour as having met classroom expectations on the SCORE IT app rating scale (0 for "never" to 4 for "always"). After students rate their behaviour the teacher can rate student behaviour to evaluate students' recording accuracy. In Bruhn, Vogelgesang et al. students were provided behaviour feedback from the teacher based on rating comparisons. With built-in data collection features SCORE IT can automatically provide users with rating summaries in the form of a bar graph presenting *percentage of positive behaviour* (PPB). In Bruhn, Vogelgesang et al., student users earned reinforcers at the end of the day if their PPB was above a goal line. Vogelgesang et al. omitted teacher feedback, or reinforcement elements in an attempt to evaluate intervention effect without these components.

Bruhn, Vogelgesang et al. (2015) reported that two middle school participants – a girl with special education needs and a boy with ADHD - in a reading intervention class, demonstrated improved target behaviour (academic engagement and disruptive behaviour) when using SCORE IT for self-management. Similarly, Vogelgesang et al., (2016) reported increases in the academic engagement of three primary school students (5th grade) with or at risk for ASD in a general education classroom setting during the SCORE IT intervention. Both studies show self-management incorporating SCORE IT is an effective intervention as all student participants showed functionally related improvements in academic engagement during intervention. Social validity measures revealed participants in both studies viewed the intervention favourably; easy to use, and worthwhile. Interestingly, teachers in both studies indicated they favoured the technology-based approach over classic paper-pencil methods.

6.2.3.4 I-Connect. In a collection of similar studies Crutchfield et al. (2014), Wills and Mason (2014), and Rosenbloom et al., (2015) investigate a technology-based self-management intervention incorporating I-Connect; an all-inclusive self-monitoring application for android-compatible handheld tablets and cell-phones. I-Connect (Wills & Mason, 2014) is designed such that users can program customisable prompts at scheduled intervals using behaviour-specific questions. Text cues (e.g., are you on-task?), delivered on an interval-schedule, are shown on the device along with a flashing screen, chime tone, or vibration notification. Once students are prompted by the tablet or cell phone, they self-observe their behaviour, and self-record by selecting a “yes” or “no” response. I-Connect automatically uploads recorded data to a secure online database through wireless network connection; thus allowing teachers to monitor responses and progress over time.

Wills and Mason (2014) first investigated I-Connect use on a Samsung Galaxy tablet with two high-school students, one with specific learning disability and one with ADHD, receiving special education supports in general education. With both students demonstrating notable improvements in behaviour (increased on-task and decreased disruptive) while using a self-management intervention incorporating I-Connect, this study established a functional relationship between the intervention and positive behaviour change. Both student participants reported high levels of satisfaction with the intervention, while the teacher rated the intervention with consistently positive ratings on the social validity measure.

Using I-Connect and a Samsung Galaxy smartphone Crutchfield et al. (2014) investigated the effects of technology-based self-management on the stereotypic behaviour of two high-school students diagnosed with ASD in a special education environment. Students were prompted by I-Connect text cues (i.e., “Quiet hands and mouth”) every 30-secs. Authors report a functional relationship was established between the I-Connect intervention and stereotypy reductions for both participants. The intervention was viewed socially valid. Crutchfield et al. reported the teacher found I-Connect to be “more socially acceptable than bulky paper or pencil self-monitoring checklists” (p. 7) while indicating that students required “less adult” support when using the application.

Building on Wills and Mason’s (2014) study, Rosenbloom et al. (2016) recently investigated I-Connect self-monitoring on the behaviour of an elementary student with ASD in a general education classroom. In each intervention session a Samsung Galaxy tablet was placed on the student’s desk, with the I-Connect app programmed to ask “Are you on-task?” at 30-sec intervals with a flashing screen. Rosenbloom et al. reported a functional relationship was demonstrated between behaviour improvements (increased on-task and decreased disruptive) and intervention implementation. Social validity data revealed the participants reported high levels of intervention acceptability. Interestingly, results show the teacher particularly appreciated that the intervention did not distract other students and motivated the participant to behave better.

6.2.4 Where to from here? The surge of research investigating all-inclusive self-management assistive technology within the last 5 years has revealed promising findings suggesting this novel technology holds the potential to improve classic self-management intervention prompting and recording methods. Results in the growing body of research (Table 6.1) demonstrate that technology-supported self-management programs are effective in producing positive behaviour change outcomes for students, and are generally considered socially valid and acceptable for classroom settings (particularly due to addressing some shortcomings of classic prompting and paper or pencil tools). Despite promising findings, further research is warranted to investigate applications of all-inclusive assistive technology, as such technology is novel and remains relatively underutilized in school-based self-management intervention literature (Bruhn, Vogelgesang et al., 2015). At present, additional research is required to examine aspects of this technology, expand existing research evidence, and to address shortcomings evident in current literature. Considering existing self-monitoring assistive technologies, future research should endeavour to investigate assistive technologies which address the shortfalls detailed in Table 6.2.

This review reveals future researchers should endeavour to advance existing research by examining the outcomes of all-inclusive self-management technology which: (a) combines discrete tactile-cues with simple technology-supported recording methods, (b) incorporates *current* technology deemed *acceptable* for broader school contexts, (c) utilises technology that permits students to actively engage and move freely around their learning environment, and (d) provides student and adult users with live, concurrent behaviour recording feedback during intervention (for accuracy monitoring), and post-intervention recording summary feedback (to allow for self-graphing). Furthermore, additional research is required to extend existing self-management SCD research in terms of research methodology and research variables. Research evaluating social validity is warranted given the inconsistent and brief nature of social validity evaluations documented in past assistive technology studies. Future research is needed to consistently examine social validity from student *and* teacher participants' perspectives, a gap in past assistive technology research (see Table 6.3). Research should also evaluate participant views on implementation barriers, and recommendations to improve assistive technologies, as past social validity analyses focus predominately on intervention satisfaction and acceptability.

Table 6.2

Self-Management Assistive Technologies: Shortfalls/Limitations and Extending Future Research

Technology	Shortfall/Limitation	Proposal for Extending Future Assistive Technology
Tactile-cued self-management technology (i.e., MotivAider, WatchMinder)	Use of tactile-cues with *classic paper-pencil recording methods*	Combine tactile-cues with *novel technology-supported recording methods*
All-inclusive assistive technology (i.e., Self-management with handheld computers, SCORE IT, I-Connect)	Use of technology-supported recording with *audio-cuing*	Combine technology-supported recording methods with *discrete tactile-cuing*
All-inclusive assistive technology (i.e., Self-management with handheld computers)	Use of dated technology (handheld computers)	Utilise novel technology (smartphones and tablets)
All-inclusive assistive technology (i.e., CellF-Monitoring)	Use of devices and social media platforms which may be deemed unsuitable for some school contexts – i.e., Cell-phones and twitter for primary school settings	Utilise novel technology which is currently widely accepted in school contexts (i.e., tablets, computers)
All-inclusive assistive technology (i.e., Self-management with handheld computers, SCORE IT, I-Connect)	Use of devices (i.e., tablets, handheld computers) which restrict students to engaging in self-management interventions at their desks or immediate work space	Utilise novel technology which permits students to freely move about their education setting should it be necessary (i.e., smartwatch technology)
Tactile-cued self-management technology (i.e., MotivAider, WatchMinder) All-inclusive assistive technology (i.e., Self-management with handheld computers, CellF-Monitoring, I-Connect)	Use of devices and/or apps which fail to provide student users and intervention facilitators (e.g., teachers) with (a) live, concurrent behaviour recording feedback, and/or (b) post-intervention recording summaries	Utilise novel technology which provides live, concurrent behaviour recording to students and intervention facilitators *and* post-intervention recording summaries

Table 6.3

Methodology Features

	Social Validity		Treatment Fidelity	Generalisability
	Student	Teacher		
Bedesem, 2012	X^	X^		
Bruhn, Vogelgesang et al., 2015	X*^	X*^	X	
Crutchfield et al., 2014		X*	X	X (fading)
Gulchak, 2008			X	
Rosenbloom et al., 2016	X*	X*	X	
Vogelgesang et al., 2016		X*^	X	X (maintenance)
Wills & Mason, 2014	X*	X*	X	X (behaviour)

*Social validity post-intervention rating scale
^Social validity post-intervention questionnaire

Future research is also needed to extend evaluations of treatment fidelity. While most studies in Table 6.3 report on intervention fidelity, no study evaluated intervention *training fidelity*. Since training students in self-management strategies is a key intervention aspect, researchers should investigate the importance of completing training procedures as specified. Additional research may consider investigating the extent to which intervention effects generalise across settings, over time, across behaviours, and/or across student participants as generalisation data is largely lacking in the current research (see Table 6.3). Finally, future research should examine the effect of using all-inclusive technology-supported self-management interventions with students in general education settings, as most research to this point has been conducted in special education settings.

6.3 Technology-Based Self-Management - Self-Management Assistive Technology (The SMAT System)

This chapter introduces an updated all-inclusive self-management assistive technology system which addresses the shortfalls identified in Table 6.2. *Self-Management Assistive Technology* (*SMAT*) (Bertram, 2015) is a novel technology-based system which utilises modern technological devices, along with a purpose designed web-application or smartwatch-application package that serves to assist users in undertaking self-management. Through the use of modern, commonplace technology, and innovative software applications, SMAT supported self-management interventions (aka. *SMAT Systems*) provide a novel approach to self-management which can be used to discretely undertake critical aspects of self-management strategies in general education classroom settings. The SMAT System modernizes existing self-management assistive technologies by integrating technology-supported tactile-prompts *and* recording tools, with novel applications which provide users with real-time *and* post-intervention behavior recording feedback. Moreover, the SMAT System incorporates school-friendly technology which permits multiple students to actively engage in independent self-management whilst moving freely in the classroom. This all-inclusive SMAT system may serve as a modern, feasible alternative to traditional self-management strategies, and holds the potential to facilitate and encourage simple self-management in class settings.

6.3.1 How SMAT works? In the context of this research SMAT has been adopted to support implementation of the self-management intervention outlined in Figure 6.2. Details of SMAT implementation, as adopted in Chapter 7, are specified here.

SMAT supported self-management involves student users self-monitoring the occurrence or non-occurrence of targeted behaviours through use of a smartwatch-application which emits discrete tactile self-monitoring prompts on an interval-schedule via a wearable Pebble Smartwatch. Immediately after each tactile-prompt, students observe and record their behaviour by responding to a visual text prompt displayed on the watch face which cues student users to answer a target behaviour question (e.g., Am I on-task?). The text-cue is displayed on the Pebble Smartwatch watch face throughout each intervention session. Students respond to smartwatch tactile-prompts, by recording on the smartwatch-app, indicating whether they are engaged in the target behaviour (yes) or not (no). The smartwatch-app automatically uploads recorded data to the partnering web-application through a wireless network connection. Recording on the Pebble Smartwatch allows students to self-monitor anywhere in the classroom – unlike past approaches which require students to self-monitor in locations where recording devices are located.

All data recorded on the smartwatch-application instantaneously uploads onto the web-application, providing both, student users and adult intervention facilitators with immediate visual feedback that can be viewed on handheld portable devices. Student users and adult facilitators can log into respective student and adult SMAT accounts on the web-application to view real-time recorded data during active intervention sessions. Student accounts display “yes”/“no” responses as smiley/frowny faces, while adult accounts display “yes”/“no” responses as ticks/crosses. Student users and adult facilitators can simultaneously view live recorded data on separate handheld devices (e.g., iPad) or computers (see Figure 6.3a and 6.3b).

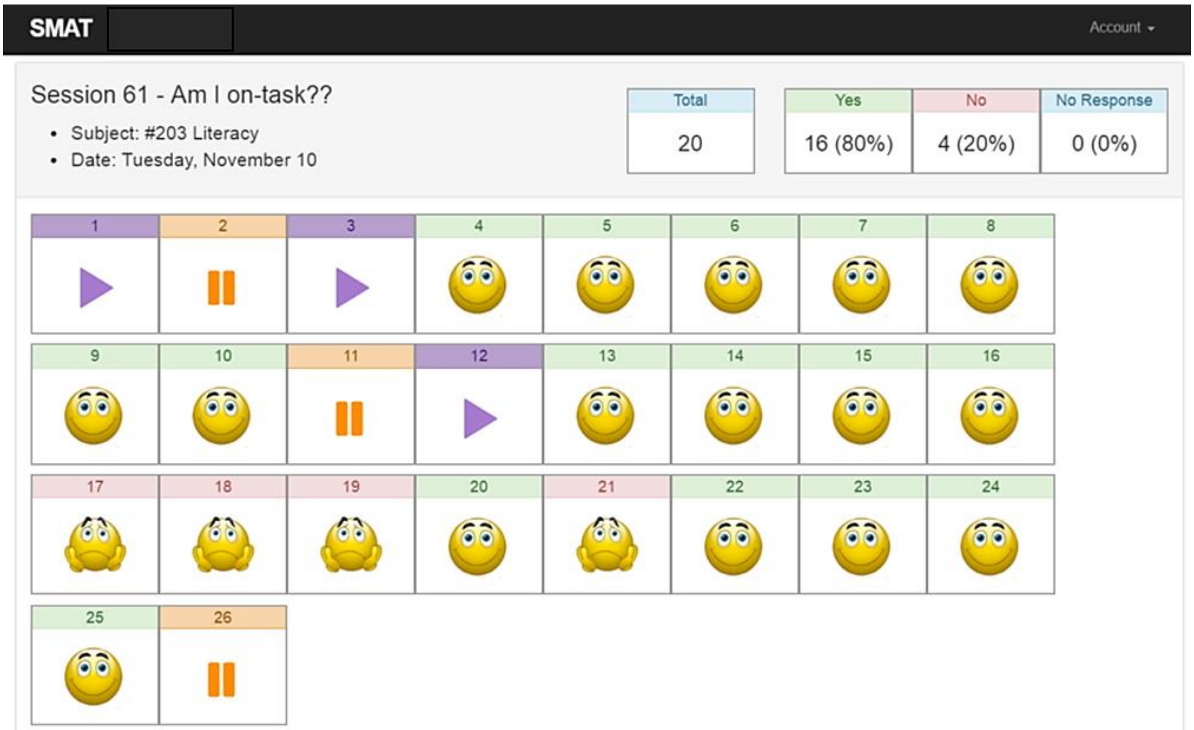


Figure 6.3a. SMAT web-app real-time recording view (student)

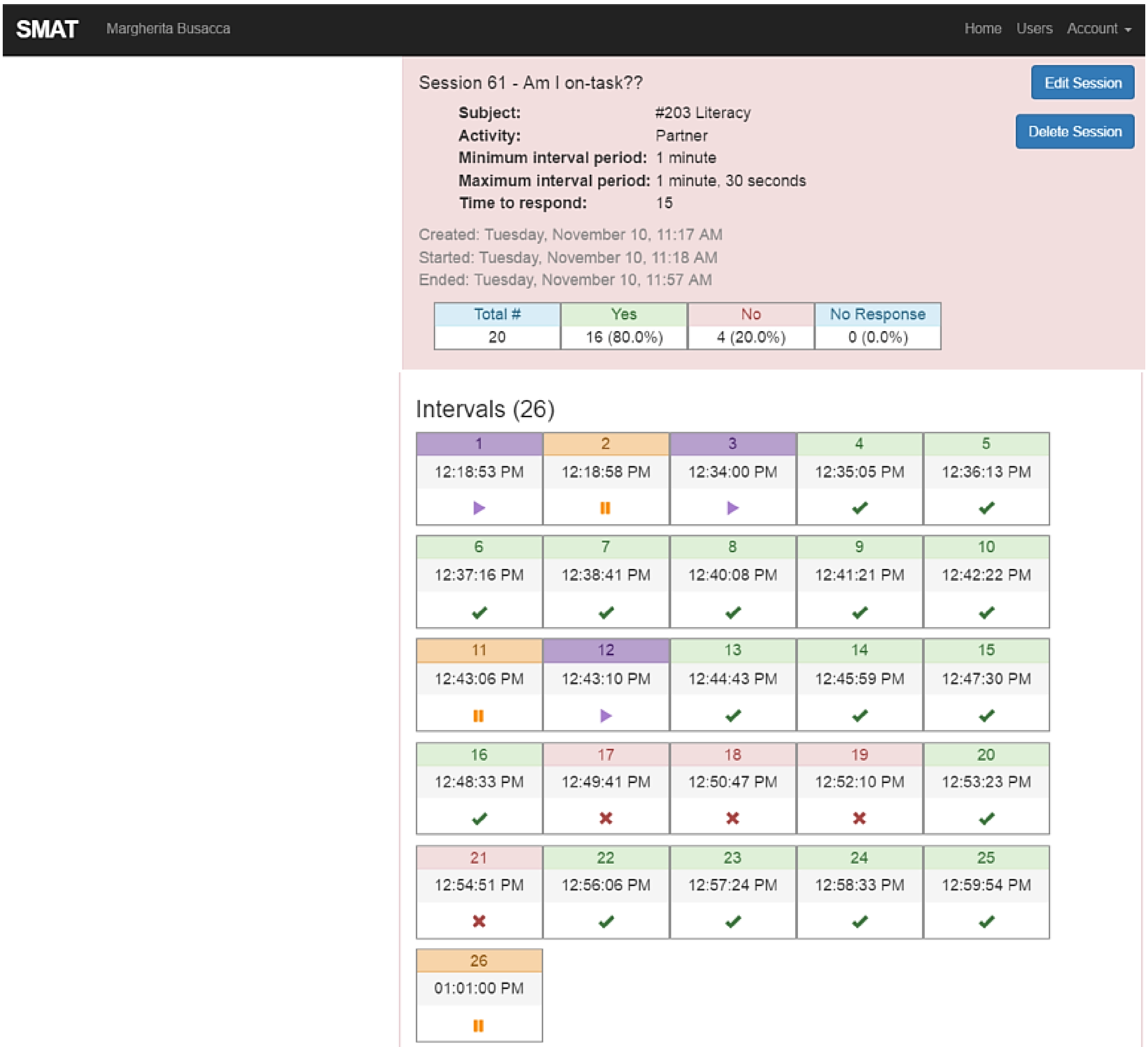


Figure 6.3b. SMAT web-app real-time recording view (adult)

Handheld devices, displaying the SMAT web-application, can be placed on student users' desks throughout intervention sessions. This feature permits student users to continuously keep track of their recorded data throughout self-management sessions as they occur, and enables adult-facilitators to monitor student recording accuracy if necessary. Students may use their iPad to view the SMAT web-app throughout the whole session or for part of the session. Student users can also view recorded data (limited to the past four intervals) instantaneously on the smartwatch-app; "yes"/"no" responses are represented by smiley/frowny faces at the bottom of the Smartwatch screen. This feature enables student users to track recorded data all around the classroom, and in situations where they do not have access to a personal handheld device.

To track overall student behaviour recording progress, student users and adult facilitators can access behaviour recording percentage summaries on the web-application following each intervention session (see top right Figure 6.3a). The SMAT web-application automatically computes the *percentage of yes recordings* and the *percentage of no recordings.* At the end of each session, student users can view their recording percentages on the web-application to consider their overall performance and graph their performance. This feature allows student users to check their progress on a session-by-session basis throughout the intervention period.

6.3.2 SMAT instrumentation. The following section describes all instrumentation required for SMAT supported self-management.

6.3.2.1 SMAT system devices. Use of the SMAT System requires three pieces of electronic equipment: a Pebble Smartwatch, an Apple iPad, and a laptop (any variety).

6.3.2.1.1 Pebble smartwatch. Smartwatches, are a relatively novel technology, which may be described as computerised wristwatches which assume functionality beyond that of the everyday watch. In recent years smartwatch technology has gained popularity, becoming increasingly widespread in everyday settings (Cecchinato, Cox, & Bird, 2015). While smartwatches have many uses (see Cecchinato et al., 2015), they are often used to connect wearers with handheld devices (i.e., smartphones or tablets) thereby providing users with extra freedom and flexibility from non-wearable devices. Incorporating *Pebble Smartwatches* in the SMAT Strategy capitalises on this idea, while giving SMAT a novel edge likely to appeal to student users.

The SMAT Strategy uses Pebble Smartwatches *(Classic)* (Figure 6.4) on the basis that they: (a) are wearable, (b) can vibrate discretely, (c) have a long battery life, (d) can connect via Bluetooth to iPad, iPhone, and Android devices, and (e) can download and store applications compatible with Pebble Technology. The Pebble Smartwatch, by Pebble Technology, first became available in 2013 thanks to a 2012 Kickstarter crowd-funded project[14]. At the time of this research the Pebble Smartwatch Classic was priced at $99 (USD)

[14] https://www.pebble.com/our_story

on the PEBBLE website[15] and $149 (AUD) at Dick Smith Electronics[16] in Australia. The Pebble Smartwatch is the same size as a moderately large sport watch with a screen size large enough to display content that can be easily viewed by student users (Case = 63.25mm diameter; 22mm width; 11.5mm thickness; 38grams). The appearance and size of a Pebble Smartwatch Classic ensures that it can be discretely worn by students in education settings.

Figure 6.4. Pebble Smartwatch Classic

6.3.2.1.2 Apple iPad. The SMAT System incorporates Apple iPads (Figure 6.5) which function as personal monitoring and feedback devices for student users. Apple iPads are the mobile handheld device of choice for SMAT based on their technological and practical functionality. iPads are compatible with the SMAT System as they: (a) can connect to Wi-Fi, (b) allow for internet browser accessibility (i.e., Safari), (c) can download and store Apple-compatible applications, (d) allow for Bluetooth connectivity, and (e) are practical for students due to their compact and lightweight build[17]. Given the widespread prominence of handheld mobile devices in Australian education contexts (Softlink, 2014), use of Apple iPads ensures the SMAT Strategy aligns with current technology trends, and has the potential to be financially feasible for students in education contexts.

[15] https://www.pebble.com/pebble-smartwatch-features
[16] http://www.dicksmith.com.au/mobile-phone-accessories/pebble-smart-watch-for-ios-and-android-black-dsau-se5060
[17] For iPad model specifications see - http://www.apple.com/au/ipad/compare/

Figure 6.5. Apple iPad

6.3.2.1.3 Laptop. Adult facilitators require a laptop to access the SMAT web-app for session programming and monitoring processes throughout the intervention. Any laptop may be used provided it has an internet browser and Wi-Fi connectivity.

6.3.2.2 SMAT system applications. The SMAT system is comprised of two novel, interacting applications: a web-based application (i.e., the *SMAT web-app*), and a partnering smartwatch-application (i.e., the *SMAT watch-app*). The SMAT apps are pivotal platforms used by adult intervention facilitators *and* student intervention users to engage with technology devices whilst undertaking SMAT supported self-management.

6.3.2.2.1 The SMAT web-ap. The SMAT web-app ***(smat.rocks)*** is accessible via an internet browser on devices that allows for internet connectivity (e.g., laptop, tablet, smartphone), and is designed to connect directly to the SMAT watch-app. The SMAT web-app is used by adult facilitators to program, manage, and oversee SMAT intervention sessions. For adult facilitators the SMAT web-app serves as a: (a) configuration platform, used to program the tactile-prompt interval-schedule and the visual-prompt delivered via Pebble Smartwatches; (b) management tool used to activate and end SMAT intervention sessions; and (c) tool to monitor live student recordings and post-intervention recording summaries. Tactile-prompt interval-schedules and visual-prompts can be customised for each individual student via the SMAT web-app. For student users the SMAT web-app serves as a feedback platform which provides: (a) real-time feedback of self-recorded data, and (b) behaviour recording summaries post-intervention session. Students can view the SMAT web-app on devices connected to Wi-Fi (e.g., iPads). Wi-Fi connectivity is required in the intervention location.

6.3.2.2.2. The SMAT watch-app. The SMAT watch-app is a programmable smartwatch application which functions to transform Pebble Smartwatches into dual-purpose prompting *and* self-recording devices for self-management. Pebble Smartwatches, loaded with the SMAT watch-app, may be programmed by adult-facilitators, via the SMAT web-app.

For *prompting*, the SMAT watch-app is programmed to emit tactile self-monitoring cues. When activated by student users, the SMAT watch-app emits vibrations via the Pebble Smartwatch. Vibration cues can be scheduled to occur on a *fixed-* (e.g., every 1min), or *variable*-interval schedule (e.g., 1min - 1min, 30secs). The latter feature enables adults to program vibrations in a way which prevents student users from predicting vibration patterns. The SMAT watch-app permits students to activate, pause, and end self-management sessions with the push of a button on the Pebble Smartwatch. For *recording*, student users record behaviour observations on the Pebble Smartwatch via the SMAT watch-app. The SMAT System allows adult facilitators to set a *limit hold* (Cooper, Heron, & Heward, 2007), or *recording window*; this feature ensures that student users have a set amount of time to record following each prompt. Recording windows will automatically end once a student self-records, or after the set period of time (e.g., 5-seconds). If students do not record observations within the set recording window, the window will end and the next observation interval will automatically commence.

6.3.2.3 SMAT System supplement resources. Implementation of the SMAT System requires the following supplementary resources which have been developed for this PhD research.

6.3.2.3.1 SMAT graphing sheets. Graphing sheets incorporate a blank bar graph grid intended for students to plot percentage of yes recordings (i.e., %yes). See Appendix E.10. Students are provided with graphing sheets following each session for the purpose of graphing recording percentages. Adult facilitators may create a *SMAT Folder* to contain graphing sheets.

6.3.2.3.2 SMAT process prompt sheets. Four process prompt sheets have been created to guide users through applications of the SMAT System (See Appendix E.11). Student process prompt sheets detail sub-steps for the three principle intervention processes engaged in throughout intervention sessions: (1) Starting-Up (i.e., how to set-up and activate SMAT),

(2) Self-Management (i.e., how to use SMAT to self-manage), and (3) Finishing-Up (i.e., how to end intervention sessions and graph performance). The adult process prompt sheet outlines the simple steps for instructing students to start-up and finish-up self-management sessions. Prompt sheets have been designed such that they can be printed.

6.3.2.4 SMAT intervention manuals. Four intervention manuals were developed by the author to facilitate the planning and implementation of a SMAT supported self-management intervention in Chapter 7 (and in subsequent replication research).

- *SMAT Intervention Manual – Intervention Facilitator (SMAT-IM-IF)* (outlines implementation guidelines and student training processes in a step-by-step format- intended for researchers or other intervention facilitators). See Appendix D.
- *SMAT Intervention Manual – Teacher (SMAT-IM-T)** (synthesised and modified version of the SMAT-IM-IF which outlines intervention processes in a step-by-step format intended for use by participating teachers or education staff).
- *SMAT Intervention Manual – Workbook (SMAT-IM-W)** (workbook developed intended for facilitators and teachers to document details on study procedures).
- *SMAT Intervention Manual – SMAT System Set-Up Guidelines* (outlines technology set-up processes in a step-by-step format with images)*

*Available from author of this PhD upon request.

The SMAT manuals contain intervention guidelines developed based on Study 1 (Chapter 4)/Study 2 (Chapter 5) findings, and various step-by-step guides published throughout self-management literature.

6.4 SMAT Implementation Framework

The aforementioned intervention manuals present an implementation framework for SMAT supported self-management - *SMAT System Intervention Framework* (aka. the *SMAT Framework*) – developed based on the seminal *SPIN: Self-Management Design and Implementation* framework by King-Sears and Carpenter (1997) (Presented in King-Sears & Bonfils (1999), King-Sears (1999), King-Sears (2006) and King-Sears (2008)) . The SMAT Framework adapts and extends King-Sears and Carpenters' four-stage SPIN framework (i.e., S -select the student's target behaviour; P - prepare to teacher self-management; I- instruct the student; N - note the impact of self-management) into a five-stage framework intended to guide intervention facilitators through the SMAT Strategy. The SMAT Framework also adapts aspects of various published step-by-step guidelines for designing and implementing self-management interventions: Bedesem (2012), Bedesem and Dieker (2013), Busick and Neitzel, (2009); Cooper et al. (2007), Ganz (2008), Koegel, Koegel, and Parks (1990), Maag (1999), McConnell (1999), McDougall et al. (2012), Menzies et al. (2009), Morrison, McDougall, Black, & King-Sears (2014), Rafferty (2010), Rankin and Reid (1995), and Wilkinson (2008).

The SMAT Framework consists of: preliminary preparation (*Preliminary Stage*); select target behaviour (*Stage 1-Select*); prepare for self-management (*Stage 2-Prepare*); train students to use self-management (*Stage 3–Train*); and implement the intervention and observe outcomes (*Stage 4–Implement and Observe*). Each stage is described in Table 6.4.

Table 6.4

SMAT Framework Stages

Stage	Details
Preliminary Stage: Preliminary Preparation*	Intervention facilitator and teacher collaborate to make initial arrangements. This stage involves introducing the self-management study, informing the teacher of all study requirements, processes and commitments, arranging student nominations and recruitment, and conducting preliminary classroom observations (to determine suitability of nominated students)
Stage 1: [Select] Select Target Behaviour*	Teacher identifies and defines of student behaviour in need of behaviour intervention with the help of the intervention facilitator. Also involves determining appropriateness of the selected behaviour; making behaviour measurement arrangements, and identifying a desired level of behaviour performance.
Stage 2: [Prepare]* Prepare for Self-Management	Teacher and intervention facilitator familiarise themselves with the self-management package, the SMAT system, study procedural steps and student training procedures. Devices and resources are prepared for intervention. Final preparations for behaviour measurement approach are also made.
Stage 3: [Train] Train Students to use Self-Management	Teacher and intervention facilitator train students in how to use the self-management strategy.
Stage 4: [Implement and Observe] Implement the intervention and observe outcomes	Students implement the self-management strategy in class. Intervention facilitator observes and monitors the impact of self-management on student behaviour. Involves the collection of behaviour data.

*Aspects of the Preliminary Preparation stage, Stage 1 and Stage 2 are not mutually exclusive. During initial stages of the study specified tasks may overlap.

6.5 Researcher-Teacher Collaboration

All manuals and the aforementioned implementation framework have been designed to facilitate researcher-teacher collaborations in Chapter 7 such that the piloted SMAT supported self-management intervention could be implemented to suit the setting and participants, while satisfying the proposed research agenda. Checklists detailing intervention processes were used to guide collaborations (available from PhD author upon request). Researcher-teacher collaboration is strongly emphasized in this pilot research as teacher input may increase the likelihood of this novel intervention being viewed as socially valid, acceptable and practical. Involving a teacher in intervention development and implementation ensured the final product was infused with valuable applied, real-world knowledge and insight. This section details the nature of researcher-teacher collaboration for each SMAT Framework stage as undertaken in the Chapter 7 pilot study.

6.5.1 Initial stage: Preliminary preparation. Across several preparation sessions the teacher and researcher discussed study aims, intervention processes, the SMAT System, study design, study timelines and scheduling, and student participation. The teacher and researcher also collaborated on participant nomination and recruitment procedures, and the development of implementation steps and resources (i.e., *SMAT Process Prompt Sheets and graph sheets*).

6.5.1.1 Student nomination/recruitment procedures. A five-phase procedure (Table 6.5) was used to guide student participant nomination and recruitment processes.

Table 6.5

Student Nomination and Recruitment Processes

Phase		Details
1.	Teacher Nomination	Teacher nominates potential target students and comparison peers, providing description of problem behaviour for each nominated target student. Students who meet selection criteria and pass screening measure[1] are included
2.	Classroom Observation	Intervention facilitator conducts non-intrusive classroom observation of nominated students to further determine suitability. Observations were conducted to (a) ascertain if teacher-reported behavioural concerns were demonstrated in the natural environment and (b) identify any further problem behaviours.
3.	Selection Discussion	Teacher and intervention facilitator discuss classroom observations and reach final decision regarding student suitability
4.	Parent/Guardian Consent	Teacher invites parents of nominated students to have their child participate. Teacher to pass relevant documentation (i.e., school letter, University explanatory statement and consent form). Parents or guardians encouraged to contact the intervention facilitator with questions or concerns.
5.	Student Assent	Intervention facilitator and teacher obtained student assent.

[1] The screening measure incorporates seven dichotomous yes/no questions relating to students' presenting classroom behaviour; and was adapted from similar measures by Menzies et al., 2009; Rafferty, 2010 and Rankin & Reid, 1995.

6.5.2 Stage 1: [Select] Select target behaviour. Stage one involved the researcher and teacher working together to select and define student target behaviour. Final arrangements were also made concerning behaviour observation and data collection procedures.

6.5.3 Stage 2: [Prepare] Prepare for self-management intervention. Collaboration efforts focused on preparing the self-management intervention and finalising the student training approach. The teacher was provided with an overview of the intervention and training approaches; teacher feedback and input was then elicited on the proposed approaches. The teacher was consulted on a number of intervention elements including; final target behaviours, housekeeping aspects and intervention instrumentation.

6.5.4 Stage 3 [Train] Train students to use self-management. The third stage involved the teacher considering the student training approach and proposed training materials; the teacher deemed the approach appropriate for the class setting and made suggestions to improve the approach. Training session lesson plans were arranged.

6.5.5 Stage 4: [Implement and Observe] Implement the intervention and observe outcomes. It was agreed that during intervention the teacher would instruct students as to when they were to start and end each self-management session in class. All remaining intervention and observation responsibilities were placed on the researcher (as described in Chapter 7).

The following chapter presents a single-case design (SCD) intervention study piloting the SMAT supported self-management intervention outlined in this chapter.

Chapter 7: Self-Management Intervention Pilot Single-Case Design Study

The purpose of this chapter is to present a single-case design (SCD) intervention study in which a novel technology-based self-management system was piloted with primary school students demonstrating low-level problematic behaviours in a general education classroom setting. It describes the pilot application of the Self-Management Assistive Technology (SMAT) supported self-management intervention system introduced in Chapter 6. Development of the current self-management intervention is based on component analysis findings presented in Chapter 5. This study was intended to further expand the current body of quality SCD self-management research evidence. To achieve this the current study was designed to meet the criteria of a high-quality SCD study, according to What Works Clearinghouse (WWC) Standards (Kratochwill et al., 2013; WWC, 2014), and to address research gaps identified in Chapters 4 and 5. This study specifically targeted on-task behaviour increase *and* disruptive behaviour decrease given the shortfall of high-quality research evidence targeting problem behaviour reductions in general education settings (Busacca, Anderson, & Moore, 2015). Participants were two typically developing male Grade 5 students and one male Grade 4 student diagnosed with a Severe Language Disorder (SLD). Targeting students of this demographic is necessary as high-quality SCD research evidence is needed for primary students across all grade levels with and without diagnosed disorders or special needs (Busacca et al., 2015).

7.1 Aim/Intent of Research

The primary goal of this study was to extend technology-based self-management literature by piloting an innovative, simple, parsimonious, technology-based self-management intervention system used by primary school students within a mainstream classroom. The main objective was to evaluate the effects of the intervention on targeted on-task behaviour and concomitant disruptive behaviour outcomes for three student participants in a general education class setting. Further objectives included evaluating the modern self-management system for: outcome generalisability across conditions, maintenance of behaviour over time, social validity (i.e., useability, acceptability), treatment fidelity, and the degree to which students were directly responsible for intervention elements. The following research questions were addressed:

(a) What effect does the intervention have on the primary dependent variable, on-task behaviour, and the concomitant variable, disruptive behaviour?
(b) Do intervention outcomes generalise to another condition (i.e co-teacher lessons)?
(c) To what extent was behaviour change maintained over time after intervention fading?
(d) Was the intervention implemented with high fidelity by adult and student stakeholders?
(e) To what extent was the intervention implemented by student vs adult stakeholder?
(f) Is the intervention considered socially valid and acceptable by teachers and students?

7.2 Method

7.2.1 Ethical considerations. This study was approved by the Monash University Human Research Ethics Committee (MUHREC) (approval certificate Appendix E.1). The principal of a Catholic primary school granted permission for the study to take place on behalf of the school and the parish (explanatory statement and permission letter Appendix E.2). After reading the study explanatory statement, the participating teacher and co-teacher signed the study consent form (Appendix E.3). The teacher and principal were provided a study overview which outlined all study aspects (Appendix E.4). Informed parental consent and student assent was obtained for all student participants (explanatory statements, consent and assent forms in Appendix E.5 a, b, c and d).

7.2.2 Participants. The following section provides details about the participants involved in this study. In all instances, pseudonyms have been used instead of students' real names to ensure participant confidentiality.

7.2.2.1 Teacher participants. The participating teacher was eligible for participation as she (a) was allocated full-time teaching duties in 2015, (b) taught more than one student who met the target student eligibility criteria (details below), (c) was willing to collaborate with the researcher for intervention development and implementation, and (d) was prepared to help with student recruitment, and obtaining parental consent. The teacher had worked at the school for two and a half years, and had accrued 7.5 years of teaching experience working with primary students across all grade levels. She held a Bachelor of Education, and had recently completed her Master of Education (Early Childhood). Part-way through 2015 the teacher received a promotion and was appointed to the position of learning co-ordinator.

Consequently the teacher's classroom attendance was reduced to three days a week in Terms 3 and 4. A co-teacher was appointed to teach two days a week. The co-teacher, who met eligibility criteria, held a Bachelor of Education and had accumulated six years full-time, along with seven years part-time teaching experience working with primary students.

7.2.2.2 Target Student Participants. Three target students, Troy, Joey, and Pete passed the student nomination and recruitment process detailed in Chapter 6. Selected students were eligible for study inclusion as they participated in a general education classroom full-time with high attendance rates, had not previously attended special education settings (i.e., resource classrooms, self-contained classrooms), were in a primary grade higher than Prep, had daily iPad access, did not have any medical or physical conditions which impacted class behaviour, and did not receive medications for behaviour management purposes. Table 7.1 presents student demographic and background information. The teacher reported all participant students displayed elevated disruptive and off-task/inattentive behaviour across three academic subjects in class. The teacher indicated that observed problematic behaviour impacted negatively on the classroom environment, interfered with her capacity to teach, hindered student relationships with herself and other peers, restricted students' ability to complete work, and hindered student learning opportunities and academic achievement.

All three students self-reported interest in improving their behaviour. At the end of Term 2 students completed Semester 1 Learning Behaviour Self-Evaluations. Troy and Pete reported they had tried their best to get back on-task when off-task. Joey identified that he tried to not get distracted by other people so that he could finish his work. Joey's goal for the year was to make "good choices and behaviour." Pete's goal was to focus on "getting on-task."

Table 7.1

Target Participant Demographic and Background Information

	Troy	Joey	Pete
Gender	Male	Male	Male
Age[a]	10years, 1month	10years, 5months	10years, 4months
Grade	4	5	5
Nationality/ Background	Sudanese (born in Sudan)	Australian (Spanish background)	Australian (Malaysian background)
Language	Primary language – Sudanese dialect. English as an additional language.	English	English
Diagnosis	Severe Language Disorder[b]	N/A (not at-risk)	N/A (not at-risk)
Mainstream school attendance	Full-time[c]	Full-time[c]	Full-time[c]
Academic Performance[d]	Below Grade Level	Average	Slightly Above Grade Level
Additional education support	Yes (See table 7.2)	N/A[e]	N/A[d]
Health	- No known medical or physical conditions (including hearing or vision impairments) which impacted classroom performance, engagement or behaviour. - No medications to manage behaviour at the time of this study		

[a] At study initiation
[b] Unknown as to whether *at-risk* for other formal conditions or diagnosable disabilities.
[c] No current or past placement in special education settings (e.g., resource classrooms, self-contained classrooms etc).
[d] No formal measure; as reported by the classroom teacher
[e] No additional education support requirements.

7.2.2.2.1 Troy. Troy, a Grade 4 male student, had attended the participating school since Prep. Troy reportedly enjoyed school with the exception of academic tasks. Troy migrated to Australia from Sudan in 2005 at approx. 4 months of age. In 2012, Troy was diagnosed with SLD, and received an Individualised Learning Plan (ILP). On the *Weschler Intelligence Scale for Children-IV (WISC-IV)* Troy's general cognitive ability was *below average* (Full Scale IQ, 71; 3rd percentile). Troy's WISC-IV index results were *average and below average* for Perceptual Reasoning (90, 25th percentile) and Processing Speed (71, 16th percentile). Scores were at the *lower extreme* for Verbal Comprehension (71, 3rd percentile) and Working Memory (54, below 1st percentile). A *Clinical Evaluation of Language Fundamentals – Fourth Edition (CELF-4)* assessment revealed expressive and receptive language skills as below average range for Troy's age, and severely disordered. Troy receive supplementary supports including intermittent speech therapy, remedial reading, and spelling sessions funded through additional education funding in 2015. Supports were delivered in the classroom in a one-on-one and small group format instructed by learning aids (Learning Support Officers; LSOs). See Table 7.2.

Table 7.2

Troy's Funded Education Supports

Intervention	Details
Speech Therapy	3 sessions per week (Approx. 40mins) Terms 1 and 4
Individualised remedial reading -Rainbow Reading Program	3 sessions per week (Approx. 15mins) Term 2
Spelling	2-3 sessions per week (Approx. 15mins) Ongoing throughout year
Integration/Learning Aides (Learning Support Officers; LSO)	2-3 sessions per week Ongoing throughout year Teacher directed LSOs to work with Troy one-on-one or in a group when required

Troy's concerning behaviour, as reported by his teacher, included talking out or calling out off-topic comments, inappropriate remarks and noises, yelling, initiating or engaging in non-permitted or irrelevant conversation in learning time, handling objects unrelated to academic tasks (e.g., throwing paper), and touching other people's belongings. Troy was reported to also exhibit characteristics of hyperactivity at times demonstrating excessive, inappropriate, and unnecessary movement, including fidgeting, crawling, walking or running. He was described as an inattentive student who often left his seat during work time, and occasional left his classroom without permission. Troy's teacher indicated she engaged in behaviour management tactics with him including strategic seating placement, reward and consequence strategies, verbal prompting, and a weighted bean-bag (placed on his lap when he is restless). The teacher reported that extrinsic rewards/reinforcers for desired behaviour worked most effectively, however outcomes inconsistent. Troy also received individual instruction to facilitate understanding; tasks were often modified to suit Troy's ability level and strengths.

7.2.2.2.2 Joey. Joey was a typically developing, male, Grade 5 student. Joey had attended the school from Prep. Joey reportedly enjoyed attending school; he particularly enjoyed the sport and the social aspects. Joey's concerning behaviour, as reported by his teacher, included talking at inappropriate times about unrelated content or topics. The behaviour reportedly occurred multiple times a day, varying in severity (e.g., random comments, long conversations). Other concerning behaviour included the tendency to make rude or inappropriate remarks and occasional teasing of peers. Previous behaviour management strategies which had not had lasting effects included strategic seating placement, verbal prompting, and delivery of consequences.

7.2.2.2.3 Pete. Pete was typically developing, male Grade 5 student. Pete changed schools at the start of Grade 4 (2014) due to social difficulties. He was reportedly well-adjusted socially at the participating school, and enjoyed coming to school. Pete's concerning behaviour involved talking to peers about unrelated topics, talking out of turn, and playing or fiddling with objects unrelated to academic tasks. This behaviour reportedly occurred on a daily basis. Pete's behaviour were audibly and visually disruptive; peers sometimes complained about Pete talking. Past management strategies included strategic seat placement, verbal prompts, encouragement, removal of physical objects, and/or student re-location.

7.2.2.3 Comparison Peer Participants. The resarcher collected data on a group of non-participating students in the same class for social comparison purposes (see Social Validity; Social Comparison). Comparison peers exhibited typical or expected levels of appropriate behaviours in the classroom according to teacher standards. Four comparison peers (Luke, Evan, Jack, and Taylor), served as exemplars of students who demonstrated desirable behaviour. Three peers were matched to target students across gender, age, and grade. Luke was matched Troy as he was identified to have SLD. Taylor, a female student, was selected for sample diversity. Comparison peer details in Table 7.3.

Table 7.3

Comparison Peer Demographic and Background Information

	Luke	Evan	Jack	Taylor
Gender	Male	Male	Male	Female
Age[a]	9years	10years	10years	10years
Grade	4	5	4	5
Diagnosis	Severe Language Disorder	N/A (not at-risk)	N/A (not at-risk)	N/A (not at-risk)
Mainstream school attendance	Full-time[b]	Full-time[b]	Full-time[b]	Full-time[b]
Academic Performance[c]	Below Grade Level	Average	Average	Slightly Above Grade Level
Additional education support	Yes[d]	N/A[e]	N/A[e]	N/A[e]
Health	- No known medical or physical conditions (including hearing or vision impairments) impacting classroom performance, engagement or behaviour. - No medications to manage behaviour at the time of this study			

[a] At study initiation
[b] No current or past placement in special education settings (e.g., resource classrooms, self-contained classrooms etc).
[c] No formal measure; as reported by the classroom teacher
[d] Attended Speech Therapy and Spelling sessions; and received LSO support throughout the year.
[e] No additional education support requirements.

7.2.3 Setting. The study took place in a general education classroom within a Catholic primary school located in a suburban town, South East Victoria, Australia. The school contained 26 classes serving 620 students in Grade Prep through to Grade 6. Participants were included in an average sized Grade 4/5 class containing 24 students; 15 males and 9 females. The class contained 13 Grade 4 students, and 11 Grade 5 students (Age 9 to 11 years). Six students were born overseas, and six students used English as an additional language. Three students had diagnosed disorders; two with SLDs and one with Autism Spectrum Disorder. Learning support officers attended class for approximately four to five hours per week.

Class time consisted of three blocks: two hours in the morning, two hours after recess, and one hour after lunch. Core academic subjects (henceforth, core subjects) included Literacy and Inquiry (i.e., reading and writing tasks), Maths, and Religion. A typical week contained five Literacy/Inquiry blocks; four-five Maths blocks, and three-four Religion blocks. The class also attended specialist subjects (e.g., Japanese, Library, Sport, Music lessons) and extra-curricular activities (e.g., school mass, assembly) outside of the classroom. The class schedule remained relatively consistent, however it varied on occasion due to term transitions, curriculum changes (e.g., testing), extra-curricular activities (e.g., school musical), and other events (e.g., excursions).

Core subject lesson structure typically consisted of direct instruction (average 7 minutes, approximate range 1-30 minutes) followed by a brief transition into work time. Instruction usually involved the teacher explaining the task while student sat on the classroom floor or at their desk. Work time consisted of independent individual, independent collaborative, partner, or small group work. Tasks varied in terms iPad and/or non-iPad based tasks, consisting of reading tasks, writing tasks, worksheets, posters, game-based activities, slideshow presentations (iPad), and/or the use of educational iPad apps. Students worked at assigned desks, or in various classroom locations (i.e., other desks, on the floor, the class hallway). Experimental sessions were conducted during scheduled core subject lessons. The teacher advised that lessons varied in duration, generally ranging from 30 min to 1.5 hours.

During work time students were typically seated in clustered, shared table formations. Seating arrangements were altered on a weekly basis for behaviour management, learning, and social purposes. Through the study the teacher continued to use existing behaviour management strategies, this included a school-based house point reinforcement system (at the end of term the house with the most points was rewarded with a free dress day and fun activities). Behaviour was also managed through a set of class expectations which specified core school principles, and good learning behaviours. Expectations were displayed in the classroom as shown in Figure 7.1. Consequences for misbehaviour involved separating students from peers, and then removing them from the class (Figure 7.1).

Figure 7.1. Images depicting classroom displays of (a) school rules (top left), (b) consequences for misbehaviour (top right), and (c) good learning behaviour (bottom centre).

7.2.4 Dependent variable. The primary dependent variable was on-task behaviour during core subject sessions. Disruptive behaviour was measured as a secondary concomitant variable to explore the effects of the self-management intervention on problem behaviour. On-task behaviour was defined as occurrence where student participants engaged with the current instructional or academic content. The definition also captured occurrences where student participants were oriented towards speakers (i.e., teacher and/or peer) discussing instructional or academic content. On-task behaviours were defined in terms of active and passive engagement in line with the Behaviour Observation of Students in Schools (BOSS; Shapiro, 2013) system. See Table 7.4 for descriptions and examples.

Off-task behaviour was defined as any instance where students were disengaged with instructional or academic content, and/or not oriented toward the appropriate speaker (e.g., teacher and/or peer). Off-task behaviours included instances when students were engaged in behaviour incompatible with on-task behaviour for the activity or task. Off-task behaviour was also defined in passive and active terms. Passive off-task was considered to have occurred when students were passively disengaged from an activity in a non-disruptive manner for at least three consecutive seconds as described in the BOSS system (Shapiro, 2013). Active off-task was defined as any behaviour where students were off-task and actively engaged in an instance of disruptive behaviour. See Table 7.5 for descriptions and examples of off-task behaviour.

Disruptive, or inappropriate classroom behaviour, was defined as any behaviour contrary to classroom behaviour expectations which disrupts (or could disrupt) class activity. Disruptive behaviour in the context of this study was any behaviour not permitted by the teacher which may warrant negative teacher attention or student-teacher interaction (i.e., behaviour re-direction, reprimand, negative consequence). Disruptive behaviour was defined in terms of motor behaviour, verbal behaviour, noncompliance, and peer-interaction. See Table 7.6 for descriptions and examples of disruptive behaviour.

To adopt a participant-centred approach the broad behaviour definitions were created by integrating information obtained from (a) the preliminary observations, (b) teacher reports, and (c) adapted behaviour definitions attained from relevant SCD studies, theoretical articles, and observation systems (e.g., Chafouleas et al., 2005; BOSS System by Shapiro, 2013; Wills & Mason, 2014). Disruptive behaviour and off-task behaviour (the converse of on-task) were considered distinct variables as we suggest that they do not always occur concurrently. For example, a student may be off-task (e.g., daydreaming) but not disrupting other students, or a student may be disruptive (e.g., talking loudly) whilst being on-task (e.g., completing work).

Table 7.4

On-Task/Task Engagement Description and Examples

Description	Examples
	Active Engagement
Appropriate behaviour response to teacher or lesson	▪ raising hand to speak to ask or answer a question, ▪ choral response, ▪ contributing to open class discussion
Appropriate interaction	▪ conversing or collaborating with peers and/or teacher about the assigned tasks in small group or class discussion when permitted – includes asking clarifying questions, asking teacher for help, having teacher check work, or working with a peer/s, ▪ lightly touching peer in a friendly or appropriate manner – includes pat on the back, shaking hands, lightly taping to gain attention
Working on assigned tasks	▪ working on assigned task at assigned desk or other acceptable area – this may include writing, reading or otherwise actively completing assigned tasks (i.e., typing on computer, using iPad, manipulating relevant materials)
Transition and appropriate movement	▪ gathering or putting away materials when instructed by the teacher OR when necessary for assigned task ▪ organising relevant materials ▪ lining up to engage with teacher ▪ taking a water break, bathroom break, or getting a piece of fruit from bag (acceptable in this class) ▪ performing an errand for the teacher ▪ going on an “EnviroWalk” to seek information pertaining to the learning task ▪ moving around the room when permitted or when appropriate ▪ walking directly to new position if a transition is required
Other	▪ responding or complying to teacher instruction/direction (i.e., working quietly, working in groups, working independently IF and WHEN instructed by teacher) ▪ using any aspect of the self-management intervention system ▪ sitting appropriately in the assigned seat or appropriate location in the classroom for a specific assignment
	Passive Engagement
Passive attending	▪ looking at or attending to appropriate stimuli during teacher instruction or during assigned tasks (i.e., classroom board, book, worksheet, iPad, video projector etc.) ▪ looking at, listening and attending to peers during discussion or task ▪ looking at, listening and attending to teacher during instruction or when addressed ▪ waiting for turn to speak with teacher or peer

Table 7.5

Off-Task/Task Disengagement Description and Examples

Description	Examples
Passive off-task[a]	▪ staring blankly or daydreaming ▪ looking around the room; looking away from the teacher and/or instructional materials; directing attention to something unrelated ▪ not focusing on assigned task (i.e., sitting quietly not working, waiting quietly prior to starting an assigned task, spending too long organising materials, or waiting quietly after completion of an assigned task) ▪ scribbling on paper or desks; doodling, drawing or writing not related to task; using iPad in a manner not related to task[b] ▪ using work materials inappropriately and/or manipulating or fiddling with objects not related to academic task[b]
Active off-task	Behaviour which falls in line with the passive off-task definition AND the disruptive behaviour definition (see Table 7.6)

[a] Behaviour must be displayed for at least 3 seconds AND must not fall under the category of a disruptive behaviour

[b] Coded as off-task only if behaviour did not disrupt peers or does not warrant teacher attention (e.g., playing with materials/objects quietly). Coded as off-task AND disruptive if behaviour disrupted other students or warranted teacher attention (e.g., throwing paper, manipulating materials while engaging with other students).

Note. Off-task behaviour was not coded if students were on-task and behaving appropriately OR if the students were on-task and engaging in disruptive behaviour (i.e., completing activity whilst being very loud).

Table 7.6

Disruptive Behaviour Description and Examples

Description	Examples
Motor	▪ physical movement breaching expectations or inappropriate for assigned task. May include walking, wandering, crawling, running around classroom, swinging on chairs unnecessarily [a] ▪ mucking about or being rowdy ▪ out-of-seat behaviour (i.e., during times where student is expected or instructed to work in seat)[a] ▪ interfering with peers' property inappropriately; touching peers' belongings without permission ▪ physically touching a peer -when not related to an academic task or such that it disrupts the peer from work (i.e., touching, poking, leaning on) ▪ being sent from the room or being physically removed from the room ▪ turning or twisting around in seat – orientated away from the classroom instruction or task ▪ fidgeting, wriggling, squirming (in seat or out of seat)[b] ▪ making noise through movement of class furniture; unnecessary movement of class furniture
Verbal	▪ making disruptive audible sound or noise (i.e., whistling, screaming, humming, forced burping, laughing inappropriately or at unsuitable times) – may be intentional or non-intentional ▪ talking loudly when not appropriate (unsuitable voice level) ▪ talking to or engaging with peers about topics unrelated to tasks ▪ making unauthorised comments or inappropriate remarks ▪ teasing or taunting another peer ▪ talking out of turn (i.e., shouting or talking out), talking during quiet time or without teacher permission, addressing teacher without raising hand or without waiting turn; or calling out answers to academic problems when the teacher has not asked for an answer
Noncompliance	▪ failure to follow individual or group instruction delivered by teacher within 5 seconds (i.e., ignoring verbal direction from teacher) ▪ refusal to follow class rules or expectations ▪ questions instructions (challenges teacher) ▪ talks back and is argumentative
Negative Peer-Interaction	▪ inappropriate interactions with classmates (i.e., nonverbal gestures, verbal disruption, insults, picking on peer, or troubling physically or harassing)

[a] Movement and out-of-seat behaviour permitted by teacher provided that the student is engaging appropriate task-task related behaviour and complying with instruction
[b] Must be 3 seconds in length
Note. Motor and verbal disruptive behaviour have been modelled based on the off-task motor and off-task verbal behaviours described in the BOSS system (Shapiro, 2013). Noncompliance and negative peer-interaction has been modelled based on definitions outlined by Chafouleas, McDougal, Riley-Tillman, Panahon, & Hilt (2005).

7.2.5 Data collection- direct observation procedure. Direct behaviour observation data were collected using a 15-second (15-s) partial-interval recording (PIR) rotation system. The primary observer (PhD author) used the interval recording, direct observation system to record off-task and disruptive behaviour observations while discretely circulating the classroom. Given the continuous, non-discrete nature of off-task behaviour, and the unpredictable nature of disruptive behaviour (i.e., can be discrete or continuous) PIR was selected as it can be used to capture occurrences of both behaviours regardless of duration (Brown-Chidsey, 2005; Cooper, Heron, & Heward, 2007). PIR also enables observers to simultaneous observe off-task and disruptive behaviours across multiple participants (Ayres & Gast, 2010; Brown-Chidsey, 2005; Cooper et al., 2007). In this study off-task observations were prioritised over on-task, given off-task behaviour often occurred along with disruptive behaviour. Data was collected during small group, partner, or independent collaborative core subject (i.e., Literacy/Inquiry, Maths, and Religion) work time. Observations did not occur when students worked under teacher supervision or guidance. Observations commenced after students received teacher-delivered instruction (set-up for self-management in the intervention phase) and the large majority of students had transitioned to the appropriate workspace to commence the assigned activity. Transition time took on average 2 minutes (range: 0 - 7 minutes) and the average observation session lasted 24 minutes (Range: 8 mins to 60 mins) with an average of 33 intervals per participant (Range: 20 – 118 intervals).

PIR involves breaking observation sessions into equal blocks of time, or intervals. For each timed interval observers record behavioural incidence if the target behaviour occurred at least once at any point within an interval regardless of behaviour duration, frequency or nature (i.e., discrete/continuous) (Chafouleas, Riley-Tilman, & Sugai, 2007; Cooper et al., 2007; Kennedy, 2005; Wood, Hojnoski, Laracy, & Olson, 2015). Behaviour was recorded using a tailor made PIR form (Appendix E.6). PIR data was used to compute measures of behaviour occurrence for each session in the form of the *proportion of intervals* behaviour was observed during the session (Ayres & Gast, 2010; Cooper et al., 2007; Lane & Ledford, 2014). Off-task and disruptive behaviour proportions were calculated by dividing the number of intervals in which each behaviour was observed by the total number of observation intervals in that session. The converse of % off-task computed to plot % on-task in results

The current PIR system mirrored systems used in past self-management research (e.g., Amato-Zech, Hoff, & Doepke, 2006; Cihak, Wright, & Ayres, 2010; Coogan, Kehle, Bray, & Chafouleas, 2007; King-Sears, 2006; Salend, Tintle, & Balber, 1988; Stahr, Cushing, Lane, & Fox, 2006). The system incorporated a two part 15-s interval; the first 10-s were observation intervals and the following 5-s were used to record the presence or absence of both behaviours as observed in the preceding 10-s (Alessi, 1988; Ayres & Gast, 2010; Hurwitz &

Minshawi, 2012). Brief observation intervals were used to minimize recording error and inflated measures of behaviour - a noted PIR limitation (Chafouleas et al., 2007; Cooper et al., 2007; Kennedy, 2005; Rapp, Colby-Dirksen, Michalski, Carroll, & Lindenberg, 2008). To prevent overestimations of off-task behaviour a 3-second disengagement criterion was adapted from the BOSS system (Shapiro, 2013) and a method developed by Wood et al. (2015). Participants were required to be disengaged for a minimum of three consecutive seconds within any one interval for off-task behaviour to be coded.

The current PIR method required observers to observe one participant per 15-s interval on a rotational system (Ayres & Gast, 2010; Skinner, Rhymer, & McDaniel, 2000). This approach was adapted from research presented by Boyle and Hughes (1994), Glynn and Thomas (1974), Harris, Friedlander, Saddler, Frizzelle, and Graham (2005), Hughes and Hendrickson (1987), Moore et al. (2001), and Rafferty (2012). Each session began with observers watching and recording the behaviour of the first target participant. In the next interval observers watched and recorded the behaviour of the second participant, and then the third in the following interval, and so forth. Once all participants had been observed, interval observations re-commenced with the first participant. Each interval observers were prompted to record observations by a Pebble Smartwatch Classic with an installed interval-app (Appendix E.7). The interval-app was programmed with a fixed 10-s/5-s interval cycle; the watch to vibrate after 10-s (end of observation interval) and then again after 5-s (end of recording interval).

To obtain a representative sample of behaviour, data was collected in each observation session until a minimum of 20-intervals were recorded for each participant (Ayres & Gast, 2010) or until the activity came to a natural end (Fiske & Delmolino, 2012; Kennedy, 2005; Lane & Ledford, 2014; Moore, Prebble, Robertson, Waetford, & Anderson, 2001). Converting data into proportion of intervals controlled for variation in session length across the observation sessions. The PIR rotational system was used to collect baseline, intervention, fading and generalisation probe data for target participants. Comparison peer data was collected using the same system.

7.2.5.1 Interobserver reliability. Two postgraduate Master of Psychology (Educational & Development)/PhD candidates with prior experience in education settings and behaviour observation served as independent secondary observers. Both secondary observers were trained to use the PIR observation system through instruction, modelling, and practice sessions. Training occurred over four sessions, each lasting between 45- 90 minutes. A 15-min video-extract[18] was used in practice sessions. To establish training reliability the primary observer and secondary observers simultaneously used the observation system to measure behaviour of four students in the video-extract. Video training continued until both secondary observers reached 85% agreement with the primary observer for two consecutive viewings. Agreement criteria was met; average agreement 91.7% (Range 89.2%-93.3%). A final practice observation was conducted in vivo (in the classroom), until both secondary observers reached 85% agreement with the primary observer for two consecutive sessions (min. of 15min duration). Agreement criterion was met; average agreement 91.3% (Range 87.7% - 95.0%).

Interobserver agreement (IOA) data was collected in all baseline and intervention phases for each target participant for a minimum of 20% of the observation sessions undertaken in each phase (Range 20%-37.5%). IOA data was not collected during fading phases and generalisation sessions due to scheduling difficulties. IOA sessions involved the primary observer and one additional observer roaming the classroom whilst simultaneously using the 15s-PIR system to measure participant behaviour. Prior to each session observers specified the participants to be observed, and calibrated observation cues on the Pebble Smartwatch interval app; the app was started at the same time to ensure vibration prompts were synchronised. Agreement was calculated using an interval agreement system (Cooper et al., 2007) where observers' recordings are compared on an interval-by-interval basis. Percent agreement was computed by dividing the number of agreements by the number of agreements plus disagreements multiplied by 100 (Cooper et al., 2007; Kennedy, 2005). Agreement at 85% was considered satisfactory. Where percentage agreement was insufficient, discrepancies were discussed and resolved in line with behaviour definitions. Overall average IOA across participants and phases was 91% (range 89-93%) for on-task behaviour and 90% (range 88-91%) for disruptive behaviour.

[18] The freely available video clip, titled Julie Eckels 4th Grade History; located on YouTube May 2015 (https://www.youtube.com/watch?v=CI0IrUIfX4s)

7.2.6 Data collection measures.

7.2.6.1 Teacher History Questionnaire (THQ). The THQ (Appendix E.8) was designed to obtain teacher (and co-teacher) information relating to teaching experience, class demographic information, and current behaviour management strategies.

7.2.6.2 Student History Questionnaire (SHQ). The SHQ (Appendix E.9) was designed to obtain student background information, and details concerning behaviour (i.e., descriptions, when it occurs, where it occurs, with whom, how often, potential triggers/antecedents or consequences, and past management strategies). The researcher-developed SHQ was created based on the broad reading of relevant published self-management SCD studies. Items relating to student behaviour were adapted from the Functional Assessment Interview (FAI; O'Neill, Albin, Storey, Horner, & Sprague, 2015).

7.2.6.3 School Behaviour Rating Scale (SBRS). The SBRS (Gardon, 2009) is an indirect pre-/post-intervention behaviour measure used to evaluate students' behaviour change from the teacher's perspective. The SBRS, developed by Gardon (2009) is a valid, reliable, internally consistent, and simple instrument designed to measure observable student behaviour, recognise behavioural strengths, and identify areas for improvement. The SBRS is an Australian developed tool designed for rating the behaviour of primary school students (Ages 5 to 12 years; Grades Kinder to 6). The SBRS comprises of six subscales including; General Classroom Behaviour, General Playground Behaviour, Getting Along with Other Students, Attempting Tasks Presented, Development of Social Skills, and Aggressive Behaviours. The measure, requires approximately 20 mins for completion, and is comprised of 51 behaviour descriptors (items) which are rated by teachers who have spent four to six weeks observing student behaviour across school settings. Each item is rated based on observed frequency of behaviour using a seven-point scale with three anchor points; Never, Sometimes, and Very Often. For five-subscales, higher scores correspond with more competent behaviour ratings, and observation of more prevalent positive behaviours across subscales. For the Aggressive Behaviours subscale, higher scores correspond with low frequency of the undesired behaviour. Subscale scores are used to obtain a Student Behaviour Profile, representative of how comparable student behaviour is to that of peers. The SBRS adopts a tri-level scoring system. Primary level ratings indicate scores which are similar to the majority of the peer group, secondary level ratings indicate additional intervention support is required, and tertiary level ratings indicate additional intervention support is *highly* recommended. SBRS info can be found in Gardon (2009; 2012).

Results for the SBRS subscales *general classroom behaviour* and *attempting tasks presented* (described in Table 7.7) are of particular interest in this study. Though scores of other domains are reported in the results section, the scores for the two noted domains are focused upon as they are of most relevance to the targeted behaviours in this study.

Table 7.7

School Behaviour Rating Scale – Subscale Description

SBRS Subscale	Description
General classroom behaviour	Subscale includes behaviours associated with following classroom rules, being able to follow instructions, come prepared to learn, and not be overly distracted by others.
Attempting tasks presented	Subscale includes behaviours associated with being on task and preserving with tasks considered difficult

Extracted from Gardon (2009)

7.2.7 Independent variable – Self-Management Assistive Technology (SMAT). The independent variable was a self-management intervention package incorporating Self-Management Assistive Technology (SMAT). The SMAT system included Apple iPads, Pebble Smartwatches, and novel SMAT applications designed to facilitate self-management. The self-management package comprised of classic self-management elements including: target behaviour selection and definition, self-monitoring (self-monitoring prompting, self-observation and self-recording), and self-charting (self-graphing). See Chapter 6 for full package description.

The SMAT supported strategy involved participants wearing Smartwatches which emitted discrete vibrations on a variable-interval schedule while the participants engaged in schoolwork. When students felt the vibrations (self-management prompt) they covertly considered their own behaviour to ascertain whether they were engaged in the target behaviour or not (self-observation). Students then recorded whether they were engaged in the target behaviour or not (self-recording) on the Smartwatch. After self-recording, students were expected to resume work on their current task. Students could elect to view real-time self-recordings throughout self-management sessions via a web-app on their iPad. Following self-management sessions participants obtained numerical feedback via the web-app and charted their performance (% yes) on a graph (self-graphing) to monitor progress over-time.

During this intervention student participants were responsible for instrumentation set-up and pack-up, giving students greater responsibility over the behaviour management strategy. In an effort to target behaviour consistent with established classroom expectations the teacher and researcher collaborated to select and define target behaviour.

7.2.8 SMAT instrumentation and materials.

7.2.8.1 Applications. The SMAT System incorporated two novel technology-based applications; a web-based application (*SMAT web-app*), and a partnering smartwatch-application (*SMAT watch-app*). For student participants the SMAT System functioned as an intervention control platform used to start, pause, and end sessions; a self-monitoring prompt; a recording device; a real-time monitoring tool; and a device which provided numerical feedback used for graphing purposes. For the researcher the SMAT System served as a configuration platform used to program vibration prompt schedules; a management tool used to activate and end intervention sessions; and a tool for monitoring student recording. All data entered into the SMAT System was stored on a secure database via wireless network connection.

7.2.8.2 Devices. Student users accessed SMAT System apps on a Pebble Smartwatch Classic[19], which linked with students' personal Apple iPads[20] via Bluetooth. Pebble Smartwatches are a wearable sport watch sized smartwatch capable of emitting discrete vibrations, and supporting applications compatible with Pebble technology. Students were accustomed to iPad use in the classroom, thus increasing the likelihood that the SMAT Strategy could be discretely integrated into the class setting. A SONY VAIO laptop operating on Windows 8 was used by the researcher for SMAT intervention session programming and monitoring. Wi-Fi connectivity was required in the intervention setting for all devices to support the SMAT System. SMAT System apps were set-up (i.e., loaded, configured, and

[19] Each participant student was allocated a Pebble Smartwatch purchased with funding was obtained from the Monash University Faculty of Education Research Fund ($149 AUD; $99 USD)

[20] All students in the class were allocated an iPad to facilitate learning, thus it was practically and financially convenient to make use of this device.

tested) on iPads and Smartwatches prior to intervention. For greater detail on SMAT System apps, devices, and set-up see Chapter 6.

7.2.8.3 Supplement materials. *SMAT graphing sheets* incorporating a blank bar graph grid (see Appendix E.10) were used by participant students in conjunction with the SMAT system to chart behaviour performance after each intervention session. A *SMAT folder* (A4 refillable display book with plastic pockets) was used to store graphing sheets. *SMAT process prompt sheets* (see Appendix E.11) presenting SMAT intervention steps were used to guide student participants and the teacher through intervention sessions. Student prompt sheets detailed three processes: (1) Starting Up; (2) Self-Managing; and (3) Finishing Up. Student prompt sheets were displayed above the bench where participants set-up SMAT for intervention sessions; the adult prompt sheet was stuck onto the class whiteboard.

7.2.8.4 Implementation resources. A set of SMAT intervention manuals (see Chapter 6) and associated checklists were used to guide active researcher (aka. intervention facilitator) and teacher collaboration in developing and implementing the SMAT intervention. A training PowerPoint slide-show was used to visually facilitate student training (Appendix E.12).

7.2.8.5 Checklists.

7.2.8.5.1 Training and process fidelity. Three *student training* process and mastery checklists were created for this study. Training checklist one; *SMAT Student Training Checklist* (Appendix E.13a), presents a step-by-step procedure modelled off the SMAT instructional sequence (Figure 7.2). Training checklist two; *Guided and Independent Practice Checklist* (Appendix E.13b), details the 13-step *starting-up, self-management*, and finishing-*up* process students complete each SMAT sessions. Training checklist three, *SMAT Post-Training Student Mastery Checklist* (Appendix E.13c), contained eight mastery indicators outlining procedures that the students needed to master prior to the intervention phase. Two process fidelity checklists; adult and student versions, were created for this study (Appendix E.14 a and b). Checklists comprised of seven and eight core steps that were completed by adult and student participants during SMAT sessions. The student checklist contains an additional item to code student use of the iPad/SMAT web-app throughout SMAT sessions.

7.2.8.5.2 Social validity. Social validity from the teachers' perspective was evaluated across intervention acceptability and effectiveness through use of the Intervention Rating

Profile (IRP-20) (Witt & Martens, 1983) and the Behaviour Intervention Rating Scale (BIRS) (Elliott & Treuting, 1991; Von Brock & Elliott, 1987). The IRP-20 consists of 20 self-report items rated on a 6-point Likert scale. Factor analysis of the IPR-20 identified one major factor, acceptability (i.e., appropriateness and will it help the child), and four minor factors of intervention acceptability including risk to the target child, amount of teacher time required, effects of the intervention on other children, and amount of teacher skill required (Witt & Martens, 1983). Coefficient alpha for the scale was .91, which suggests adequate reliability (Witt & Martens, 1983). The BIRS consists of 24 items also rated on a 6-point Likert scale. Factor analysis of the BIRS identified three factors: acceptability, effectiveness, and time of effect (Elliott & Treuting, 1991). Coefficient alpha for the scale was .97, which suggests adequate reliability (Elliott & Treuting, 1991). A hybrid scale comprised of 38 items was created for this study by merging the BIRS and IRP-20 scales and removing duplicate items (Appendix E.15a). Items were rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree); higher scores (i.e., 5 or 6) reflect higher acceptability. Social validity from the students' perspective was measured using a questionnaire comprised of eight-items evaluating students' opinion on the self-management strategy, the training approach, intervention use difficulty, and the perceived outcomes (Appendix E.15b).

7.2.9 Teacher/research collaboration. For this pilot study the researcher collaborated with the classroom teacher to: (a) recruit target students and comparison peers over a four-week period using the five-phase nomination and recruitment procedure described in Chapter 6, (b) adapt intervention elements to suit the classroom environment, the needs of the teacher, and the needs of participating students, (c) prepare for implementation (i.e., scheduling), (d) arrange and undertake student training, (e) tailor intervention resources, and (f) implement the intervention. The researcher and teacher also collaborated to establish teacher expectations for this study. The teacher agreed she would complete implementation protocol to the best of her ability, whilst continuing to engage in her usual teaching practices and management strategies. Agreed upon teacher behaviour expectations are presented in Table 7.8

Table 7.8

Teacher Behaviour Expectations

Please DO:	▪ Go about your classroom activities as usual ▪ Continue with any classroom management or behaviour management plans which were in place prior to the research study ▪ Interact with students in your usual manner
Please DO NOT:	▪ Prompt or encourage the participating student/s to get on task or stay on-task more so than usual. ▪ Provide participating students with praise or reinforcement above and beyond what was provided during baseline (or what is generally provided to other students in the classroom) ▪ Stop any classroom management plans put in place prior to the study ▪ Stop delivery of any disciplinary action due to inappropriate classroom behaviour ▪ Change behaviour or academic expectations for the participant (i.e., do not lower expectations) ▪ Use the intervention and/or intervention devices as good behaviour reinforcers ▪ Ask students to “behave” or “be good” for the researchers when they are in the classroom setting

Adapted from Bedesem, 2010 with permission

7.2.10 Research design and procedures. A multiple-baseline design (MBD) across core academic subjects was used to evaluate the effects of the technology-based self-management intervention on the participants’ on-task and disruptive behaviours in the general education classroom setting. This design included baseline (plus training), intervention, and fading conditions. Concurrent baseline and intervention data were collected across staggered baselines via the 15-s PIR rotation observation procedure. Baseline and intervention sessions occurred when the teacher taught – typically Mondays, Tuesdays, and Wednesdays. Generalisation probes were usually collected on Thursday and Friday when the co-teacher taught. Phase-changes decisions were made based on the primary dependent variable - on-task behaviour. To ensure a rigorous study design and maximum experimental control, the study, where possible, adhered to the WWC design quality standards (Kratochwill et al., 2013; WWC, 2014). Standards included the systematic manipulation of intervention, the collection of adequate IOA data, and where possible the demonstration of six MBD phases in an attempt to provide evidence of effect at three different points in time. In addition, efforts were made to collect a minimum of five data points per condition phase prior to changing phase; where this was not possible three data points were considered acceptable. If visual analysis determined data was trending or highly variable additional phase data points were collected. This study was completed across two school terms; excluding holiday breaks and school camps.

7.2.10.1 Baseline. In the baseline phase no student engaged in self-management; students were not provided SMAT instrumentation. To adhere with baseline logic (Cooper et al., 2007) baseline data, where possible, was collected until a clear, consistent, predictable and stable pattern of behaviour was observed. Baseline data was considered stable when three consecutive data points did not vary more than *20%* from the mean (and median) in either direction. This criterion was adapted from Bedesem (2012) and Wood, Murdock, & Cronin (2002) who apply similar criteria in previous self-management studies. Unlike Bedesem (2012) and Wood et al. (2002), who considered a 50% criteria from the mean, a more conservative criteria was applied to align with visual analysis criteria used by Busacca et al. (2015).

Participants all entered the first intervention phase after three stable on-task baseline sessions. The intervention phase commenced in subsequent tiers, in a staggered fashion, once stable on-task baseline data was observed, *and* a notable behaviour improvement had been observed in the intervention phase of the previous tier. This aligns with MBD baseline logic (Cooper et al., 2007). In this study a notable improvement was operationalised as three consecutive intervention data points (a) had fallen within the plotted mastery range, or (b) did not overlap with the last three consecutive baseline data points (adapted from Rafferty, 2012).

7.2.10.2 Student training. Prior to the intervention phase, target students were required to demonstrate independent use of the SMAT Strategy. During baseline, approximately two weeks prior to the literacy (Tier 1) intervention phase, target students were trained in how to use the SMAT System. Two formal instructional sessions (approx. 40 mins each), and one applied practice session (average duration 37 minutes; range 33-47 minutes) were held to train student participants across three school days. Session 1, which involved target participants, the teacher, and the researcher, was conducted in the classroom. Session 2, a one-on-one session with the researcher, was held in the classroom corridor. Session 3 involved target students undertaking an independent practice session using the SMAT system under supervision in class. Training focused primarily on introducing target behaviour (Table 7.9), teaching students to discriminate between target and non-target behaviours, training students on how to use the SMAT System, introducing students to the SMAT System class rules (Table 7.10), and showing student where to collect SMAT instrumentation (see Figure 7.3). Target students were taught to use the SMAT System through direct instruction, modelling demonstration, role-play, guided-practice, independent-practice, and positive and corrective feedback methods. The training framework presented in Figure 7.2 guided training processes.

Step 1: Introduce Self-Managment and Target Behaviour

- (1.A) Introduce Concept of Self-Management Strategies: Provide rationale for self-management
- (1.B) Identify Target Behaviour: Demonstrate examples and non-examples through behaviour discrimination
- (1.C) Student practice of target behaviour (Create Target Behaviour Prompt[#]).

Step 2: Introduce SMAT System

- (2.D) Introduce SMAT System
- (2.E) Adult Models Self-Management Strategy through think-aloud examples

Step 3: Provide Practice, Assess Mastery and Transfer to Authentic Setting

- (3.F) Guided practice opportunitites for students (under adult supervision)*
- (3.G) Discuss the When, What, Who, How (Intervention House Keeping)
- (3.H) Independent practice in classroom setting*

[#] For Troy only – see Intervention Accommodations to follow

*Consideration of Student self-management mastery and procedural accuracy

Adapted from Bedesem (2012); King-Sears & Carpenter (1997); and McDougall, Morrison, & Awana, (2012)

Figure 7.2. The SMAT instructional sequence

Table 7.9

Target Behaviours and Descriptions

On-task Behaviour	▪ Doing my work or thinking about my work ▪ Remaining focused even when class mates try to distract me (ignore inappropriate peer behaviour) ▪ Actively working with peers or group member ▪ Removing things that I find distracting from my work area (for example, things I may fidget with)
Appropriate/Expected Classroom Behaviour	▪ Following directions straight away AND the first time they are given ▪ Listening when the teacher (or speaker) is talking ▪ Starting assigned tasks or work straight away ▪ Moving about the classroom ONLY for the purpose of my learning (i.e., Going on Envirowalks or gaining materials for the current activity) ▪ Engaging in on-task learning conversations if appropriate AND allowed by teacher ▪ Asking permission to leave the room ▪ Follow classroom rules ▪ Using materials and iPads in an appropriate manner

Table 7.10

Rules for Self-Management

- Wait until the teacher tells you to get your self-management materials out
- Do not wear your watch out to recess or lunch
- Do not take your watch home with you
- Put your watch in the **Watch Box** on the teacher's desk before you go out for recess, lunch or leave for home
- Do not flaunt or brag to other students that you have a watch
- IMPORTANT: Whenever the watch vibrates <u>immediately</u> respond to the question on the screen *accurately* AND as *quickly* as possible.

  THEN <u>get straight back to work</u>
- Do not draw attention to the vibration it should be a secret that only you know about!
- FOCUS ON PERFORMING **ON-TASK** and **APPRORIATE CLASSROOM** BEHAVIOURS WHILE USING SELF-MANAGEMENT

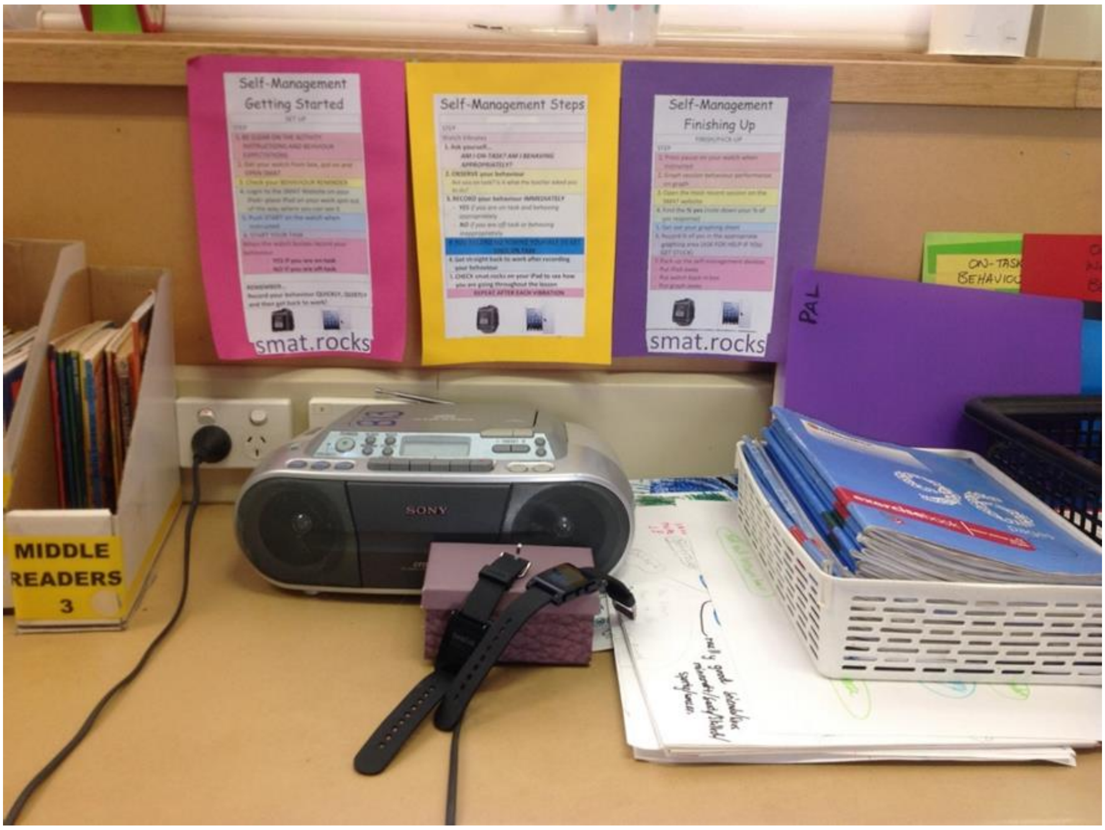


Figure 7.3. The SMAT area

7.2.10.2.1 Intervention introduction. During training the entire class was introduced to the Pebble Smartwatch to ensure all peers were familiar with the foreign object being used in the class setting. When first introduced into the class setting smartwatches proved slightly distracting as they instantly became a hot topic of student discussion; presumably due to novelty. Initial interest subsided after SMAT processes and devices were formally presented and demonstrated to students. Exposing peers to the SMAT system prior to intervention seemed to appease student curiosity and minimised class disruption.

7.2.10.2.2 Booster session. After training sessions, baseline data was collected for two weeks to assess for possible training effects on behaviour. Booster sessions were held just prior to the intervention phase to review informational content presented in initial training. Booster sessions were conducted in class with Troy, Joey, and Pete; sessions lasted 10-15 minutes. Students were reminded to approach the teacher or researcher with any questions or concerns during the phase.

7.2.10.3 Intervention. Next, the self-management intervention was implemented in the general education classroom setting. The SMAT strategy was initially used during Literacy/Inquiry (Tier 1) and across Maths, and Religion (Tiers 2 and 3) at later stages. Prior to each intervention session the researcher used the SMAT web-app to program and activate a unique self-management intervention session (aka. SMAT session) for each participant. Throughout the intervention phase the teacher prompted students to set-up for SMAT sessions during class transition after class instruction and prior to commencing the academic task; this occurred up to three times per day depending on participant availability and subject scheduling. To commence SMAT sessions students put on their Smartwatch, accessed the SMAT watch-app and pushed the start button to activate the system. Students who elected to use the SMAT web-app/iPad combo to monitor their behaviour self-recordings live during the session logged into their SMAT web-app (*smat.rocks*) student account and propped-up their iPad at their work space in view (e.g., Figure 7.4).

While participants engaged in academic tasks the SMAT watch-app displayed a prompt question (“Am I on-task?”) on the watch face, and emitted vibrations on a set variable-interval schedule (between 1 to 2.5 mins). After each vibration students observed their behaviour, and responded to the prompt question on the Smartwatch by recording “YES” or “NO” through the push of a button. Students self-recorded “YES” if they caught themselves on-task or behaving appropriately, or “NO” if the opposite occurred. The SMAT watch-app was programmed to provide a 10-sec recording window; if no response was recorded in this time the SMAT watch-app automatically ended the interval and initiated the next. Participants (ideally) continued with assigned tasks after each recording.

The teacher prompted students to pause the SMAT watch-app and to graph their behaviour at the end of each session. Students logged onto their SMAT web-app account via their iPad to view numerical performance feedback in the form of *percentage ‘yes’/’no’ recordings* (i.e., % of ‘yes’ vs ‘no’ recordings). Students would then record their % ‘yes’ score on the appropriate SMAT graph for the completed session (self-graphing), and pack away SMAT instrumentation.

Figure 7.4. SMAT Set-Up

7.2.10.3.1 Intervention accommodations. Aspects of the piloted intervention were slightly altered or individualised to accommodate unique student participant presentations, and to ensure the intervention remained socially valid. Procedural alterations are described.

Vibration Prompts. Vibration prompt schedules emitted from the SMAT watch-app via the Smartwatch were tailored to individual student needs. Students who displayed higher on-task behaviour (and lower levels of disruptive behaviour) in baseline were assigned a reduced-frequency prompt schedule, while students who displayed lower levels of on-task behaviour (and higher levels of disruptive behaviour) behaviour were assigned an increased-frequency prompt schedule. Student preferences also influenced the frequency of Smartwatch vibrations; discussions were held with participant students to ensure that prompt schedules rates would not disrupt them. Vibrations were emitted between 1 min -1 min 30 secs (60-90 secs) for Troy; 1 min 40 secs – 2 mins (100-120 secs) for Pete; and 2 mins- 2 mins 30 secs (120-150 secs) for Joey.

iPad Usage. Students were provided the option of using the ipad/SMAT web-app to monitor their behaviour live during SMAT sessions.

Post SMAT Session Booster Chats. Upon completion of SMAT sessions the researcher, when necessary, engaged participants in brief follow-up conversations or *Booster Chats*. Booster chats lasted no longer than a few minutes (<5mins), and typically occurred when students completed self-graphing. Follow-up booster chats were respectively conducted with Troy, Pete, and Joey in 63%, 43% and 19% of their SMAT sessions. Recording accuracy was typically the topic of booster chats. Discussion typically focused on: prompting participants to reflect on their recording accuracy, encouraging students to self-record accurately, and talking about the importance of accurate recording. Although no formal measurement of student self-recording accuracy was collected the observers gauged student recording patterns. This issue was addressed when participants were caught recording inaccurately for five or more intervals. Participants did not receive specific feedback on the accuracy of their self-monitoring data.

Target Behaviour Prompt (TBP) and Visual Prompt Card. After discussing Troy's special needs (specifically, his poor working memory and need for frequent reminders/ prompts in class) with the teacher it was decided Troy's intervention would incorporate a TBP. The TBP comprised of an A4 poster which presented photos of Troy self-modelling target behaviour (see Figure 7.5a). The TBP functioned as a visual reminder, depicting target behaviours Troy was trying to improve, which was viewed at the beginning of each SMAT session. Early in the intervention phase Troy stated that he did not need the prompt cards as he knew what his target behaviours were. Consequently, this element was faded out. Later in the intervention phase it was determined that Troy's behaviour did not stabilise. In an effort to stabilise behaviour an additional visual behaviour prompt with the statement "Am I on-task?" was implemented (see Figure 7.5b). The researcher worked with Troy to create the prompt card which served as a visual stimulus to remind him of his targeted behaviour.

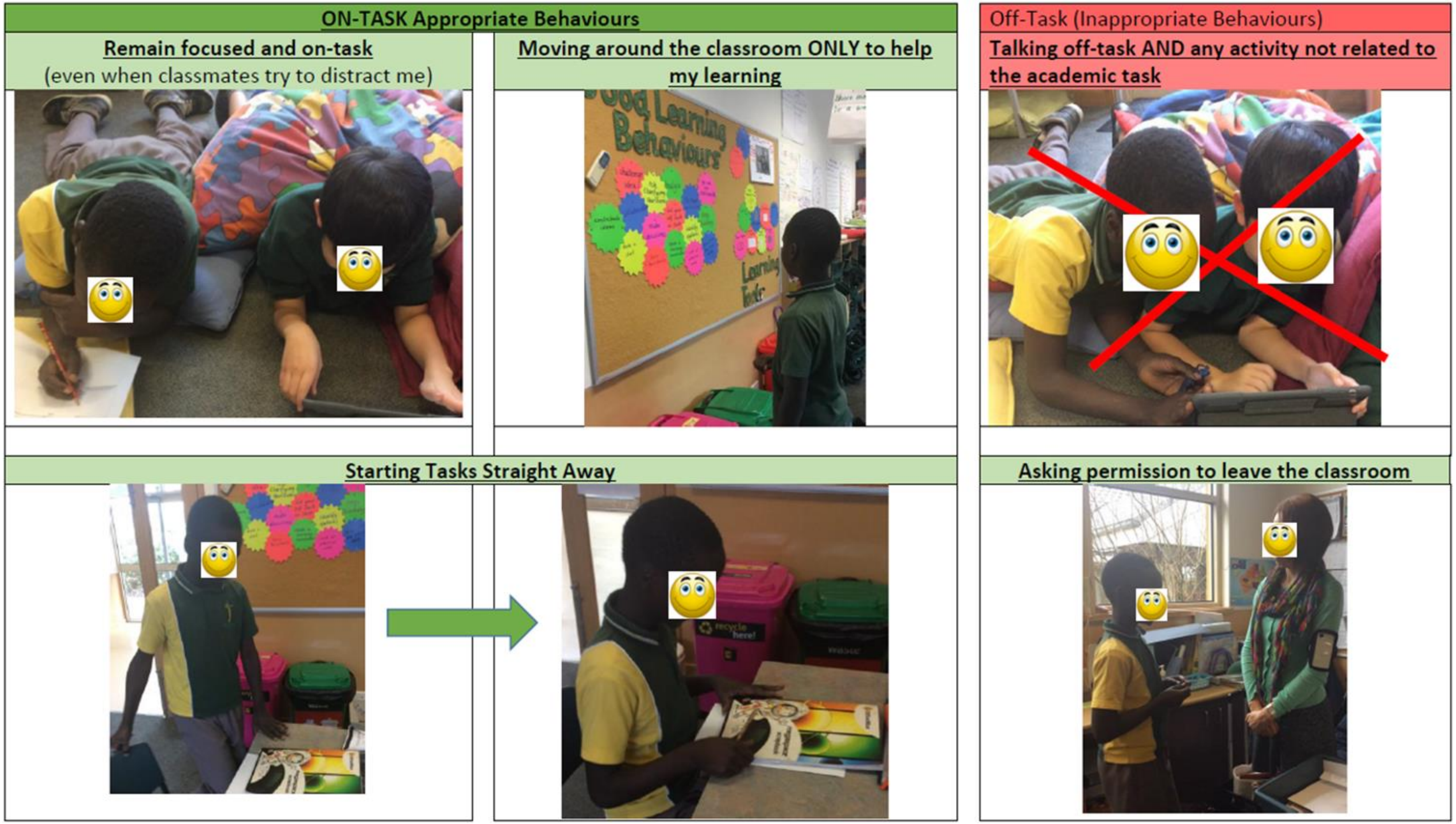


Figure 7.5a. Target behaviour prompt

Figure 7.5b. Visual Prompt

7.2.10.4 Fading (Generalisation - response maintenance). To promote response maintenance in the classroom the research design incorporated generalisation programming in the form of intervention fading. Aligning with the sequential-withdrawal design principle (Kazdin, 1982) the fading process involved gradually withdrawing or reducing elements of the intervention package over time. This involved reducing the frequency of vibrations emitted by the Pebble Smartwatch and removing the graphing component. The graphing aspect of the intervention was immediately withdrawn for all fading sessions. The vibration prompt was gradually withdrawn and fading programs varied across participants to suit student preference, performance, and needs. To promote student-involvement, input was obtained from students to determine the rate at which vibrations would be faded. Troy's fading condition also involved the gradual fading of two other intervention elements: the pre-session check-in/post-session booster follow-ups and iPad/web-app use during sessions. Post-session booster sessions were completely withdrawn from Pete and Joey's fading sessions.

Data were evaluated through this process to determine whether behaviour change was maintained over time after partial intervention removal.

The fading condition was introduced to all three students simultaneously across all three academic subjects. Fading sessions occurred across five school days with Troy and Pete, and across three days with Joey. For Pete the SMAT watch-app was programmed to emit vibrations on a 2.5-3.5min (150-210seconds) variable-time schedule during the first fading sessions (F1). Subsequent sessions were scheduled at: 3.5-4.5min (210-270seconds) on the second (F2) and third fading sessions (F3), and 4.5-5.5min (270-330seconds) on the fourth (F4) and fifth (F5) sessions. Joey's first fading session (F1) was set at a variable-time schedule of 3-4mins (180-240seconds). Fading session 2 (F2) and three (F3) were respectively set at 4-5min (240-360second) and 5-10min (360-600second) variable-time schedules. Troy's first fading session was programmed to emit vibrations on a 1.5-2min (90-120second) variable-time schedule (labelled F1 on graphs). Subsequent fading sessions were programmed with the following variable-time schedules: 2-2.5min (120-150seconds) on the second fading session (F2), 2.5-3min (150-180seconds) on the third (F3) and 3-4min (180-240seconds) on the fourth (F4) and fifth (F5) sessions. During F1 and F2 fading sessions Troy was given the option to make use of the iPad/web-app to monitor recordings during SMAT sessions. For F3, F4, and F5 sessions Troy ceased using the iPad/web-app. To promote maintenance of behaviour with Troy the visual prompt card stayed in place throughout fading sessions.

7.2.10.5 Stimulus generalisation. Further generalisation analysis investigated whether behaviour change extended to other situations (i.e., across novel stimuli, conditions or stimuli) (Cooper et al., 2007; Maag, 1999). To investigate stimulus generalisation, probes were collected for all participants in class when the co-teacher taught. Probes were analysed to determine whether self-management intervention use in one context (i.e., teacher days) coincided with spontaneous behaviour change generalisation in another context where self-management was not used (i.e., co-teacher days). Analyses are based on literacy and maths probe data due to insufficient opportunity to collect adequate probe data in religion sessions. Where it seemed that desired spontaneous generalisation was not going to occur, generalisation was actively programmed. A simple instructed generalisation (Cooper et al., 2007; Stokes & Baer, 1977) approach was adopted as a proactive method for programing generalisation. In programming sessions students were instructed to use the SMAT strategy on the co-teacher's days in the same way that they did in intervention sessions. Students were told they controlled strategy use in the novel context where necessary instrumentation was made freely available in the same way as in intervention sessions. No further training was provided to students.

Generalisation programming decisions were based on participant information (i.e., anecdotal evidence from teacher or co-teacher discussions) and observation data. Programming was initiated for Joey and Troy in literacy sessions; no programming occurred in Maths or Religion due to scheduling. For Joey programming occurred due to notable differences between the intervention and probe data means for on-task and disruptive behaviour. Programming occurred for Troy as the teachers advocated that Troy would benefit from active generalisation programming on the co-teacher days. Generalisation programming was not initiated with Pete as the co-teacher reported he was behaving at an acceptable level; data also did not demonstrate a notable difference between intervention data and generalisation probes.

Generalisation programing sessions were undertaken in co-teacher sessions when the fading phase commenced. For Troy generalisation programming sessions involved use of the (a) SMAT watch-app via the Pebble Smartwatch programmed to emit vibrations on a 1-1.5 min (60-90 secs) variable-time schedule, (b) SMAT web-app on the iPad, and (c) use of the visual prompt card. Brief post-session follow-ups were provided when required. For Joey generalisation sessions involved the use of the SMAT watch-app via the Pebble Smartwatch programmed to emit vibrations on a 2-2.5 min (120-150 secs) variable-time schedule. Joey did not make use of the web-app and did not receive any post-session follow-up. No student graphed their performance during these sessions; this decision was made to align generalisation programming with the fading processes.

7.2.11 Treatment fidelity. Treatment fidelity (or procedural fidelity, intervention fidelity and treatment integrity) was measured to (a) ensure critical student training steps were completed (*training fidelity*), and (b) analyse intervention adherence (*intervention process fidelity*). Intervention process fidelity was analysed in terms of the degree to which the SMAT intervention system was implemented as specified, and the extent to which the system was managed by adult agents and student participants.

7.2.11.1 Training Fidelity. The researcher completed checklists to evaluate students' *procedural adherence, procedural mastery,* and *self-monitoring accuracy* during intervention. Having students satisfy mastery requirements for intervention processes during training helps to ensure future success and independence in using self-management in authentic settings (King-Sears, 1999). A training checklist was used to guide training sessions to ensure all training elements were completed by the researcher (procedural adherence). Fidelity data was self-reported by the researcher who marked whether each training step had been completed. All steps were completed as specified. After guided and independent practice sessions the researcher used a checklist to record if participants had completed each step and whether they had done so independently or with partial assistance (procedural mastery). After each training session the researcher marked if students satisfied each mastery indicator and considered whether students had exceeded the mastery criterion. Students satisfied minimum requirements for all mastery indicators; thus it was judged that participants could successfully apply the SMAT Strategy.

7.2.11.2 Intervention process fidelity. Fidelity checklists were used to evaluate intervention fidelity (i.e., step-by-step adherence), and degree of management (i.e., the extent to which the intervention was (a) student-managed versus adult-managed, and (b) teacher-managed versus researcher-managed). Aligning with current literature (Barnett et al., 2014; Collier-Meek, Fallon, Sanetti, & Maggin, 2013; Ledford & Gast, 2013; Sanetti & Collier-Meek; 2014) data was collected using direct observation, self-report (i.e., researcher self-report), and permanent product fidelity measurement. Due to the unpredictable nature of classroom settings it was anticipated the teacher may not always be able to complete all steps in order, or at all. As SMAT procedures had not yet been formally trialled in applied settings it was unknown as to whether the steps would be feasible for a teacher. Thus, the decision was made that if the teacher was unable to complete any implementation step the researcher would assist. It was reasoned that completion of adult-managed steps was important to determine whether the SMAT System can be successfully used in a classroom setting.

To measure fidelity the researcher directly observed each SMAT session and completed both fidelity checklists by marking whether each step was completed (✓/YES or ✗/NO) and who completed it (i.e., student, teacher, researcher). Fidelity was measured on 100% of the intervention sessions. Session and step fidelity data was evaluated. Session fidelity analysed the average percentage of steps implemented across all sessions for each participant (student and adult). Session fidelity for each SMAT session was computed by dividing the number of steps implemented in a session by the total number of possible steps. Average session fidelity was computed by summing the percentage of steps for all SMAT sessions, dividing the total by the number of sessions and multiplying by 100). Step fidelity evaluated the percentage of sessions each step was applied. Step fidelity was computed by dividing the number of sessions in which a step was completed by the total number of SMAT sessions and multiplying by 100.

Analysis was undertaken to determine the extent to which each adult checklist step was implemented by the teacher versus the researcher. Percentage of teacher-implementation (% teacher) and facilitator-implementation (% facilitator) was computed for every adult checklist step across all participants. A final analysis was conducted to identify the degree to which each student checklist step was managed by the students themselves. This analysis looked at the percentage of independently student-managed steps (% student) versus the percent of steps which involved adult-assistance or joint-management (% joint). % student and % joint were computed for all student checklist steps across all participants. Mean values were not obtained as this analysis was completed at the individual participant level.

7.2.12 Social validity. Social validity was evaluated via social comparison and subjective evaluation methods (Cooper et al., 2007; Kazdin, 1977, 2011; Kennedy, 2005). Data was collected to investigate social validity in terms of the: (a) social significance of behavioural goals, (b) appropriateness of procedures, and (c) social importance of intervention effects (Kazdin, 1977; Wolf, 1978).

7.2.12.1 Social comparison. Social validity was evaluated by comparing the behaviour (DV) of target student participants to that of comparison peers, who served as a normative reference sample from the classroom (Cooper et al., 2007; Kazdin, 1977, 2011; Kennedy, 2005). Comparison peer observation data was collected prior to intervention to form a *micronorm*. Coined by Alessi (1980, cited in Alessi, 1988) a micronorm is a local norm standard based on the behaviour of peers (with similar demographic characteristics to target participants) who under the same task demands and context have not shown behaviour problems or been subject to intervention. The micronorm functioned as a standard used to determine if target participants required intervention (Alessi, 1988; Kazdin, 1977; Skinner et al., 2000). As target participant baseline behaviour deviated considerably from that of the comparison peer micronorm it was reasoned that intervention was warranted. The micronorm served as a criterion by which changes in participant behaviour was evaluated throughout the study (Kazdin, 1977). It formed a basis for evaluating the social significance of behaviour change/intervention effects. The micronorm also functioned as a normative standard which reflected realistic or reasonable behaviour change expectations. Ascertaining a local normative standard ensured that unrealistic or unobtainable behaviour change expectations/goals were avoided (Kennedy, 2005).

7.2.12.1.1 Establishing the micronorm. The first three weeks of formal data collection were dedicated to establishing the micronorm. In this time comparison peer observation data was collected. A minimum of five observation probes were collected for each comparison peer across the three academic subjects in the first three weeks to obtain a representative micronorm in adherence to the WWC standards. While the standards do not specifically apply to social comparison data, this criterion was adopted as a threshold to obtain a reasonable sample of comparison peer behaviour.

Average micronorm data for on-task and disruptive behaviour were computed through a three-step process. First, average behaviour estimates were computed for on-task and disruptive behaviour for each independent comparison peer across the three academic subjects (i.e., Comp Peer Lit Mean = sum %behaviour all probes/total No. probes). Next, average behaviour estimates for all comparison peer were aggregated across academic subjects and averaged to obtain an overall subject mean (aka. subject micronorm) (i.e., Literacy micronorm (mean) = (Comp Peer 1 Lit Mean + Comp Peer 2 Lit Mean + Comp Peer 2 Lit Mean + Comp Peer 4 Lit Mean)/4). Once a micronorm was computed for each subject, two range windows were established for each subject for the purpose of analysing probe variability in a conservative manner. The first range windows comprised of a 20% stability envelope (see visual analysis protocol Chapter 4), while the second window comprised of two standard deviations each side of the micronorm.

Comparison peer probes were collected on days that target participants were observed when scheduling circumstances permitted. Two to four comparison peers were observed for each probe (average of three peers). Comparison peer selection for probe observation was unsystematic, determined by student availability. Probes were used to check the stability of comparison peer data over time. Comparison peer micronorm data, corresponding ranges, and average probes are plotted with target participant data.

7.2.12.2 Subjective evaluation. Participant subjective evaluation involved the researcher obtaining feedback from the teacher, co-teacher, and the target participants via questionnaires and unstructured follow-up interviews.

7.2.12.2.1 Teacher subjective evaluation. The hybrid rating scale was completed by the teacher pre- and post-intervention to obtain feedback concerning anticipated (pre) and perceived (post) intervention acceptability and effectiveness. Following the post-intervention scale completion the researcher conducted an unstructured interview with the teacher to elicit further information. An unstructured interview was also conducted with the co-teacher.

7.2.12.2.2 Target student participant subjective evaluation. Following the fading phase each participant completed a post-intervention student feedback questionnaire. Students rated items on a 5-point Likert Scale ranging from 1 (Yes, a lot!) to 5 (No, not at all). Joey and Pete completed the feedback survey form independently without adult assistance; due to reading difficulties Troy received assistance in completing the form. Following feedback survey completion students were subjected to an unstructured interview conducted by the researcher conducted to elicit further information based on survey responses. The interview addressed perceived efficacy of the intervention, acceptability of the strategy, student preferences, and future recommendations.

7.2.13 Data analysis – effect size computation. Data for each participant were evaluated using visual analysis and statistical analyses. The no assumptions model standardised mean difference (SMD) effect size (Busk & Serlin, 1992) and the nonoverlap effect size technique Tau-U (Parker, Vannest, Davis, & Sauber, 2011) were computed to assess the effect of the intervention on on-task and disruptive behaviour. Intervention effects were calculated using participants as the primary unit of analysis; a separate effect size was computed for each participant for on-task and disruptive behaviour.

Busk and Serlin's SMD effect size (1992) was computed by subtracting the mean of the baseline from the mean of the corresponding intervention phase and dividing it by the standard deviation of the baseline phase. To obtain an effect size for each participant a weighted average estimate was calculated for each MBD across academic subject design following the method outlined by Beeson and Robey (2006). Computing SMD allowed of evaluation of magnitude of behaviour change. As no specific SCD conventions for interpreting SMD exist, effects were interpreted using Cohen's (1988) group design criteria– 0.2, 0.5, and 0.8 being indicative of small-, medium-, and large-effects.

Tau-U (Parker et al., 2011) is a non-parametric effect size approach that measures data non-overlap between two phases. Tau-U was chosen as, unlike other non-overlap methods, it can correct for undesirable baseline trend, is robust with small data sets, offers greater statistical power, and utilises all SCD data for calculations (Parker, Vannest, & Davis, 2011; Vannest & Ninci, 2015). While Tau-U can be calculated manually (see Parker et al., 2011, Parker, Vannest, & Davis, 2011; Vannest & Ninci, 2015) calculation of Tau-U in this study was undertaken using a web-based application[21] created by Vannest, Parker, Gonen, & Adiguzel (2016). Procedures presented in the instructional video accompanying the web-based application were followed to yield Tau-U effects. Tau-U was interpreted using the criteria proposed by Vannest and Ninci's (2015); small change (<0.20), moderate change (0.20-0.60), large change (0.60-0.80) and large to very large change (0.80>).

In addition to the aforementioned effect size percentage, means were used to draw comparisons between behaviour observed in the baseline, intervention, and fading phases. For each participant the mean percentage of intervals in which on-task and disruptive behaviour was observed was computed for each phase across all conditions. To obtain a phase mean all phase data points were summed and divided by the number of data points.

7.3 Results

In the following section, the SCD results are described for each participant with specific focus on treatment fidelity, design quality, intervention effects on on-task behaviour and disruptive behaviour, intervention generalisation and maintenance, and social validity outcomes.

[21] http://www.singlecaseresearch.org/calculators/tau-u

7.3.1 Treatment fidelity.

7.3.1.1 Training fidelity. Students completed 100% of the steps across four practice sessions (two guided and two independent). In the independent practice sessions Pete and Joey completed 100% of the steps independently, thus meeting mastery criterion. Troy independently completed 65% of the steps, requiring adult prompting with some steps. Despite this Troy commenced the SMAT system along with the other participants; however, he was provided with assistance initially until he was competent in the process. In training, students self-observed and self-recorded their own behaviour accurately and satisfied mastery criterion (Min. 80% accuracy) (self-monitoring accuracy). On average students accurately self-recorded 94.78% of the recording intervals (Range: 87.5-100%).

7.3.1.2 Intervention process fidelity.

7.3.1.2.1 Intervention step fidelity. Across all intervention sessions student participants collectively completed an average of 7.2 of the eight core student steps; mean session fidelity was 89%. Troy, Joey, and Pete respectively completed an average of 7.7 (mean fidelity 96%), 6.7 (mean fidelity of 84%) and 7.0 (mean fidelity of 88%) steps across intervention sessions. Session fidelity for Joey and Pete was reduced as they did not always log into the SMAT web-app on their iPads and set it up at their work space (Step 3a/b).

Table 7.11 presents mean percentages representing the proportion of intervention sessions each student step was implemented. Steps 4 and 5 were implemented in 100% of sessions while Steps 1, 2, 6, 7, and 8 were implemented in 88-97% of sessions. Step 2, watch obtainment, was not required in sessions where smartwatches had been worn immediately prior. While graphing (Step 7) occurred for all sessions times arose where students did not graph immediately following each SMAT session due to class scheduling. Step 8, session pack-up, was not completed in sessions where SMAT materials were needed in another SMAT session immediately following.

With regard to Step 3, participants each elected whether to use the SMAT web-app/iPad to support self-monitoring in sessions. Table 7.12 presents the average percentage for Step 3 across sessions for each individual participant. Results demonstrate that Troy used the iPad in 71% of the SMAT sessions. Joey and Pete respectively used the iPad in 4% and 22% of the SMAT sessions.

Table 7.11

Average Student Step Implementation Fidelity Across Sessions

Step	% implemented#	% not necessary#	% not implemented#
1. Listen	98	2	-
2. Obtain Watch	88	12	-
3. Set-Up Materials*	~	~	~
4. Open SMAT	100	-	-
5. Start	100	-	-
6. Pause SMAT	97	-	3
7. Graph	94	-	6
7.a. Open	92	-	8
7.b. Observe	92	-	8
7.c. Record	93	-	7
8. Pack-Up	90	10	-

*Results for Step 3 are presented at an individual level in Table 7.12
#Mean percentage of sessions the step was implemented, not necessary and thus not implemented, or not implemented at all

Table 7.12

Student Step Implementation Fidelity Across Sessions – Step 3a and 3b

Step	% implemented#	% not implemented#
3.(a.) SMAT Login (b) iPad Set-Up		
Troy	71	29
Joey	4	96
Pete	22	78

#Mean percentage of sessions the step was implemented or not implemented

The teacher and researcher collectively completed an average of 6.1 of the seven core adult fidelity steps across intervention sessions; mean session fidelity was 87%. An average of 6.3 (mean fidelity 90%), 6.0 (mean fidelity 85%) and 6.1 (mean fidelity 87%) adult steps were respectively completed across SMAT sessions with Troy, Joey, and Pete. As the intervention phase progressed it was not necessary for adults to complete each step every session due to students' increased independence in implementing the SMAT strategy. For instance, adults did not prompt students to gather SMAT materials (Step 3), or remind students to finish SMAT sessions (Steps 5, 6, and 7) as students, particularly Joey and Pete, began to take initiative in completing these steps without instruction.

Table 7.13 shows mean percentages representing the proportion of intervention sessions each adult step was implemented. Steps 1, 2, and 4 were implemented in all sessions (100%). Step 3, prompting students to set-up SMAT materials, was implemented, on average, in 80% of sessions. This step was not required in 20% of sessions as participants were already set-up for SMAT due to having completed another SMAT session just prior. Steps 5, 6, and 7 were on average implemented in 75%, 89%, and 63% of the sessions respectively. These steps were not completed in some sessions as students completed the finishing action without adult prompting.

Table 7.13

Average Adult Step Implementation Fidelity Across Sessions

Step	% implemented#	% not necessary#
1. Instruct	100	-
2. Commence Activity	100	-
3. Set-Up Materials	80	20
4. Start SMAT	100	-
5. End SMAT	75	25
6. Graph	89	11
7. Finish Session	63	37

#Mean percentage of sessions the step was implemented or was not necessary and thus not implemented

7.3.1.2.2 Recording accuracy. Throughout the intervention students were 100% responsible for independently self-monitoring (i.e., self-observation and self-recording in response to watch vibration prompts) their own behaviour in 100% of sessions. Though formal self-monitoring accuracy data was not collected throughout the intervention, observers monitored student accuracy informally when possible. It was observed that on occasion students were not accurate with their self-recordings. Student participants were asked why this may have been the case in the follow-up interview. Pete indicated that sometimes he simply “pressed the wrong button” on the smartwatch. Pete also reported that sometimes he was purposely dishonest as he “didn’t want to get a bad mark for the graphing.” Troy reported that he “did not want to push no… I [he] felt bad… I [he] wanted to get 100(%).” He referred to wanting to get a self-recording score of 100% for on-task behaviour for the graphing component.

7.3.1.2.3 Degree of management. Analyses revealed that of the adult intervention steps (Table 7.13) the teacher was largely responsible for implementing Steps 1, 2, 3, 5, and 6 across the intervention phase. The teacher implemented the steps in 89-100% of the sessions they were implemented in. The researcher was primarily responsible for the delivery of Steps 4 and 7. The researcher was responsible for implementing these steps in 95% and 85% of the sessions where these steps occurred. Figure 7.6 presents a bar chart depicting these results.

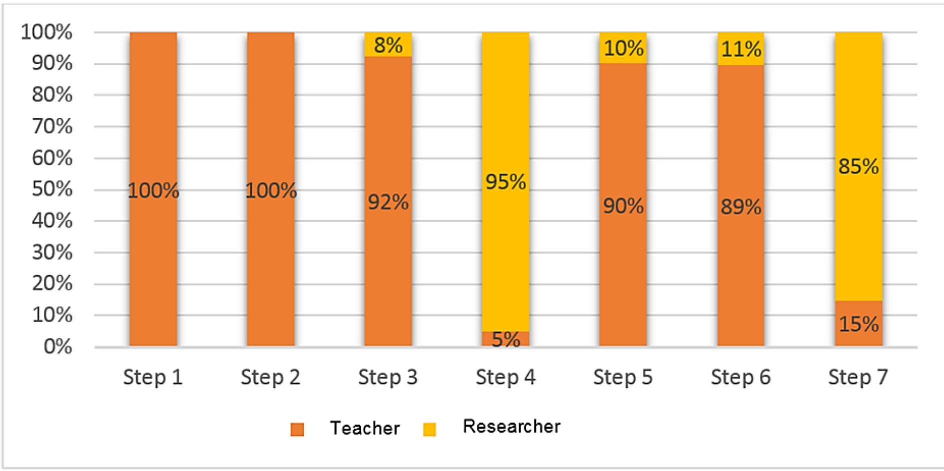
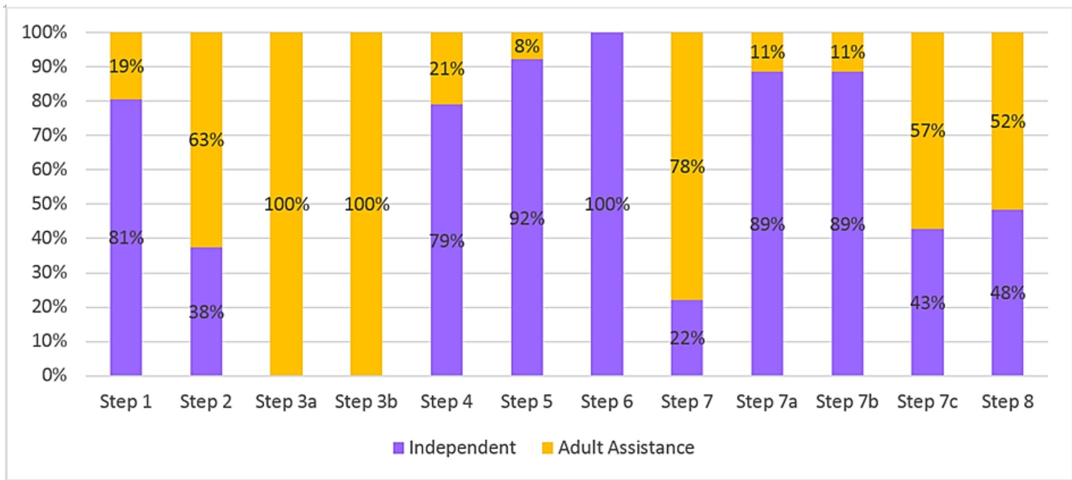
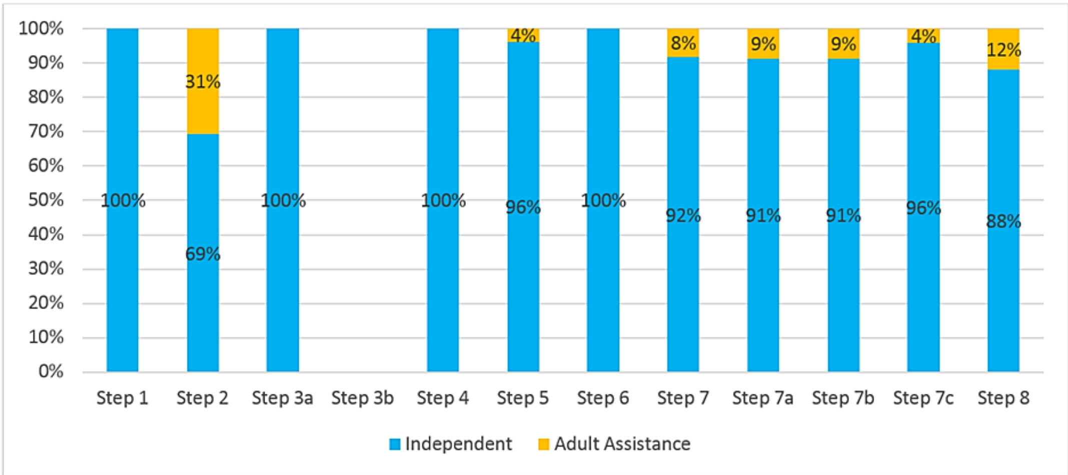


Figure 7.6. Teacher vs researcher implemented steps

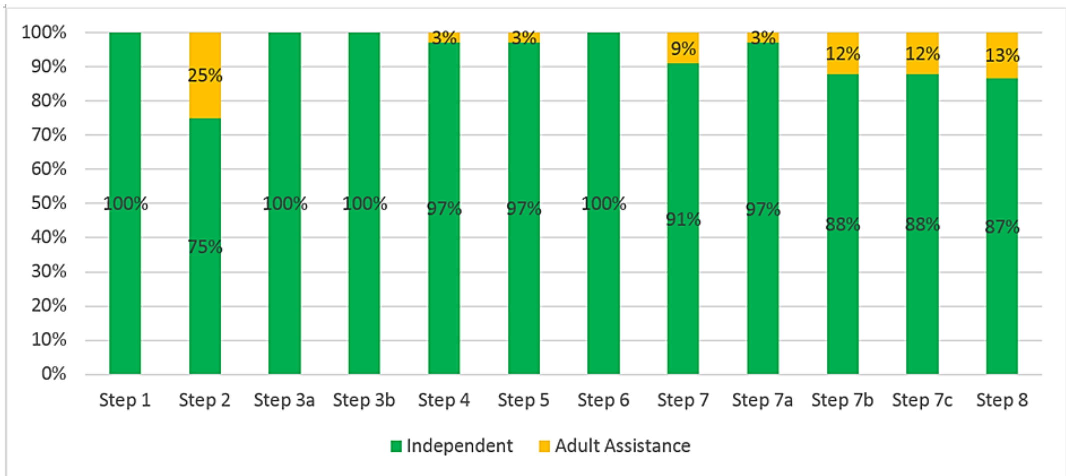
Analysis investigating the degree to which students managed the student intervention steps (Table 7.11) revealed that Troy was predominately responsible for the independent implementation of steps 1, 4, 5, 6, 7a and 7b in 79-100% of the sessions these steps were implemented (See Figure 7.7 (a)). In sessions containing steps 2, 3a, 3b, 7, 7c and 8, Troy obtained notable adult assistance in implementing these steps. Troy received adult-assistance whilst setting up the SMAT web-app/iPad (steps 3a and 3b) in 100% of sessions which included this step. Joey and Pete were predominately responsible for implementing student steps across intervention sessions (See Figures 7.7 (b) and (c)). Excluding step 2, Joey and Pete were responsible for implementing student steps in 88-100% of the sessions these steps were implemented. Joey and Pete were respectively responsible for Step 2, obtaining the smartwatch, in 69% and 75% of sessions where this step occurred. The researcher assisted with Step 2 predominately when students were not instructed to set-up for their SMAT session.



(a) Troy



(b) Joey



(c) Pete

Figure 7.7. Independently implemented vs adult assisted student intervention steps

7.3.2 Design quality. Review of the graphed experimental data presented in the following two sections reveals that the study design meets WWC design standards for two of the participants. Design standards were met without reservation for Pete's graphical data as the MBD contains a minimum of five data points across six phases (baseline and intervention), and demonstrates three attempts to show an experimental effect. The design standards were met with reservation for Troy's graphed data as only three data points were collected within the religion intervention phase, thus fulfilling minimum requirements. Troy's MBD also contains six phases, and three attempts to demonstrate an experimental effect. Unfortunately the design standards were not met for Joey's graphed data as only two attempts to demonstrate experimental effect were undertaken. A minimum of three are required in order to demonstrate functional relations (Kratochwill et al., 2013; WWC, 2014).

7.3.3 Effects of the SMAT system. The results reported in Figures 7.8-7.13 display graphed experimental data collected for each participant in baseline, intervention, and fading conditions. Data points in each MBD figure were collected during individual collaborative, partner or group work sessions undertaken across Literacy, Maths, and Religion subjects.

7.3.3.1 Effects on on-task behaviour. Table 7.14 presents student means, medians, minimum and maximum results for all conditions across the three MBD tiers. Table 7.15 presents co-teacher probe means and medians generalisation results. Figures 7.8, 7.9 and 7.10 present results showing the percent of intervals of on-task behaviour per session for Troy, Joey, and Pete across literacy, maths, and religion subjects during all conditions. Following baseline and intervention training conditions, self-management intervention was introduced across literacy, maths, and religion classes in a *staggered fashion* when baseline data demonstrated stability in accordance to criterion detailed in the method section on page 230.

Table 7.14

Participant On-Task Behaviour (%) Across Baseline, Intervention and Fading Conditions

	Troy			Joey			Pete		
	Lit.	Math.	Rel.	Lit.	Math.	Rel.	Lit.	Math.	Rel.
Baseline *M* *(Md)* (%)	31.13 (33.33)	27.66 (25.56)	40.86 (38.10)	51.67 (52.17)	65.17 (69.46)	58.79 (57.14)	36.31 (33.33)	45.77 (44.72)	42.68 (42.86)
Min. (%)	4.35	0.00	3.85	30.00	3.13	12.00	5.00	17.86	15.38
Max. (%)	64.00	61.90	86.67	76.00	100.00	96.67	69.64	82.00	80.95
Intervention *M* *(Md)* (%)	55.77 (54.09)	50.43 (53.33)	57.42 (53.85)	77.18 (83.33)	NA	56.53 (62.50)	65.06 (68.24)	67.85 (69.69)	67.27 (62.07)
Min. (%)	18.18	17.86	40.63	43.18	NA	27.50	29.17	50.00	50.00
Max. (%)	79.41	73.68	77.78	92.31	NA	74.07	90.00	83.64	100.00
Absolute Mean Change*	24.64	22.77	16.56	25.50	NA	-2.26	28.77	22.08	24.60
Fading *M* (%)	57.50	62.22	67.01	78.33	NA	90.91	59.17	69.17	48.52

Note: Lit. = Literacy/Inquiry; Math. = Maths; Rel. = Religion
*Absolute Mean Change = absolute difference between the baseline mean and the intervention mean

Table 7.15

Participant On-Task Behaviour (%) Generalization Data: Co-Teacher Sessions

	Troy			Joey			Pete		
	Lit.	Math.	Rel.	Lit.	Math.	Rel.	Lit.	Math.	Rel.
Baseline Co-Teacher Probes *M* *(Md)* (%)	32.56 (30.00)	34.09 (30.46)	34.07 (30.21)	50.30 (44.74)	54.86 (55.71)	37.21 (35.54)	37.69 (38.00)	45.65 (46.05)	53.00 (55.44)
Intervention Co-Teacher Probes *M* *(Md)* (%)	53.83 (58.33)	52.09 (52.09)	NA	65.07 (71.76)	NA	NA	51.39 (48.33)	67.59 (67.59)	NA
Gen. Program. *M* (%)	58.21 (57.14)	48.50* (55.00)	NA	70.65 (78.26)	NA	NA	65.50* (63.33)	81.32* (82.35)	NA

Note: Lit. = Literacy/Inquiry; Math. = Maths; Rel. = Religion
Gen. Program. =Generalisation Programming
*Sessions observed in fading phase with no generalisation programming, baseline conditions continued.

7.3.3.1.1 Troy. Figure 7.8 displays percent of intervals of on-task behaviour per session for Troy. During all three baseline phases, Troy showed considerable variability. Plotting a trend line using the split-middle method (Cooper et al., 2007; Gast, 2010) revealed a slight decreasing trend in literacy and maths baselines, and a slight religion baseline trend increase. Mean percent of intervals of on-task behaviour was 31.13% (range 4.35-64.00%) in literacy, 27.66% (range 0-61.90%) in maths, and 40.86% (range 3.85-86.67%) in religion.

An immediate increase on on-task behaviour was observed in literacy and maths intervention phases. Mean percent of intervals of on-task behaviour increased to 55.77% (range 18.18-79.41%) in literacy. Notable variability was identified across all three intervention phases, however literacy intervention data show increasing stability with an improving trend, if excluding the last three data points (obtained following a long weekend). Mean percent of on-task behaviour increased to 50.43% (range 17.86-73.68%) for maths intervention. While not immediately observable due to notable overlap with baseline data, Troy's mean percent of on-task behaviour increased to 57.42% (range 40.63-77.78%) in religion intervention. Religion intervention data showed a sharp trend increase.

Simultaneous fading of the intervention across the three subjects saw a slight improvement in mean percent of on-task behaviour intervals across literacy (M=57.50%), maths (M=62.22%) and religion (M=67.01%). Mean percent of on-task behaviour was 32.56% and 34.06% across literacy and maths for baseline generalisation probes collected in co-teacher sessions. Generalisation probes improved to a mean of 53.83% and 52.83% for literacy and maths intervention conditions. Probe data showed that generalisation means are comparable to baseline and intervention phase means; the means fell within 5% of each other. Generalisation programing probes demonstrated on-task behaviour averaged 58.21% in literature.

7.3.3.1.2 Joey. Joey's on-task results are presented in Figure 7.9. During literacy, religion, and maths baseline phases, the mean percent of on-task behaviour displayed by Joey was 51.67% (range 30.00-76.00%), 58.79% (range 12.00-96.67%), and 65.17% (range 3.13-100.0%) respectively. Notable variability is demonstrated in all three baseline phases with the greatest variability evident in maths baseline. Trend lines plotted using the split-middle method revealed a flat trend in literacy and religion baseline phases, and a maths baseline phase trend increase. Intervention was not introduced for maths, as analysis revealed an improving pattern of on-task behaviour in this subject. While intervention may have stabilised behaviour, the decision not to intervene was made based on observed data, student preference, and teacher judgement.

During literacy Joey's on-task behaviour increased to 77.18% (range 43.18-92.31%), and demonstrated a slight decreasing trend in the intervention phase. With the exception of one outlier which was collected following a three-day school camp, data collected during literacy intervention generally exceed baseline data which was collected following training prior to the phase change. Joey's on-task behaviour data during religion intervention showed a trend increase, along with a slight decrease in level to a mean of 56.53% (range 27.50-74.07%). Transition to the fading phase show Joey's on-task behaviour gains were maintained following the intervention phase at a mean of 78.33% for literacy. The singular fading phase data point for religion demonstrated a continued improvement in on-task behaviour following-intervention removal at 90.91%.

Generalisation probes collected during co-teacher sessions show an on-task behaviour mean of 50.30% in literacy baseline, and 65.07% in literacy intervention without active intervention implementation. Co-teacher generalisation data means are comparable to teacher data means in baseline and intervention phases; means fall within 5% for baseline and within 15% for intervention. Generalisation programing probes demonstrated mean percent on-task behaviour of 70.65% in literacy.

7.3.3.1.3 Pete. Figure 7.10 shows the percent on-task behaviour intervals per session for Pete across each academic subject within each condition. Baseline data across all three subjects showed considerable variability. Split-middle trend line plots suggest that literacy and religion baseline data demonstrate a slight trend increase, while maths baseline data demonstrates no trend. The mean percent of on-task behaviour demonstrated by Pete during baseline was 36.31% (range 5.00-69.64%) for literacy, 45.77% (range 17.86-82.00%) for maths, and 42.68% (range 15.38-80.95%) for religion.

Following intervention implementation literacy mean percent of on-task behaviour increased to 65.06% (range 29.17-90.00%). Despite some variability, literacy intervention data demonstrate a trend increase. Pete's on-task behaviour increased to 67.85% (range 50-83.64%) in maths, and 67.27% (range 50.00-100.00%) in religion during intervention. Both intervention phases demonstrated slight variability in data patterns along with trend increase. During the fading phase Pete's mean percent on-task behaviour in maths improved to 69.17%. Mean percent of time on-task declined slightly during the fading condition in literacy (M=59.17%) and religion (M=48.52%) fading phases.

Generalisation probe data revealed Pete's mean percent on-task behaviour was 37.69% in literacy and 45.65% in maths during baseline. Intervention generalisation probes showed mean on-task rose to 51.39% in literacy and 67.59% in maths. Comparable levels of mean on-task behaviour were documented across teacher data and co-teacher generalisation probes for baseline and intervention; the means fell within 5% for baseline and within 15% for intervention.

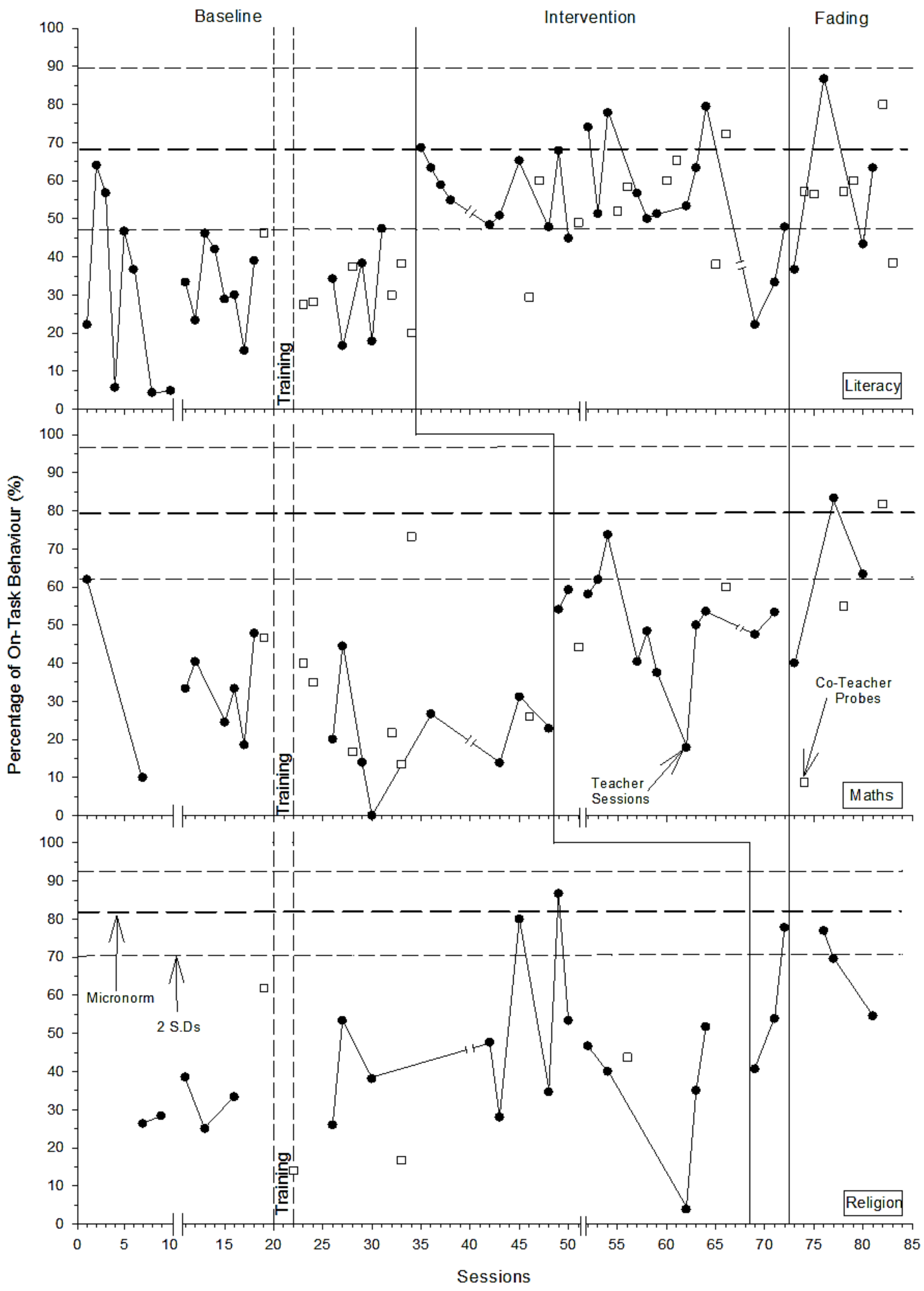


Figure 7.8. Troy's percent of on-task behaviour

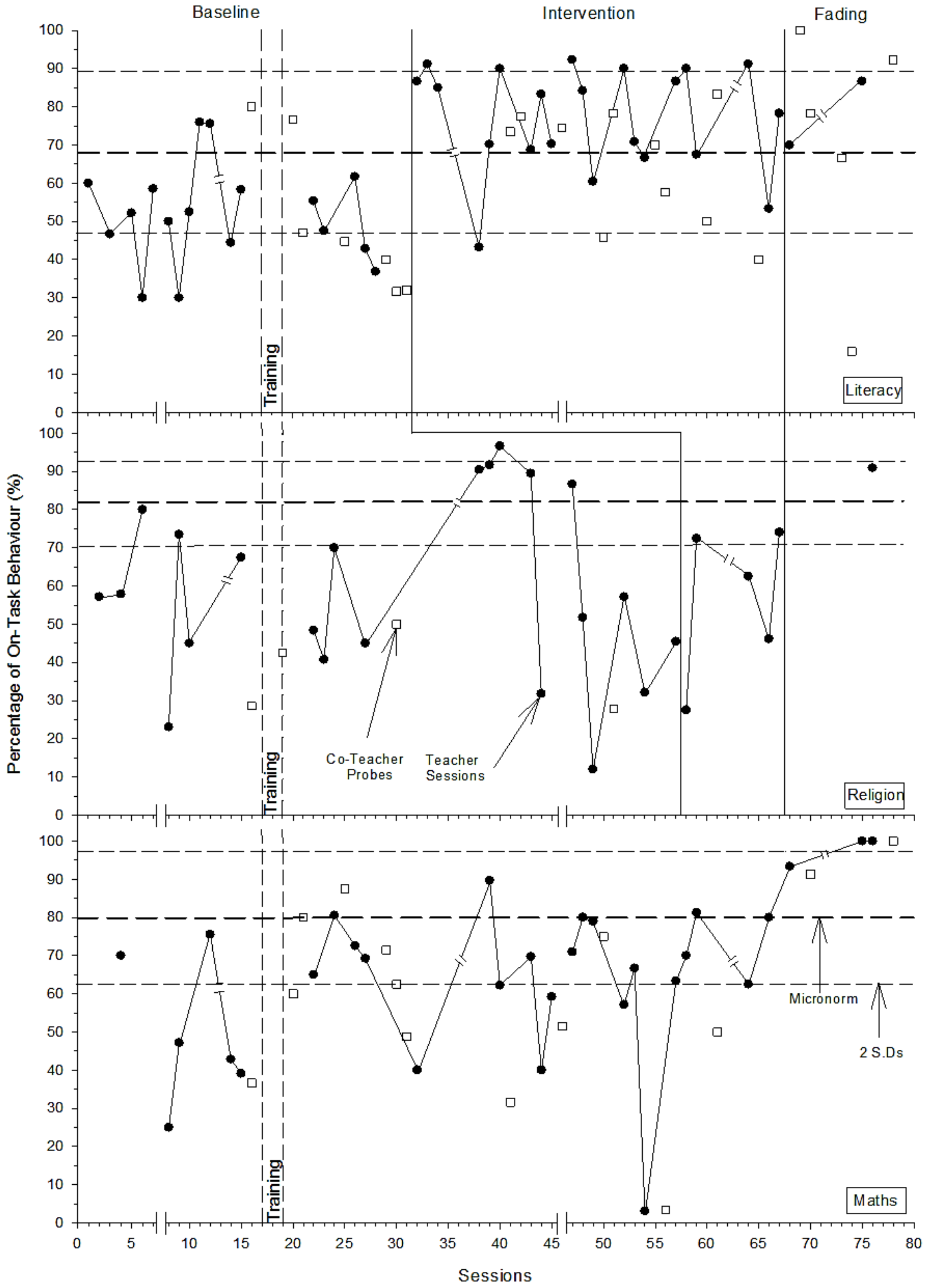


Figure 7.9. Joey's percent of on-task behaviour

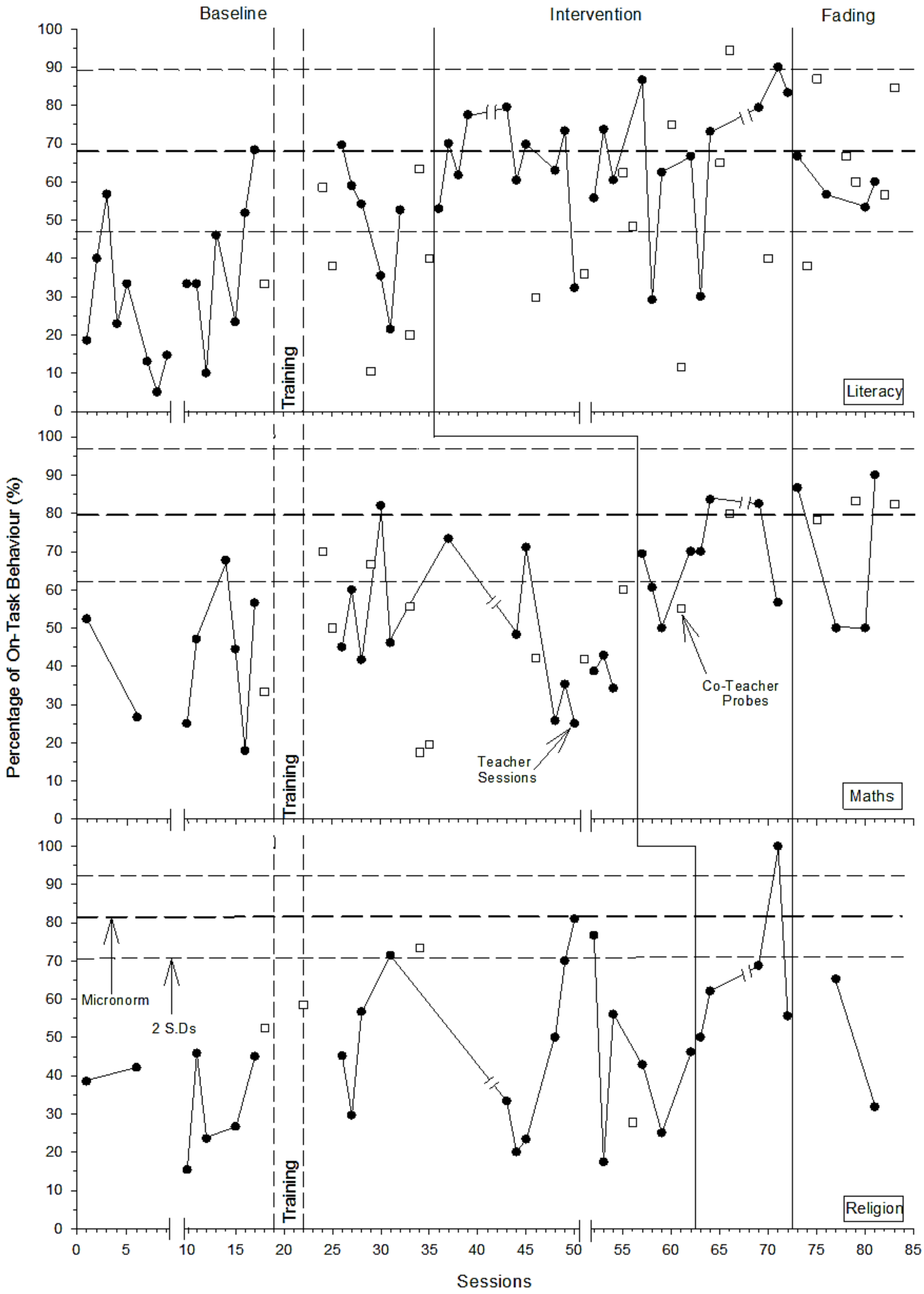


Figure 7.10. Pete's percent of on-task behaviour

7.3.3.1.4 Aggregate mean changes. Table 7.14 present the amount of absolute mean change between the baseline mean and intervention mean for each participant across each academic subject. Troy's aggregate mean on-task was 33.22% in baseline and 54.54% in intervention demonstrating an absolute increase of 21.32 points across the three academic subjects following intervention implementation. Introduction of the SMAT Strategy corresponded with a mean aggregate on-task behaviour absolute increase of 11.63 points for Joey; his aggregated baseline mean improved from 55.23% to 66.86% during intervention. Pete's mean aggregate of on-task behaviour increased from 41.59% (baseline) to 66.73% (intervention) following SMAT implementation; an absolute positive increase of 25.15 points. Overall, the mean aggregate of on-task behaviour for all three participant was 41.66% during baseline. This increased to a mean aggregate of 62.19% in intervention; signifying an absolute increase of 20.33 points in on-task behaviour across participants. On-task intervention data mean was 12.1% higher than the mean for generalisation probe data.

7.3.3.1.5 Effect sizes. For Troy, Joey, and Pete SMD was 1.32, 1.09 and 1.36 respectively, all representative of a strong effect. Tau-U was indicative of a large effect for Troy and Pete; 0.60 CI_{95} [0.30, 0.91] and 0.65 CI_{95} [0.38, 0.92] respectively. For Joey Tau-U was 0.47 CI95 [0.13, 0.81], representative of a moderate effect. The on-task behaviour SMD aggregate score across participants was 1.27, indicative of a strong effect size and the aggregate Tau-U was representative of a moderate effect; 0.59 CI_{95} [0.41, 0.76]. Table 7.16 presents effect size computations for each tier and aggregated effects for each participant.

Table 7.16

Participant On-Task Behaviour Effect Sizes

	SMD			
	Lit.	Math	Rel.	Weighted SMD
Troy	1.47	1.44	0.86	1.32
Joey	1.93	-	-0.09	1.09
Pete	1.47	1.27	1.28	1.36
	Tau-U			
	Lit.	Math	Rel.	Weighted Tau-U
Troy	0.77	0.86	-0.16	0.60 CI_{95} [0.30-0.91]
Joey	0.8	-	-0.02	0.47 CI_{95} [0.13-0.81]
Pete	0.61	0.71	0.65	0.65 CI_{95} [0.38-0.92]

7.3.3.2 Concomitant effects on disruptive behaviour. Results for percent of intervals with active disruptive behaviour are respectively presented in Figures 7.11, 7.12 and 7.13 for Troy, Joey, and Pete. Table 7.17 presents student results (means, medians, minimum and maximum values) for all conditions across the three MBD tiers. Table 7.18 presents co-teacher probe means and medians generalisation results. As disruptive behaviour is the concomitant variable, the self-management intervention was introduced across literacy, maths, and religion classes in a staggered fashion, according to when *on-task* baseline data demonstrated stability.

Table 7.17

Participant Disruptive Behaviour (%) Across Baseline, Intervention and Fading Conditions

	Troy			Joey			Pete		
	Lit.	Math.	Rel.	Lit.	Math.	Rel.	Lit.	Math.	Rel.
Baseline *M* (*Md)* (%)	63.40 (62.71)	67.81 (70.00)	56.45 (61.90)	43.17 (41.17)	29.92 (28.89)	34.23 (30.60)	53.84 (64.00)	49.98 (54.07)	46.31 (47.62)
Min. (%)	36.00	30.43	6.67	21.05	0.00	0.00	3.37	19.35	13.04
Max. (%)	90.24	100.00	80.00	73.33	77.08	73.08	95.00	85.71	88.24
Intervention *M (Md)* (%)	33.05 (30.25)	35.34 (35.48)	34.81 (46.88)	17.03 (13.33)	NA	24.61 (23.08)	25.79 (24.03)	31.68 (36.67)	22.57 (20.69)
Min. (%)	11.11	6.45	3.70	2.94	NA	10.34	2.56	7.27	7.69
Max. (%)	63.64	75.00	53.85	45.54	NA	47.50	61.76	46.67	40.74
Absolute Mean Change*	30.35	32.47	21.65	26.14	NA	9.62	28.05	18.30	23.74
Fading *M* (%)	21.67	25.93	11.69	5.00	NA	9.09	28.33	28.75	53.36

Note: Lit. = Literacy/Inquiry; Math. = Maths; Rel. = Religion
*Absolute Mean Change = absolute difference between the baseline mean and the intervention mean

Table 7.18

Participant Disruptive Behaviour (%) Generalization Data: Co-Teacher Sessions

	Troy			Joey			Pete		
	Lit.	Math.	Rel.	Lit.	Math.	Rel.	Lit.	Math.	Rel.
Baseline Co-Teacher Probes *M (Md)* (%)	62.25 (64.00)	57.28 (61.67)	54.28 (54.79)	51.42 (52.94)	42.12 (40.73)	55.64 (53.75)	49.61 (43.33)	39.32 (32.62)	37.34 (36.98)
Intervention Co-Teacher Probes *M (Md)* (%)	39.00 (34.62)	27.25 (27.25)	NA	30.51 (26.76)	NA	NA	33.78 (42.00)	24.14 (24.14)	NA
Gen. Program. *M* (%)	37.94 (31.00)	*28.41* (20.00)*	NA	23.82 (26.09)	NA	NA	*15.04* (14.29)*	*14.50* (11.76)*	NA

Note: Lit. = Literacy/Inquiry; Math. = Maths; Rel. = Religion
Gen. Program. =Generalisation Programming
*Sessions observed in fading phase; no generalisation programming, baseline conditions continued.

7.3.3.2.1 Troy. Figure 7.11 displays percent of intervals for Troy's disruptive behaviour per session. During baseline Troy's mean percent of disruptive behaviour intervals was 63.40% (range 36.00-90.24%) in literacy, 67.81% (range 30.43-100.00) in maths, and 56.45% (range 6.67-80.00) in religion. All baselines demonstrated slight decreasing trends, undesirable levels, and variability suggesting intervention was warranted. Following intervention implementation Troy showed an immediate and on-going drop in disruptive behaviour in literacy and maths. Religion intervention data did not demonstrate a clear reduction in disruptive behaviour initially, however a reduction was observed in the third session. All intervention phases continued to demonstrate variability in data patterns. Troy's mean percent of disruptive behaviour during intervention was 33.05% (range11.11-63.64%) in literacy, 35.34% (range 6.45-75.00%) in maths, and 34.81% (range 3.70-53.85%) in religion. Due to introduction of the fading phase it was not determined whether this reduction continued under intervention conditions.

Simultaneous intervention fading demonstrated a further reduction in mean percent disruptive behaviour across literacy (M=21.67%), maths (M=25.93%) and religion (M=11.69%). Baseline generalisation probes revealed mean percent of 62.25% and 57.28% disruptive behaviour for literacy and maths respectively. Intervention generalisation probes showed mean percent reduced to 39.00% (literacy) and 27.25% (maths). Across baseline and intervention phases co-teacher generalisation means were comparable to teacher session means falling within 10% of each other. Generalisation programing probes demonstrated mean percent disruptive behaviour of 37.94% in literacy.

7.3.3.2.2. Joey. Joey's percent disruptive behaviour results are presented in Figure 7.12. Joey's baseline data revealed variable data across literature, religion and maths subjects, which suggest that Joey could benefit from intervention. Split-middle trend line plots indicate all baselines demonstrate decreasing trends. Joey's baseline data show a mean percent of disruptive behaviour of 43.17% (range 21.05-73.33%) in literacy, 34.23% (range 0.00-73.08%) in religion, and 29.92% (range 0.00-77.08) for maths. When Joey entered intervention phase during literacy his disruptive behaviour demonstrated an immediate drop along with a flat trend. Joey's mean percent disruptive behaviour reduced to 17.03% (range 2.94-45.54%) during literacy intervention, and to 24.61% (range 10.34-47.50%) during religion intervention. Although an obvious drop in disruptive behaviour was not observed in religion intervention data a desired decreasing behaviour trend occurred. Data remained variable in both literacy and religion intervention phases. As noted previously, intervention was not implemented in maths.

During the fading phase Joey's mean disruptive behaviour further decreased to 5.00% in literacy and 9.09% in religion. Generalisation probes revealed disruptive behaviour averaged 51.52% in literacy baseline and 30.51% in literacy intervention. Co-teacher generalisation means were comparable to the teacher data means falling within 10% for baseline and within 15% for intervention. Generalisation programing probes demonstrated mean percent on-task behaviour of 23.82% in literacy.

7.3.3.2.3. Pete. Figure 7.13 demonstrates Pete's disruptive behaviour results. The mean percent of disruptive behaviour demonstrated by Pete during baseline was 53.84% (range 3.37-95.00%) in literacy, 49.98% (range 19.35-85.71) in maths, and 46.31% (range 13.04-88.24%) in religion. Baseline data in all subjects demonstrated notable variability. Literacy baseline showed a slight decreasing trend, however, the six data points collected after training demonstrated a trend increase. Relatively flat trends were demonstrated in both maths and religion baseline phases. Following the staggered implementation of intervention across literacy, maths, and religion subjects, Pete's disruptive behaviour displayed a flat trend in literacy and a decreasing trend in maths and religion subjects. Intervention data revealed disruptive behaviour averaged 25.79% (range 2.56-61.76%), 31.68% (range 7.27-46.67%), and 22.57% (range 7.69-40.74%) across literacy, maths, and religion. Data remained variable in all subjects during intervention. Transition to the fading phase did not reveal a further reduction in disruptive behaviour across literacy (M=28.33%) and religion (M=53.36%). During fading Pete's mean percent of disruptive behaviour reduced further in maths (M=28.75%).

Generalisation demonstrated disruptive behaviour averaged 49.61% and 39.32% for baseline literacy and maths. Data revealed a disruptive behaviour reduction to 33.78% (literacy) and 24.14% (maths) for intervention generalisation probes. Similar levels of disruptive behaviour were documented with teacher data and co-teacher generalisation probe data falling within 15% of each other for baseline and intervention. Generalisation programming did not occur for Pete.

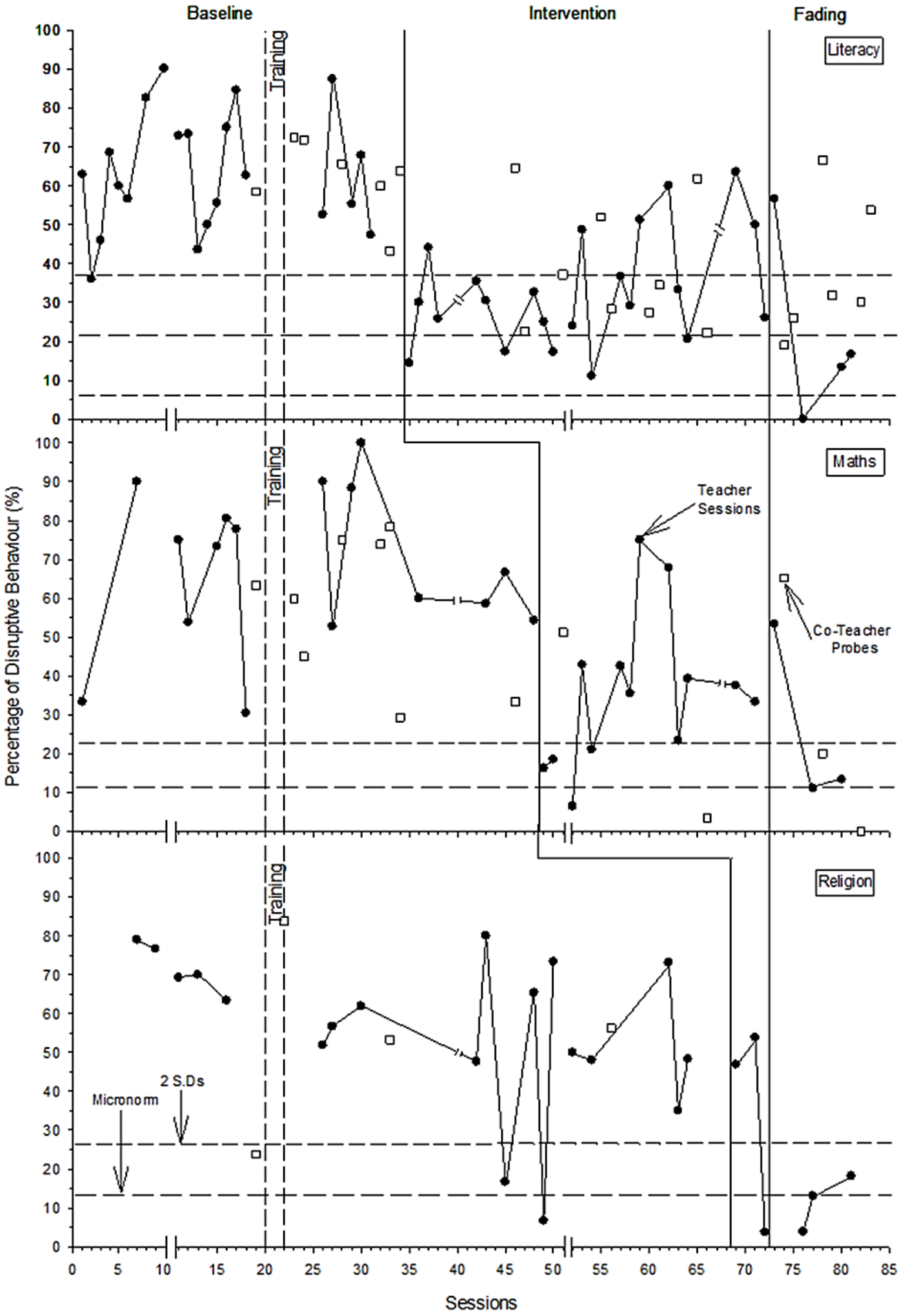


Figure 7.11. Troy's percent of disruptive behaviour

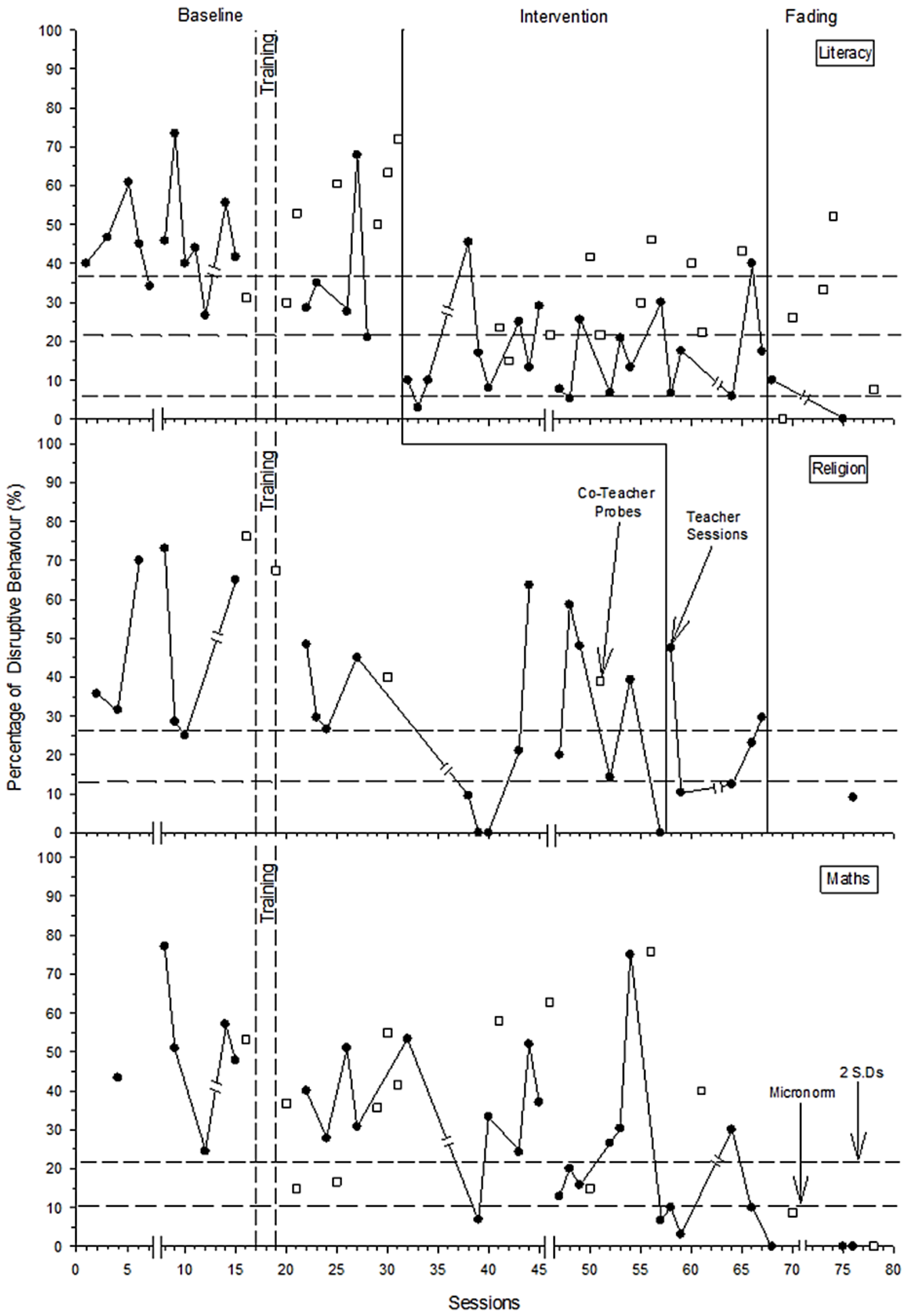


Figure 7.12. Joey’s percent of disruptive behaviour

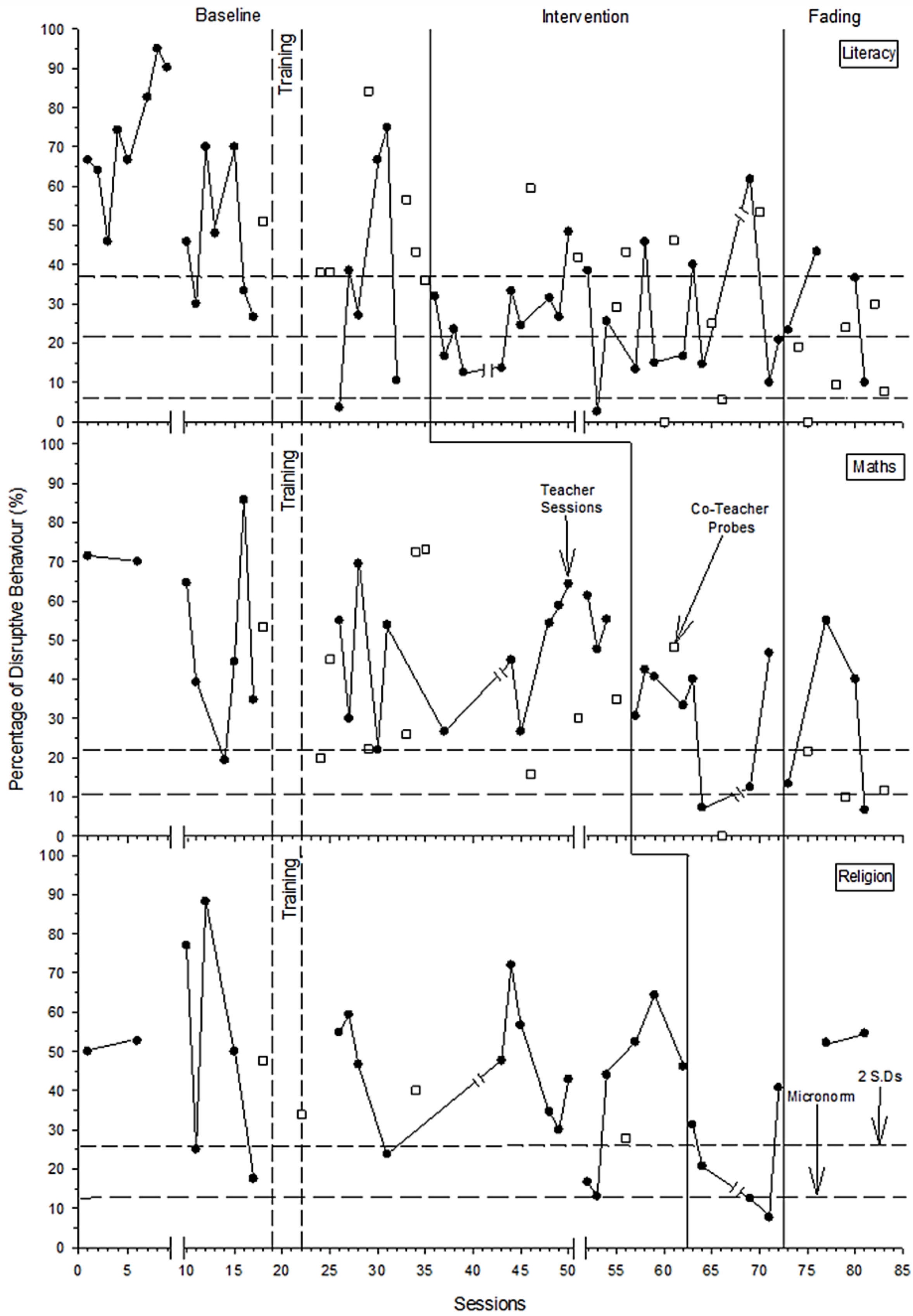


Figure 7.13. Pete's percent of disruptive behaviour

7.3.3.2.4 Aggregate mean changes. Table 7.17 present the amount of absolute mean change between the baseline mean and intervention mean for each participant across each academic subject. Troy's aggregate mean disruptive behaviour was 62.55% in baseline and 34.40% in intervention; demonstrating an absolute decrease of 28.15 points across the three subjects. Joey's disruptive aggregate mean percent disruptive behaviour decreased from 38.70% in baseline to 20.82% in intervention; an absolute reduction of 17.88 points across literacy and religion. For Pete aggregate disruptive behaviour averaged 50.04% in baseline and 26.68% during intervention revealing an absolute behaviour decrease of 23.36 points. Overall, the mean aggregate of disruptive behaviour for all three participants decreased from 51.90% in baseline to 24.36% in intervention representing an absolute reduction of 27.54 points across participants. Disruptive behaviour intervention data mean was 13.5% higher than the mean for generalisation probe data.

7.3.3.2.5 Effect sizes. SMD was representative of a strong effect for all participants; -1.65 (Troy), -1.22 (Joey) and -1.10 (Pete). Tau-U was indicative of a moderate effect for all participants; Troy (-0.51 CI_{95} [-.81, -0.21]), Joey (-0.31 CI_{95} [-0.65, -0.04]) and Pete (-0.57 CI_{95} [-0.85, -0.30]). The disruptive SMD aggregate across participants (-1.33) was representative of a large effect and the Tau-U aggregate was indicative of a moderate effect; -.48 CI_{95} [-0.66, -0.31]. Table 7.19 presents effect size computations.

Table 7.19

Participant Disruptive Behaviour Effect Sizes

	SMD			
	Lit.	Math	Rel.	Weighted SMD
Troy	-1.98	-1.60	-1.07	-1.65
Joey	-1.79	-	-0.42	-1.22
Pete	-1.10	-1.01	-1.22	-1.10
	Tau-U			
	Lit.	Math	Rel.	Weighted Tau-U
Troy	-0.84	-0.72	0.53	-0.51 CI_{95} [-.81- -0.21]
Joey	-0.74	-	-0.35	-0.31 CI_{95} [-0.65- -0.04]
Pete	-0.51	-.55	-0.71	-0.57 CI_{95} [-0.85- -0.30]

7.3.4 Pre-/post-intervention student behaviour evaluation. Pre- and post-intervention domain results from the SBRS are presented in Table 7.20 to assess student behaviour concerns and changes as observed by the classroom teacher. Scores for the School Behaviour Rating Scale general classroom behaviour and attempting tasks subscale items are presented in Appendix E.16.

Troy's pre-intervention School Behaviour Profile (SBP) scores for general classroom behaviour (2.06) and attempting tasks presented (1.25) fall within the tertiary intervention level indicating that additional intervention support tailored to his individual needs is highly encouraged. Scores for the other subscales fall within the primary intervention level suggesting that Troy's behaviour in these domains was of a similar standard to most peers and not overly problematic. Post-intervention results show improvements across all SBRS rating domains with the exception of the *getting along with other students* domain. Scores for general classroom behaviour (3.12) and attempting tasks presented (2.75) respectively fell within the secondary and primary intervention levels.

Joey's SBP scores placed him at the primary intervention level for all six subscales pre-and post-intervention indicating his behaviour was rated a similar standard to most peers. Despite no changes in the level of recommended intervention, higher post-intervention subscale scores indicated that Joey's behaviour improved in general classroom behaviour, attempting tasks presented, and aggressive behaviours. Pete's SBP scores also placed him at the primary intervention level for all six subscales pre- and post-intervention. Though no change in the level of recommended intervention was evident, higher post-intervention subscale scores also suggest that Pete's behaviour competency improved in general classroom behaviour, attempting tasks presented, and the four other subscale domains.

Table 7.20

School Behaviour Rating Scale Score – Pre- and Post-Intervention

Subscales	Troy		Joey		Pete	
	Pre	Post	Pre	Post	Pre	Post
General classroom behaviour	2.06	3.12	3.59	4.76	4.24	6.24
General playground behaviour	4.50	4.67	4.67	3.83	6.00	6.67
Getting along with other students	5.38	4.88	5.88	5.75	4.63	5.63
Development of social skills	5.00	6.00	5.67	5.50	5.83	6.50
Attempting tasks presented	1.25	2.75	2.25	5.00	3.00	5.75
Aggressive behaviours	4.30	5.30	4.40	5.20	5.50	6.20

Note. Pre = Pre-Intervention rating, Post = Post-Intervention rating
Key = Recommended Intervention Level.
General Classroom Behaviour. Tertiary = 2.35≤; Secondary = 2.36-3.31; Primary = 3.32 ⩾
Attempting Tasks Presented. Tertiary = 1.33≤; Secondary = 1.34-2.25; Primary = 2.26 ≥

7.3.5 Social validity.

7.3.5.1 Social comparison. Figures 7.14 and 7.15 show plotted micronorm data, standard deviation and 20% stability envelope range lines and comparison peer data probes for on-task and disruptive behaviour. Table 7.21 presents all micronorm data. On-task behaviour micronorm data across literacy, maths, and religion were 68.26%, 79.66%, and 81.59%. Disruptive behaviour micronorm data were respectively 21.49%, 10.86% and 13.13% across literacy, maths, and religion. Analysis of comparison peer probes across the three academic subjects revealed that the probes remained relatively stable throughout baseline and intervention; on average 92.93% of probes fell within the 20% range lines and 85.21% of probes fell within two standards deviations. This shows that comparison peers largely demonstrated consistent levels of behavior.

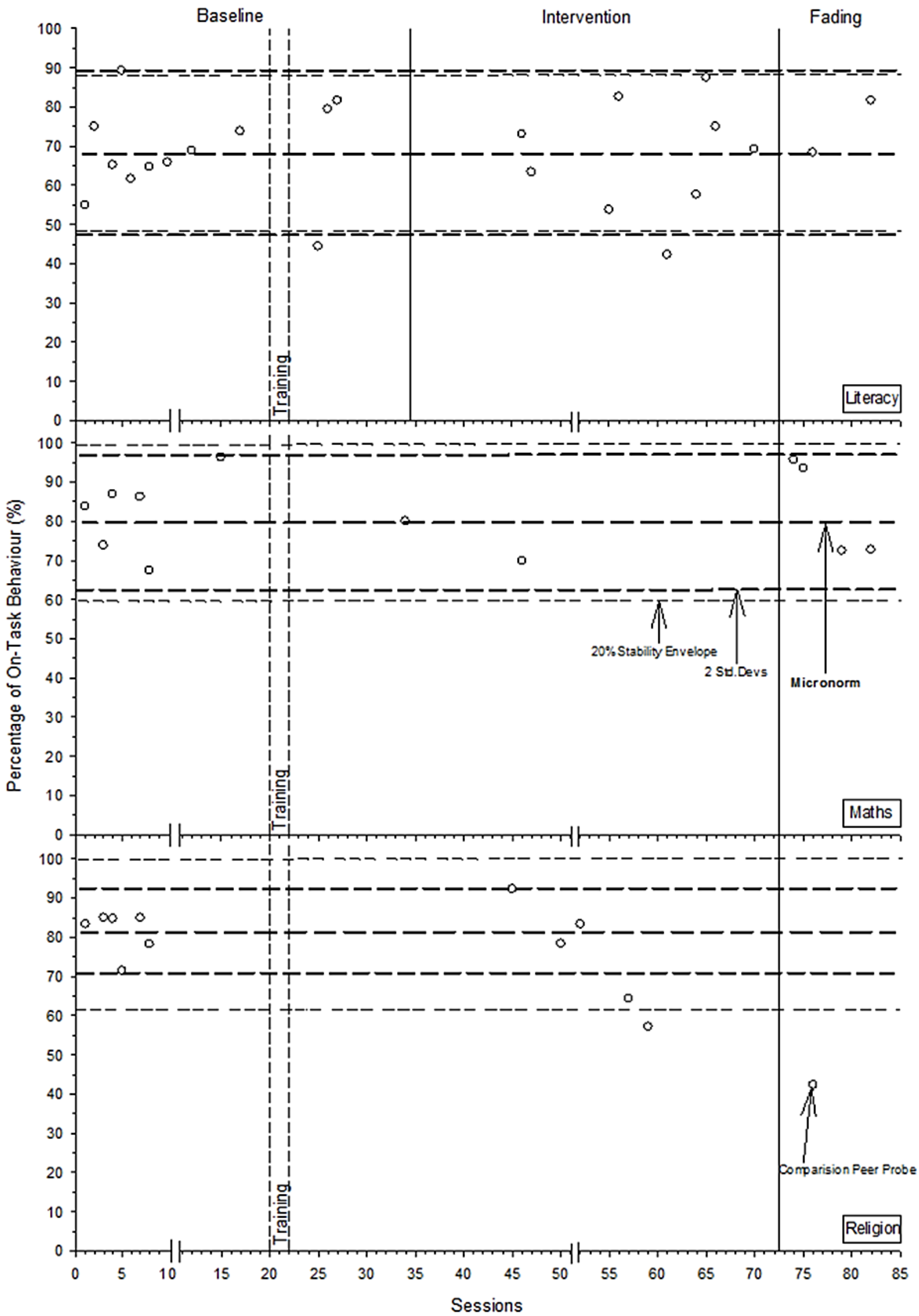


Figure 7.14. On-task behaviour comparison peer micronorm data

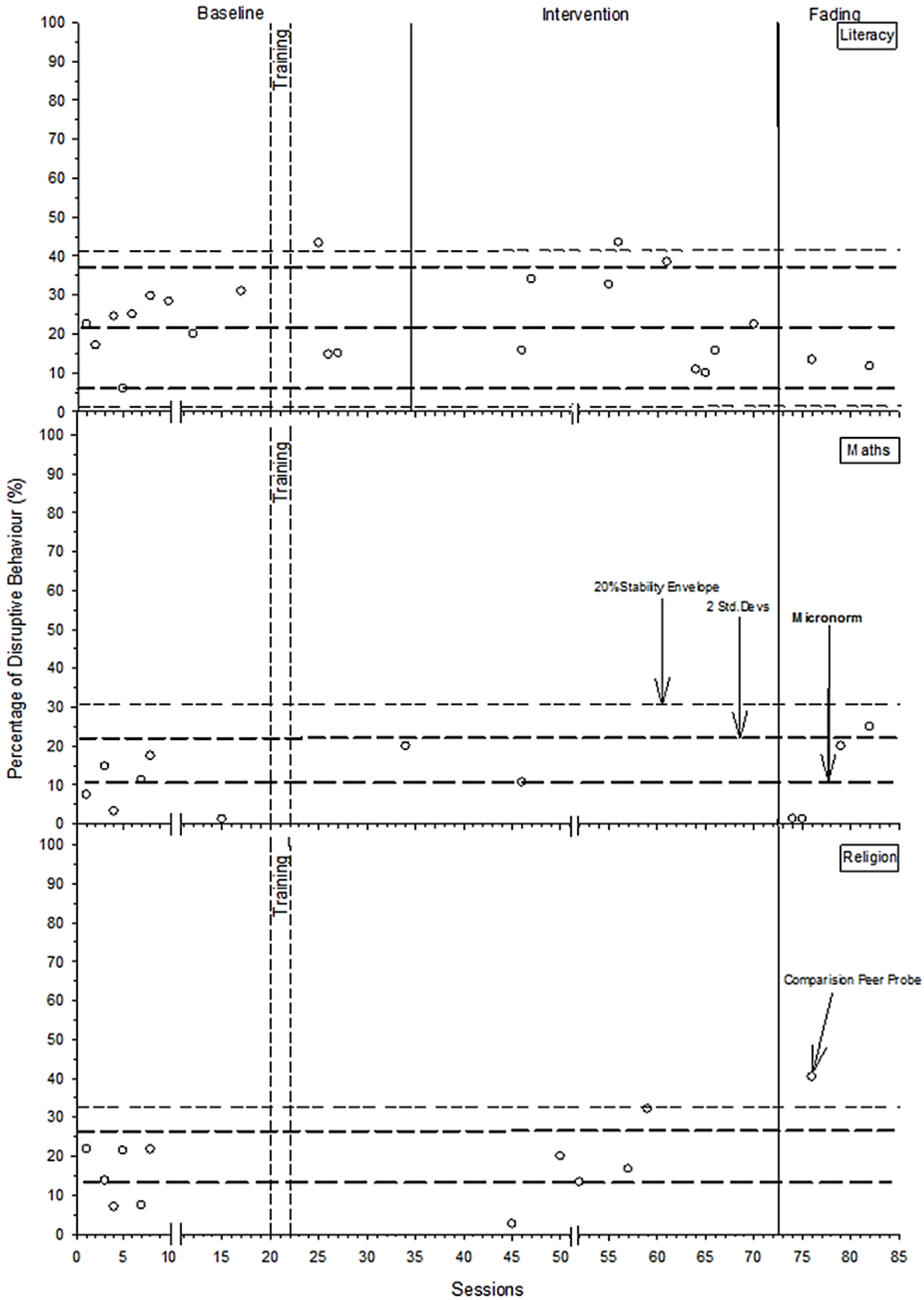


Figure 7.15. Disruptive behaviour comparison peer micronorm data

Table 7.21

Comparison Peer Micronorms

	Literacy	Maths	Religion
On-task behaviour Micronorm (%)	68.26	79.66	81.59
Disruptive Behaviour Micronorm (%)	21.49	10.86	13.13
N	7	5	6

n = average number of probes used from each comparison peer to compute micronorms

7.3.5.1.1 Target participants vs comparison peers. The following describes mean improvements in target participant behaviour means relative to the aforementioned comparison peer micronorm data; these results are discussed in *absolute values* (i.e., total amount of change). As shown in Table 7.14 mean percent of on-task behaviour increased during intervention across all academic subjects (tiers) for all three participants, with the exception of religion for Joey which decreased by 2.26 points. On-task behaviour absolute value improvements ranged from 16.56 to 28.77 points (see table 7.14). Similarly, Table 7.17 shows that mean disruptive behaviour decreased across all academic subjects for all three participants. Disruptive behaviour absolute value improvements ranged from 9.62 to 32.47 points (see Table 7.17). These intervention phase gains resulted in participants mean on-task and disruptive behaviour becoming increasingly comparable to the micronorm data in Table 7.21. Appendix E.17 contains two tables presenting quantitative data to illustrate (a) mean target participant on-task/disruptive behaviour change between baseline and intervention phase and (b) the difference between target participant behaviour and respective micronorms. These results are summarised in the following section.

During baseline Troy's mean on-task behaviour was 37.13 (literacy), 52.00 (maths), and 40.73 (religion) points lower than relative micronorms. In intervention on-task behaviour was 12.49 (literacy), 33.37 (maths) and 24.17 (religion) lower compared to the micronorm. This demonstrates Troy's mean on-task behaviour shifted towards the micronorms by 24.64 (literacy), 18.63 (maths) and 16.56 (religion) points. Mean disruptive behaviour was 41.91 (literacy), 56.95 (maths) and 43.32 (religion) points greater than the absolute micronorm in baseline. During intervention disruptive behaviour was observed to be greater in terms of absolute value compared to the micronorm by 11.56 (literacy), 25.34 (maths) and 21.68

(religion) points. Troy's disruptive behaviour shifted towards the respective micronorm by 30.35 (literacy), 31.61 (maths) and 21.64 (religion) points.

Joey's baseline on-task behaviour was 16.59 (literacy) and 22.80 (religion) points lower than the respective micronorm. During literacy intervention a positive shift occurred for on-task behaviour with it surpassing the micronorm by 8.92 points. Conversely, an undesirable shift occurred for on-task behaviour in religion intervention; it became 25.06 points lower than the micronorm. This demonstrates Joey's mean on-task behaviour shifted towards the micronorm by 25.51 in literacy and further away from the micronorm by 2.26 points in religion. Disruptive behaviour was 21.68 (literacy) and 21.10 (religion) points greater than the respective micronorm. During intervention Joey's disruptive behaviour was less than the micronorm by 4.46 points in literacy and greater than the micronorm by 11.48 points in religion. Joey's disruptive behaviour shifted towards the respective micronorm by 26.14 (literacy), and 9.62 (religion) points. Average behaviour in maths (no intervention) was 14.49 points lower (on-task) and 19.06 points greater (disruptive) than the micronorm.

Pete's baseline on-task behaviour was 37.13 (literacy), 52.00 (maths), and 40.73 (religion) points lower than the micronorm. During intervention Pete's on-task behaviour across literacy, maths, and religion was 12.49, 29.23, and 24.17 points lower than the micronorm showing a positive shift towards the micronorm. This shows Pete's mean on-task behaviour shifted towards the respective micronorms by 24.64 (literacy), 24.17 (maths) and 16.56 (religion) points. Pete's disruptive behaviour in baseline was higher than the respective micronorm by 32.35 (literacy), 39.12 (maths), and 33.18 (religion) points. During intervention disruptive behaviour was 4.30, 20.82 and 9.44 points greater than the micronorm across literacy, maths, and religion, once again indicating Pete's behaviour became more comparable to his peers. Pete's disruptive behaviour shifted towards the respective micronorm by 28.05 (literacy), 18.30 (maths) and 23.74 (religion) points.

7.3.5.2 Subjective evaluation. The following sections present results obtained via teacher and student subjective evaluation measures inclusive of pre-and post-intervention acceptability rating scales, follow-up participant interviews, and post-intervention surveys.

7.3.5.2.1 Teacher Rating Scale. BIRS (24 items) and IRP-20 (20 items) teacher ratings pre- and post-intervention data are reported. The teacher filled out a hybrid scale (38 items) with 6-point Likert scale; strongly disagree (rating 1) - strongly agree (rating 6). The average pre-intervention and post-intervention scores for the BIRS and IRP-20, and relevant factors, are presented in Table 7.22.

Table 7.22

BIRS and IRP-20 Pre- and Post-Intervention Teacher Average Ratings

	Pre-Intervention	Post-Intervention
BIRS	4.79	5.08
Factor 1: Acceptability	5.07	5.40
Factor 2: Effectiveness	4.43	4.43
Factor 3: Time of effect	4.00	5.00
IRP-20	4.35	4.60
Factor 1: Appropriateness	4.86	5.26
Factor 2: Risk to target child	4.50	4.25
Factor 3: Amount of teacher time required	4.25	4.75
Factor 4: Effects of intervention on other children	3.37	3.37
Factor 5: Amount of teacher skill required	3.50	4.00

Note: All items are rated on a 6-point Likert scale with 6 representing the highest acceptability rating.

BIRS Ratings. Across all BIRS items the teacher's average score was 4.79 pre-intervention. All items were coded 4 (slightly agree), 5 (agree), or 6 (strongly agree) pre-intervention, demonstrating moderate to high levels of acceptability. Post-intervention, the average BIRS item score increased to 5.08. Post intervention ratings revealed an increased number of items coded 5 (agree) and 6 (strongly agree), showing the intervention was considered more acceptable following implementation. No ratings indicated disagreement at either time point. Results further demonstrate moderate to high levels of acceptability across the BIRS factors ratings which remained consistent (effectiveness) or improved (acceptability and time of effect) post-intervention.

IRP-20 Ratings. The average score across all IRP-20 items was 4.35 pre-intervention; indicative of moderate acceptability. Pre-intervention item ratings revealed moderate to strong levels acceptability for 80% (n=16) of items (i.e., ratings of 4, 5, or 6). Slight disagreement (i.e., rating 3) was reported for four items indicating the teacher had slight reservations concerning (a) teachers' potential preference for other interventions (Item 11), (b) intervention practicality (Item 13), (c) feasibility to implement in a full class (Item 16), and (d) training requirements (Items 20). These responses reflected the teacher's initial concerns regarding the time required to set-up and run the intervention in the classroom. In spite of these concerns the teacher acknowledged that given this was a pilot study she would expect that the required time involvement would become more acceptable as the intervention process is refined and developed further.

Post-intervention, average IRP-20 score increased to 4.60. Analysis suggests the teacher viewed the intervention as increasingly acceptable following implementation; a shift in post-intervention ratings was observed with more items having been coded 5 (agree) and a slight reduction in 3 (slightly disagree) responses (n=3). Post-intervention, Items 11 and 16 retained the slightly disagree rating they obtained pre-intervention. Item 18 also received a slightly disagree coding revealing concern relating to the difficulty of using this intervention while simultaneously meeting needs of other students in class. In the pre-intervention survey the teacher commented that while the strategy may be a good approach to trial as an initial formalised or structured intervention strategy she would probably try all of her unstructured strategies prior to this intervention.

Results revealed average IRP-20 ratings for Factors 1 (appropriateness), 2 (risk to target child) and 3 (amount of teacher time required) demonstrated moderate to high levels of acceptability; ratings remained relatively consistent pre-and post-intervention with slight variation. Results also demonstrated Factors 4 (effects of intervention on other children) and 5 (amount of teacher skill required) obtained similar pre-and post-intervention ratings indicating moderate acceptability. Pre-intervention the teacher reflected these concerns, commenting that “you would be surprised at some teacher’s lack of technology skills” suggesting that some teachers may not readily adopt such a strategy without some prior training.

7.3.5.2.2 Teacher interview. The teacher indicated that the intervention had “certainly gained the interest of the students” and suggested the participating students were very keen to participate due to the technology involved. In terms of effectiveness the teacher commented that the intervention worked well and benefited target students. Observed behaviour improvements were reported for all students, with quicker improvements having been observed for Pete and Joey. Particular improvements in Joey’s behaviour were observed during group-based classwork. The teacher indicated that while Troy’s improvements seemed to take longer she believes that he had great opportunity for growth through intervention use. Troy’s articulations during intervention led the teacher to believe that he had learnt how to recognise and distinguish between his on-task/off-task behaviour. On occasion the teacher observed Troy asking himself whether he was on-task/off-task and telling himself to get back on-task to rectify off-task behaviour. In terms of social comparison the teacher noted that Joey and Pete's behaviours improved to the point where she did not notice them deviate from other classmates' behaviour during intervention. The teacher indicated that despite observed behaviour improvements Troy's behaviour continued to deviate from that of his classmates.

The teacher suggested that while she saw value in assigning students increased responsibility over their behaviour through monitoring processes there may be a need for supplementary adult support throughout implementation processes. She indicated that having a researcher oversee the intervention and student progress made implementation more manageable and ensured minimal impact on her teaching. When questioned on whether the intervention could be used independently by teachers to meet student needs the teacher indicated that it would depend on frequency of intervention use and teacher technology knowledge. She emphasised that the intervention would potentially be manageable sans additional adult support if used in one learning area per day (i.e., one lesson) and required minimal on-going observation and data analysis. It was also suggested that brief training or on-site implementation support may increase acceptability for teachers who are not tech-savvy. Given existing classroom pressures the teacher suggested that protocol improvements could focus on refining and simplifying programming and implementation protocols to reduce teacher skill, effort, and time required for initial set-up.

7.3.5.2.3 Co-teacher interview. Co-teacher interview feedback suggested that the SMAT strategy was "easy for students to learn how to use" and "easy to implement." The co-teacher indicated that the strategy was non-intrusive, non-disruptive, and fit readily into her classroom routine. She liked how SMAT devices were "portable" and did not restrict students to their desks. The co-teacher also liked the idea of using self-management to help students to become independent learners ("would be a great tool to help students to be independent learners"), indicating that "[she] could see how the strategy benefited student learning by helping them to stay on-task."

The co-teacher recommend that other teachers use this strategy "for select students and for select time periods." When asked if the intervention would be appropriate for use with students of different grades and disability status she indicated that "it would depend on the individual student and their response to being introduced to it [the strategy].” It was suggested that SMAT would be best suited for students in Grade 2 or upwards as at this level students “will be able to discern and learn what on-task’ means.” She also suggested that this strategy would be best received when freely accepted for use by students and not viewed as a punishment for inappropriate behaviour.

The co-teacher stated that time required to learn about SMAT may be a barrier to its use in school settings. She suggested that it may require staff professional development sessions to introduce the strategy to teachers or relevant education professionals. She also suggested that some on-line training supplemented with support provided by an on-site staff members responsible for managing the system at a school-wide level may be beneficial. Overall, the co-teacher indicated that the strategy holds potential to be a practical and useful intervention for mainstream school settings provided that it was accompanied with clear instructions.

7.3.5.2.4 Target student participant feedback questionnaire. Questionnaire results revealed student participants viewed the self-management strategy as acceptable and effective. Results indicated that students liked (a) self-management approach (average rating = 4.67), (b) the way in which they were trained (average rating = 4.33), and (c) using the strategy (average rating = 4.67). Students reported that they found the intervention easy to use in class (average rating = 4) and think the strategy would be good to use with other students (average rating = 5). Students also believed using the intervention helped to improve their target behaviour in class (average rating = 4). Results indicate students believe using self-management to keep track of their behaviour helped them to do better at school (average rating = 4.33). The ratings also indicated participants think using the self-management intervention helped them to join into class activities better (average rating = 4.33).

7.3.5.2.5 Target student participant interview. See Table 7.23 for key interview themes and associated responses. Interview data revealed all students were aware of the importance of targeted on-task behaviour outcomes and were aware they had been asked to use the intervention to improve on-task behaviour. All students reported that they liked the self-management strategy incorporating SMAT and enjoyed using it in class. Feedback suggests that students perceived positive outcomes for on-task behaviour, self-talk, and learning. Data suggests that intervention elements viewed most favourably by students included: (a) vibrating self-monitoring prompts ("It vibrated just hard enough for me to realise and get back on-task" – Pete; "it [the smartwatch] vibrates and reminds you to stay on-task" - Joey), (b) self-generated visual electronic feedback (Referring to smiley faces on the watch – "the answer that told you that you were on-task" – Joey) and (c) graphing ("if I get 100 (%) my teacher would be proud", "I was really proud when I got to 100 (%)" – Troy). While graphing Pete indicated that he liked to compare his performance across days to see whether he got "a higher score than last time."

In terms of effectiveness, students suggested that the strategy worked best when school work was interesting, and when working independently. Conversely, Joey did not like the interval schedule, indicating that longer durations between vibration prompts would have been preferred. Troy complained about a technical glitch which caused the watch to vibrate continuously at times. Pete even suggested that the strategy could be useful for other peers, as student users could encourage peers to get on task when prompted by SMAT. All student participants reported that if given the opportunity they would continue to use this self-management strategy and suggested that other students would also like using the strategy.

Table 7.23

Student Feedback Interview Themes

Theme	Sub-Theme	Feedback Response Quotes
Why use self-management?	To improve on-task behaviour	"to stay on-task" – Pete "to stay on-task" – Joey "to help myself get-back on task" – Troy
Impression of the self-management strategy	Students liked strategy	"I think it was fun to use the watch. I liked to show off the watch" –Troy *All students responded "Yes" to the question *Did you like the self-management strategy?*
Perceived outcomes	On-task behaviour improvement	"helped me to get on-task and that was a good thing" – Troy "It teaches me to stay on-task"- Troy "The watch told me if I was off-task. It helped me get on-task and that was a good thing"- Troy "It helps you stay on-task"-Joey "I am now more on-task instead of off-task"– Joey "I learnt that I can get back on-task more if I try hard enough" – Pete
	Learning	"It helped me a lot"/"it helped me learn more" – Pete "Because it helps me to learn better." – Troy
	Self-talk	"I like that my mind says 'get back on-task, get-back on-task' "-Troy "It told me to 'get back on-task, get back on-task, try harder' "-Troy "The final thing is – my head was telling me to get back on-task (while wearing the watch) and that's the good thing of it!" – Troy "That I had to stay on-task" – Pete (Response to question querying what went through his mind)
Preferred Elements	What students liked	"Using the watch to get me on-task more" – Pete "That is vibrates and reminds you to stay on-task" – Joey "That it [the watch/iPad] always tells me that I am on-task or off-task. If I push no it tells me I am off-task with a frowny face" - Troy
Most Helpful Element	Vibrating and feedback	"The vibrating"/ "It vibrated just hard enough for me to realise and get back on-task" – Pete "Probably the vibrating and the answer that told you that you were on-task" (referring to the smiley faces on the watch-face) – Joey "The vibrating cause it normally tells me if I am on-task" - Troy
Non-Preferred Elements	Interval schedule	"Make it vibrate a little bit longer" – Joey

	Technology bug	"It was vibrating quickly. I didn't like the bug, the lagging…" – Troy "the bug was annoying…" – Troy
	N/A	Pete
Usefulness	Helping other peers	"Yes, it helped other people. It helped them learn more in class time"/ "If I rated (i.e., self-recorded), and I was off-task I then got on-task. And if the person next to me was off-task I would tell them to get on-task" – Pete
	Helping self	"Cause it helped you to remind yourself to get on-task and to do your work" – Joey "Yes, mmm hmmm – because it was telling me to get back on-task" – Troy
Future use	Other students' perceptions	"They would think that it would help them to" – Pete "They'd probably like it" – Joey "They will think that I am getting better and will think 'oh hey! I want to use that to get better like Troy!' "- Troy
	Personal use	"Yeh, it would be a good thing to use in the future. Because I can get fully on-task more" – Pete "Yeh, maybe" – Joey "Yeh, because it was really fun" – Troy
Effectiveness	Effective	""Some of the strategies worked and other times it did not work"/"It worked best when I was interested in the work I'm doing" – Pete "When I'm not with a whole bunch or a group (i.e., his friends)" - Joey
	Ineffective	"[It did not work] when I had something in my mind that I had to talk to my friends about"- Pete "It doesn't work when I am with my friends"- Joey
Inaccurate recordings	Reasons for dishonestly	"Sometimes I pressed the wrong button"/"I didn't want to get a bad mark for the graphing"- Pete "I did not want to push no… I felt bad… I wanted to get 100 (%)" – Troy (referring to wanting to get a self-reported 100% on-task score for the graphing component).
Motivation	Achieving high scores for graphing purposes	"[Like it] because it's fun to do the graphing because you get to color it. And if I get 100 (%) my teacher would be proud"/ "I was really proud when I got to 100 (%)" – Troy "get a higher score than last time" - Pete
	Improving behavior for high school	"to stay on-task. Just like in year 7 I might get better and I might get smarter" – Troy
Other	Peer Involvement	"cause some people were helping me (classmates). Because in class sometimes I am off-task and talking to my friends. The watch told me if I was off-task. It helped me get on-task and that was a good thing" - Troy

7.4 Discussion

The primary purpose of this study was to investigate the application of a novel technology-based self-management intervention system (SMAT) by primary school students within a mainstream classroom. Specifically, the study focused on determining the effects of SMAT on the on-task and disruptive behaviour of three students in a general education classroom setting. Generalisation to a second condition (i.e., lessons run by a co-teacher), and maintenance were also assessed. In addition, treatment fidelity and social validity (social comparison and subjective evaluation) were monitored. Analysis was also undertaken to evaluate the degree to which the SMAT supported self-management strategy was student-managed as opposed to adult-managed.

7.4.1 Behaviour outcomes: On-task and disruptive behaviour. A single-case MBD was employed to investigate the functional relationship between SMAT supported self-management and changes in participants on-task and disruptive behaviours within a general education classroom setting. In an effort to ensure experimental control, and to maximise the likelihood of a functional relation, the study methodology was designed to adhere to design quality standards established by the WWC (WWC, 2014). Based on high-quality MBDs, this study provides evidence at the individual level that behaviour change (on-task and disruptive) for Troy and Pete may be functionally related to the introduction of the SMAT supported self-management intervention. Unfortunately as Joey’s MBD results did not meet WWC design standards it cannot be concluded that a functional relation was demonstrated for this participant. Despite this, visual analysis and statistical analysis results presented in this study support the efficacy of self-management incorporating SMAT in increasing on-task and reducing disruptive behaviour displayed by primary school students.

Current findings indicate that SMAT supported self-management has the potential to produce moderate to strong effects on student behaviour, as behaviour gains made by all student participants in intervention saw their behaviour shift towards the class behaviour norm band identified via social comparison means. In addition, indirect school behaviour measure results indicate the teacher observed behaviour improvements for all participants post-intervention; the teacher considered student participants’ general classroom behaviour and on-task behaviour as less problematic and more comparable to peer behaviour. Despite some notable variability in the presented data (discussed in limitations), these findings largely mirror and support the positive findings of past studies investigating technology-based self-management interventions in school contexts (e.g., Bedesem, 2012; Rosenbloom, Mason, Wills, & Mason, 2016; Vogelgesang, Bruhn, Coghill-Behrends, Kern, & Troughton, 2016; Wills & Mason, 2014).

7.4.2 Generalisation and fading. This study extends the previous research of Boyle and Hughes (1994), Edwards, Salant, Howard, Brougher, & McLaughlin (1995), Legge, DeBar, & Alber-Morgan (2010), McDougall (1998), and Rock and Thead (2007) by analysing the effects of fading the SMAT self-management strategy on behaviour. A unique graduated fading program was implemented for each student participant to optimise desired self-management outcomes over time (Edwards et al., 1995). Findings suggest that the fading procedure was somewhat effective in helping participants maintain improved levels of behaviour. Similar to previous findings (Edwards et al.; Legge et al., 2010; Rock & Thead, 2007) students' fading session mean on-task and disruptive behaviour maintained at levels generally comparable to those observed in intervention. One exception was Pete's results with mean percent for both behaviours during religion fading phases reverting to baseline levels. Maintained behaviour levels in fading phases may be attributed to the continuation of an unpredictable and intermittent variable interval recording schedule (Cooper et al., 2007; Legge et al.). Variable-interval prompt schedules have been widely recognised as a means of reducing the probability of behaviour extinction (Amato-Zech et al., 2006; Cooper et al.; Finn, Ramasamy, Dukes, & Scott, 2015; Legge et al.).

Expanding upon past research (Amato-Zech et al., 2006; Rafferty, 2012), generalisation probes were collected in another context (different teachers) to investigate if student behaviour change spontaneously generalised. Cautious interpretation of these data indicates some spontaneous generalisation effects. Similar to past findings (i.e., Amato-Zech et al.) current results reveal behaviours improved in the intervention and generalisation condition where the intervention was not in use. Troy's behaviour generalisation was associated with spontaneous development of self-talk behaviours. Troy occasionally verbally prompted himself to engage in targeted behaviour (i.e., "get back on-task") during intervention and generalisation sessions. Pete and Joey's generalisation probe pattern generally demonstrated similar levels, range, and variability to that of intervention data.

Generalisation programming for Troy and Joey did not yield any additional behaviour improvements above those obtained in the intervention phase.

7.4.3 Intervention fidelity. Following app configurations for each SMAT session, adult implementation agents were required to complete a small number of setting-up and finishing implementation steps. Greater involvement was required from students as they completed necessary set-up and pack-up processes in conjunction with critical self-management processes (i.e., self-monitoring and self-graphing). Results show successful SMAT use involved students assuming responsibility for behaviour management as they accessed and activated the SMAT watch-app on the Pebble Smartwatch and undertook self-observation and self-recording (i.e., self-monitoring) of their own behaviour in all sessions. Across sessions average intervention fidelity was high for teacher (mean 87%) and student implemented steps (mean 89%). Current findings provide preliminary evidence suggesting that the SMAT strategy can be successfully applied as designed, indicating that through further research this primarily student-managed intervention package framework can be refined and used as an alternative to adult-managed strategies.

Based on implementation fidelity data the following points were identified. First, not all setting-up and finishing-up adult implementation steps were completed in all sessions as student initiative rendered certain steps redundant. As the intervention progressed student participants, specifically Joey and Pete, began to complete some intervention steps independently without adult instruction. These findings suggest students may require less support from adults as familiarity with SMAT processes increases over time. Current findings support past research which suggests technology-based self-management may be a promising behaviour management strategy with reduced adult-involvement and student independence increase (Cihak et al., 2010; Finn et al., 2015; Rosenbloom et al., 2016; Soares, Vannest, & Harrison, 2009).

Second, SMAT web-app login/iPad set-up was the least frequently completed student step completed by Troy, Pete, and Joey. Low rates of fidelity are likely due to an accommodation made to original student implementation steps to increase intervention social validity and acceptability. Initial protocol required students to set-up the SMAT web-app/iPad for use during every intervention session, however as Joey and Pete were not eager to use the iPad/web-app component at all times students were given this component as an option.

Findings suggest, when given the choice, students may or may not opt to view visual behaviour recording feedback via the SMAT web-app/iPad. For instance, Joey often elected to receive feedback via the Pebble Smartwatch watch-app sans iPad web-app, whereas Pete occasionally chose to receive watch-app feedback along with web-app feedback when the iPad was not required for academic work. Troy seemed to enjoy using the iPad/web-app, thus it remained a permanent component in his intervention. It is possible that the appeal of iPad use to support SMAT processes may vary as a function of individual student preferences.

Third, current findings suggest existing adult implementation steps may warrant slight alterations to accommodate students requiring occasional *booster chats* to support SMAT use in classroom settings. Intermittent adult-led booster chats were introduced in this pilot to promote student self-recording accuracy. Troy required substantially more booster chats compared to Pete and Joey suggesting that greater adult support following intervention sessions may be required for students with special needs (i.e., SLD). Although the aim of self-management interventions is to increase the degree of independent student self-management, current findings suggest adult support may be required in some situations. This finding aligns with those of Finn et al. (2015) and King-Sears (2006) who suggest that some form of adult follow-up is required after teaching students self-management to ensure that intervention skills and outcomes are progressing as planned.

7.4.3.1 Degree of management. This study reflects previous findings (Briesch & Chafouleas, 2009; Davis, Mason, Davis, Mason, & Crutchfield, 2016; Fantuzzo & Polite, 1990) suggesting that self-management intervention implementation in education contexts may require notable levels of adult facilitator involvement, particularly during initial implementation processes. Current data demonstrates that while students were responsible for self-monitoring, adults often facilitated implementation processes pre- and post- SMAT sessions (i.e., SMAT device/app set-up and maintenance). Interestingly adult support varied across participants suggesting that adult involvement may depend on individual student factors. While Joey and Pete required minimal adult support, Troy required adult assistance for approximately half the student implementation steps (i.e., obtaining and setting-up technology devices and applications, completing the graphing component and packing up the devices).

Efforts were made in this pilot to keep teacher involvement and inconvenience minimal by having a researcher aid the teacher throughout SMAT implementation. Findings show the teacher was predominately responsible for completing five adult-implementation steps while the researcher was primarily responsible for signalling students to begin their SMAT session (Step 4) and reminded students to pack up (Step 7) after graphing. Based on this finding it is suggested the existing SMAT protocol may be best implemented in future by an intervention co-ordinator (i.e., learning support staff member, special education teacher, school psychologist, behaviour interventionist) or via a co-facilitator arrangement with the teacher (i.e., teacher and supporting adult facilitator). Ideally future research will refine the existing SMAT protocol to ensure classroom teachers can facilitate SMAT supported self-management with students such that additional education personnel are not required. Alternatively, future research may look to investigate the viability of *peer-assisted* SMAT supported self-management in a bid to reduce or eliminate the need for adult-involvement.

7.4.4 Social validity. Overall, results demonstrate moderate to strong social validity as participants considered target behaviour to be important, were satisfied with observed outcomes, and considered the SMAT intervention strategy acceptable. These results support those from past studies investigating technology-based self-management (e.g., Bedesem, 2012; Bruhn, Vogelgesang, Schabilion, Waller, & Fernando, 2015; Crutchfield, Mason, Chambers, Wills, & Mason, 2014; Rosenbloom et al., 2016) and show that the piloted intervention was viewed as highly favourable by the teachers and student participants in the general education classroom. Analysis revealed that in comparison to initial pre-intervention views, the teacher considered the approach more effective and acceptable post-intervention. Similar to previous research findings (e.g., Bedesem, 2012; Finn et al., 2015) teachers viewed students assuming greater responsibility over their behaviour via self-management as an important intervention outcome. Student feedback revealed that students liked the piloted strategy and believed it helped them improve behaviour. Based on students' positive feedback and observed enthusiasm towards the technology devices utilised within SMAT the technology elements of the SMAT strategy may motivate student users to engage in behavioural self-management strategy. Research which suggests that student populations readily accept and embrace self-management interventions utilising modern technology is both timely and critical as schools consider the use of and actively introduce novel devices and technology across student populations (Bedesem, 2012; Gulchak, 2008; Rosenbloom et al., 2016; Vogelgesang et al., 2016).

Current social comparison results support those of past investigations of modern self-management interventions that also document improvements in participants' behaviour to the point where behaviour closely mirrored the socially accepted levels of non-targeted comparison peers (e.g., King, Radley, Jenson, Clark, & O'Neill, 2014; Morrison, McDougall, Black, & King-Sears, 2014). Participant feedback and normative comparison data suggest that study outcomes were socially valid as student behaviour during intervention reflected teacher expectations and observed classroom norms more than during baseline. Current findings demonstrate the importance of considering statistical (i.e., effect size and mean comparison) and visual analysis outcomes. Based on these findings it is suggested that the intervention has potential to facilitate behaviour change such that target student behaviour can reach socially acceptable levels.

Teacher feedback indicated that professional demands along with varying levels of technology proficiency and knowledge may challenge a teacher's capacity to adopt and monitor the SMAT system in future. Though previous studies boast of the ease with which self-management interventions can be implemented in classroom settings (e.g., Bruhn et al., 2015; Crutchfield et al., 2014; Finn et al., 2015; Rosenbloom et al., 2016) this study suggests further development of SMAT strategy processes is required to increase acceptability and feasibility. Feedback also indicated feasibility and acceptability may be improved through the development of teacher intervention training resources along with the provision of training sessions (i.e., face-to-face or on-line) and/or on-site supports and aides during implementation. Alternatively, acceptability may be enhanced by having teacher learning aids adopt intervention support roles under circumstances where classroom teachers are unable to oversee intervention implementation.

Overall, students found the strategy appealing largely due to the novelty of incorporated technology. Minimal negative feedback was obtained with students only commenting on some technical glitches and interval duration. Students viewed the strategy as easy to use, thus indicating that it may be appropriate for use with students in grades as low as Grade 4. Interestingly, student opinion indicates SMAT strategy elements favoured most by participants included vibration prompts, self-generated visual electronic feedback (i.e., smiley or frowny faces provided via the watch-app/web-app), and graphing. This may highlight the critical nature of prompting and performance feedback elements within self-management processes (the importance of feedback is discussed further in the contributions and implications to research section to follow). While students were not instructed to set concrete behaviour goals, it became apparent that students, particularly Troy and Pete, were driven by self-imposed comparative goals (i.e., doing better than previous days).

During intervention sessions the SMAT system was viewed to be largely unobtrusive, delivering discrete self-monitoring vibrations prompts in a similar fashion to other technology-supported self-management systems (Bedesem, 2012; Crutchfield et al., 2014; Finn et al., 2015; Vogelgesang et al., 2016). While peers were generally unaware of the SMAT system operation during intervention sessions, they were sometimes distracted by Troy's responses. Troy occasionally engaged in self-talk (i.e., "Am I on-task?"; "oh it vibrated") when prompted to self-monitor by the smartwatch. This findings highlights that some students may require more explicit training instruction and practice on how to discretely self-management without causing further distraction.

7.4.5 Study limitations. Although this study demonstrates promising findings consistent with previous studies, several limitations may have impacted the results and interpretations.

The first limitation concerns notable data variability documented consistently across baseline, intervention, and fading phases for all target student participants. Unlike previous intervention studies that demonstrate stable student behaviour after technology-based self-management intervention implementation (e.g., Crutchfield et al., 2014; Rosenbloom et al., 2016), a clear cut, stable pattern of on-task and disruptive behaviour was not consistently observed in this study. Data variability can be viewed as an undesirable threat to internal validity which can compromise experimental control in SCD design studies (Cooper et al., 2007; Gast, 2010). Unstable data can occur in natural, applied settings like classrooms due to various uncontrollable extraneous and confounding variables (Cooper et al.). For instance, Troy's unusually high on-task behaviour during some literacy baseline sessions may be explained by personal preference for drawing-based activities. Similarly, for Joey, remarkably high on-task behaviour in religion baseline occurred during four consecutive sessions where he was motivated to complete a Christmas Card activity. Pete's unusually high on-task behaviour in literacy baseline, on the other hand may, be attributed to limited social interaction opportunities due to a change in seating location when he was placed next to a highly studious, shy peer. Interestingly, comparable amounts of data variability were identified in target participant data *and* social comparison data, which may suggest such variability is a normal feature of the classroom environment. The following student and contextual variables, observed in the current study, may have affected student behaviour: (i) activities (i.e., individual, partner, group task or iPad vs no iPad tasks); (ii) seating plan and table layout changes; (iii) session duration (i.e., varying time-frames); (iv) flexible lesson schedule (i.e., varied at teacher discretion); (v) extracurricular event interruption (i.e., school musicals, excursions, sports days), (vi) social interactions, peer relationships, and peer absences, (vii) climate (i.e., heat and wet weather), and (viii) individual differences (i.e., cognitive ability, motivation, task preferences, affect, mood, physical health, alertness or fatigue, social tendencies).

Limited fading, maintenance, and generalisation probes represents a second limitation. Current fading results must be interpreted with caution due to minimal data; up to four sessions per fading phase across all tiers. To promote on-going behaviour maintenance, interventions are ideally withdrawn in a systematic, gradual fashion (Cooper et al., 2007; Kazdin, 1982), however it was not feasible to undertake this process. The fading phase coincided with the end of school year, thus it was not possible to undertake a comprehensive fading program. Student behaviour maintenance was not measured following intervention withdrawal as the school year ended. Generalisation findings must also be interpreted cautiously due to sparse data and the absence of probe interobserver checks. Current generalisation findings are solely based on literacy probes due to scheduling challenges which made it difficult to collect adequate generalisation probes across maths and religion. Scheduling challenges also made it difficult to arrange multiple observers on co-teacher days, thus IOA probe checks were not undertaken during co-teacher sessions.

Like many past self-management studies (e.g., Crutchfield et al., 2014; Morrison et al., 2014) the current study has not evaluated the impact of self-monitoring response accuracy and promptness. Thus, the third limitation relates to the lack of data that would enable such an analysis. While past findings generally suggest self-monitoring accuracy may not be pivotal to obtaining positive outcomes (Crutchfield et al.; McDougall, Morrison, & Awana, 2012; Wills

& Mason, 2014) research has noted that the extent to which self-monitoring accuracy influences outcomes remains unknown (Bedesem, 2012). Similarly, the influence of self-monitoring promptness (how quickly one self-records when prompted and resumes work afterwards) is also unknown. McDougall et al. suggests promptness may impact positive outcomes more than recording accuracy. Future research would benefit from further investigation into the influence of self-recording response accuracy and promptness of self-management outcomes.

The fourth limitation concerns the observation system used to measure student behaviour. While a simple, systematic PIR approach was deemed suitable for this study, PIR, like all observation approaches, has its recognised strengths and limitations (Ayres & Gast, 2010; Brown-Chidsey, 2005; Cooper et al., 2007; Hurwitz & Minshawi, 2012). For instance, PIR is often criticised due to its tendency to overestimate behaviour (Cooper et al.) (efforts were made in the current study to control for this limitation). Though some research findings discount PIR as a suitable for estimating behaviour frequency and suggest momentary-time sampling observation may be more suited for approximating behaviour duration (Devine, Rapp, Testa, Henrickson, & Schnerch, 2011; Meany-Doboul, Roscoe, Bourret, & Ahearn, 2007; Rapp et al., 2008), at this stage no one “gold-standard” observation approach exists. Despite this limitation PIR was judged appropriate for this study given its on-going use in current self-management SCD studies.

The fifth limitation relates to absence of data and analyses regarding self-monitoring prompt frequency. In accordance with previous studies, prompt frequency was programmed for each SMAT session based upon individual student characteristics (i.e., age, ability levels, preferences) and the target behaviour observed prior to intervention (Bedesem & Dieker, 2013; Bruhn, Waller, & Hasselbring, 2015; King-Sears & Carpenter, 1997; Wilkinson, 2008). Though prompt schedules were individually tailored for student needs, it is unknown as to whether the interval schedules were optimal.

The final limitation encountered concerns intervention fidelity. While efforts were made to adhere to the proposed implementation protocol with high fidelity some protocol alterations were required to adjust for various unforeseen participant and contextual factors (see Method: Intervention fidelity). Given the common assumption that high fidelity interventions result in optimal outcomes (Harn, Parisi, & Stoolmiller, 2013) the current study may be criticised for failing to strictly adhere to designed implementation protocol. Due to the pilot nature of the intervention, reactive protocol adjustments were necessary to ensure the intervention was feasible, acceptable, and socially appropriate for participant use in the real-life setting. While effective and socially valid interventions are not considered useful to consumers if they are delivered with low fidelity (Reed & Codding, 2014), priority was assigned to social validity rather than fidelity in this study to minimise classroom disruption in this study. Future research is needed to improve fidelity.

7.4.6 Technology challenges. In this study several challenges related to technology use were identified. Two notable challenges included students' technology use and technology up-keep. Through student feedback and anecdotal observation this study identified some circumstances where the SMAT system may need adjusted to omit iPad use. In situations where iPads were required for academic tasks, it was not feasible to use iPads for self-monitoring. In other circumstances students, particularly Joey and Pete, simply preferred not to make use of the iPad for self-monitoring purposes, electing to just make use of the Smartwatch. While research suggests students may be motivated to undertake technology-based self-management (Bruhn, Waller, & Hasselbring, 2015; Gulchak, 2008) current finding suggests there may be instances where students simply do not want to make use of all SMAT system technology features. As new intervention technologies continue to develop, further research is needed to identify appealing and unappealing aspects of technology so appealing aspects can be better integrated into interventions.

The next challenge relates to technology (device and SMAT applications) preparation, maintenance and up-keep. Issues were encountered when students forgot to bring their personal iPads to class - Troy was particularly prone of this. Monitoring device battery charge levels was another issue that was occasionally difficult to manage. The researcher and student participants monitored iPad and smartwatch charge; however, on rare occasions devices ran out of battery charge as this was done inadequately. Unfortunately due to the nature of technology situations occurred where, for unknown reasons, required Wi-Fi and Bluetooth connectivity did not work as desired. When this occurred the researcher explored settings options to establish connections. Another technical challenge related to student participants deleting the Pebble smartwatch Apple app from their personal iPads; the app was re-installed after students had deleted on a couple of occasions. This proved problematic as unforeseen upgrades had been made to the Pebble Apple application during the course of this study. Unfortunately this rendered SMAT web-app and watch-app incompatible with the Pebble Apple app. In these instances tech support was required. Overall, these technical challenges highlight the need for further research to investigate the skills, knowledge, and supports required by education staff to adopt the SMAT system in classroom contexts.

7.4.7 Contribution and implications: Research. This study contributes to research by addressing a gap identified by Busacca et al. (2015) in high-quality SCD literature regarding the use of a self-management intervention with primary school students demonstrating challenging behaviours in general education classroom settings. Given that Troy and Pete's graphed data demonstrates adequate design quality in accordance with WWC standards (WWC, 2014) this study adds to the limited methodologically rigorous self-management SCD research targeting primary school populations in classroom contexts, and illustrates the challenges researchers face in conducting high-quality research in such applied contexts. Despite the recent emergence of literature investigating technology-based self-management intervention strategies (Bruhn, Waller, & Hasselbring, 2015; Rosenbloom et al., 2016; Wills & Mason, 2014), minimal published SCD research investigates use of such interventions in primary school contexts and even less has commented on SCD research design quality (Bruhn et al., 2015; Busacca et al. 2015; Fishley, & Bedesem, 2014).Thus, this study may also contribute to literature as one of the first high-quality SCD studies to investigate technology-based self-management use with primary students in a mainstream setting. This documentation of a high-quality SCD study ensures great confidence can be placed in results which have been reliably obtained in a rigorous manner (Maggin & Chafouleas, 2013).

As self-management interventions are commonly structurally diverse and can be made up of many components, researchers have long investigated intervention component arrangements to determine what self-management component combinations result in optimal student outcomes (Briesch & Chafouleas, 2009; Davis et al., 2016; Fantuzzo & Polite, 1990). Though consensus is yet to be reached regarding a universal self-management package, past research suggests that basic packages (e.g., primarily self-monitoring) may be equally or more effective than elaborate packages (Briesch & Chafouleas, 2009; Davis et al., 2016; Chapter 5). Findings from this study support this notion that basic self-management packages containing few components can be effective in yielding positive student outcomes. In fact, current findings support previous research which suggest desired student outcomes can be obtained through basic self-monitoring interventions which omit goal-setting, self-evaluation, and self-reinforcement intervention components (see Crutchfield et al., 2014; Davis et al., 2016; Fishley & Bedesem, 2014; Sheffield & Waller, 2010; Wills & Mason, 2014; Chapter 5). The current findings largely support the efficacy of a basic self-management package for the two typically developing students, Joey and Pete. Interestingly, a slightly more complex intervention package was effective with Troy, who presented with poor working memory and a diagnosis of SLD. For Troy, the addition of a Target Behaviour Prompt component to his intervention was deemed necessary to accommodate for his memory weakness. Although an aim of this study was to pilot a basic self-management intervention package, the accommodations made to individualise Troy's SMAT supported self-management package may suggest that students with diagnosed disabilities or cognitive weaknesses may require more complex packages tailored to their unique needs. The individualisation of self-management intervention packages is a topic which warrants investigation in future.

By omitting student reinforcers (i.e., edible, sensory, tangible, activity, or social) from the piloted self-management package, current findings support past literature which suggest formal integration of self-reinforcement components in self-management interventions may not be required to yield behaviour improvement (e.g., Amato-Zech et al., 2006; Davis et al., 2016; Fishley & Bedesem, 2014). Rather than incorporating formal self-reinforcement, the piloted intervention placed greater emphasis on self-delivered feedback in the form of behaviour performance feedback via student self-monitoring (instant feedback) and self-graphing (delayed feedback). Given Hattie and Timperley's (2007) model on the effects of feedback on learning, feedback may have possibly played a key role in obtaining positive behaviour outcomes in this study. Hattie and Timperley assert that the power of feedback lies in knowing one's current performance (i.e., "How one is going?") such that tasks may be undertaken (i.e., "Where to next?") to reduce the gap between where one is at and where one is aiming to be (i.e., "Where I am going?"). In accordance to this model, feedback obtained via self-monitoring one's behaviour using SMAT may cue student action such that appropriate behaviour was maintained or future behaviour was changed to resemble desired outcomes (i.e., self-imposed goals). Given the varied nature of feedback in SMAT supported self-management (i.e., visual feedback via the watch-app vs the web-app; immediate vs delayed feedback; feedback provided by self-graphing mechanisms) further research is required to determine the specific feedback mechanisms required for optimal behaviour change.

In line with operant theory, behaviour feedback obtained via self-monitoring processes may also hold the potential to yield reinforcement effects (Cooper et al., 2007). While feedback does not always produce a reinforcing effect, feedback may function as a reinforcer and/or punisher which may respectively increase and/or decrease the likelihood of student behaviour (Cooper et al.). As SMAT supported self-management involved self-delivery of a feedback via a smiley face contingent upon desired behaviour (and a frowny face contingent upon non-desired behaviour) these specific consequences may have held reinforcement (or punishment) value for students. Previous studies suggest that it is possible for visual feedback representative of improved behaviour changes to function as a reinforcer for desirable behaviour (Bruhn et al., 2015; Moore, Anderson, Glassenbury, Lang, & Didden, 2013). Future investigation is required to investigate the potential reinforcing function of the visual feedback provided through the SMAT system.

According to classic self-management literature (de Haas-Warner, 1991; de Haas-Warner, 1992) self-talk is considered a key self-management component of self-monitoring. Self-talk is widely conceptualised as an internalised or covert cognitive occurrence that individuals undertake whilst self-monitoring to appraise one's behaviour and to determine whether desired behaviour has been demonstrated (de Haas-Warner, 1992; Joseph & Konrad, 2009; King-Sears & Carpenter, 1997; Moore et al., 2001; Rock, 2004). Observations from the current study suggest self-talk may occur as a concomitant self-monitoring outcome; this seemed the case for Troy who engaged in overt self-talk while self-monitoring. Troy, on occasion, asked himself whether he was showing target behaviour (e.g., "Am I on-task?") and told himself to "get back on-task!" when he caught himself engaging in undesirable behaviour. These observations suggest self-talk may play a role in subsequent behaviour change after each self-monitoring instance. The spontaneous occurrence of observable self-talk indicates future research is warranted to further investigate the role of both covert and overt self-talk in self-management interventions.

7.4.8 Contributions and implications: Practice. Use of technology (i.e., iPads, Smartwatches and web-/watch-apps) to modernise self-management strategies offers a novel and appealing take on this well-researched intervention approach. Given the current, common use of technology in every day education environments (Edyburn, 2013; McDougall et al., 2012) SMAT supported self-management holds important implications for classroom behaviour management practices.

First, as the self-directed nature of SMAT supported self-management requires students to assume active roles in the management of their own behaviour; this strategy may thus foster greater student self-regulation, responsibility and independence. Granted that adult-assistance is required prior to intervention sessions for configuration and initial set-up, this intervention strategy also fosters minimal adult involvement during intervention. Furthermore, the SMAT system itself also promotes minimal adult demands through the elimination of cumbersome materials and resources commonly managed by adults in classic self-management packages (i.e., timers, iPods, CD players, and audio prompting tracks, paper or pencil checklists). These implications are consistent with those drawn from past technology-based self-management interventions studies (see Amato-Zech et al., 2006; Crutchfield et al., 2014; Finn et al., 2015). Thus, technology-based self-management interventions hold the potential to promote social validity via improved student responsibility and reduced teacher behaviour management demands.

Second, the SMAT system can be discretely implemented anywhere within classroom settings without alteration to academic curriculum and with minimal disruption to peers. Unlike classic self-management approaches that require paper or pencil self-monitoring in set locations, the SMAT system is easily portable (i.e., Pebble Smartwatch worn on wrists) and permits students to roam freely whilst self-monitoring). With the emission of silent self-monitoring vibration prompts, the SMAT system was ideal for the classroom environment and peers usually did not notice when target students engaged in self-monitoring. Third, given the current popularity of personal devices, students may find technology-based self-management more appealing and socially acceptable than classic paper or pencil approaches. Though current student participants had mixed views on iPad use, all participants were intrigued and eager to use the Pebble Smartwatch within the SMAT system. Students particularly liked the idea of using something novel that other peers did not have access to. Consistent with previous research (Amato-Zech et al., 2006; Gulchak, 2008; McDougall et al. 2012) the current study indicates students are quite receptive to using technology devices for self-management purposes.

Fourth, by building upon previous self-management literature (e.g., Bedesem, 2012; Finn et al., 2015; Gulchak, 2008), this study is one of the few studies piloting a purpose built self-management device/application system–the SMAT system. Aside from i-Connect (see Crutchfield et al., 2014; Rosenbloom et al., 2016 Wills & Mason, 2014) SMAT is one of the few all-inclusive technology-based systems specifically created for self-management. The SMAT system improves upon previous non-technology and technology based self-management systems as it (a) allows multiple students to simultaneously use SMAT supported self-management at any one time based on their individual needs, (b) automatically presents student self-recording data in real time, and (c) generates data summaries ready for analysis upon session completion. Automatic data generation was of particular benefit to students during self-graphing processes at the end of each session as they did not have to carry out any manual calculations prior to completing graphing. In-built data generation features also assisted intervention agents in assessing student self-recording accuracy as they were able to simultaneously watch student behaviour and live student recordings via the SMAT web-app. This feature of SMAT may prove useful for future research examining the accuracy of student responses and the impact of inaccuracies.

Finally, like many published self-management investigations which omit functional behaviour assessment (FBA) (see Busacca et al., 2015; Machalicek, O'Reilly, Beretvas, Sigafoos, & Lancioni, 2007) this study suggests SMAT supported self-management holds the potential to reduce problem behaviour even when target behaviour function is not identified. Considering School-Wide Positive Behaviour Support (SWPBS) framework (Lane, Menzies, Ennis, & Bezdek, 2013; Mitchell, Bruhn, & Lewis, 2016) current findings suggest SMAT supported self-management may be effectively used as a non-function-based Tier 2 strategy with a small group of students presenting with similar low-level problem behaviours. This idea contrasts findings from recent research which suggests enhanced positive behaviour change occurs following FBA informed self-management interventions (Hansen, Wills, & Kamps, 2014; Hansen, Wills, Kamps, & Greenwood, 2013; Wadsworth, Hansen, & Wills, 2014), thus demonstrating the efficacy of self-management as a possible Tier 3 function-based intervention. Future research including and omitting FBA processes will help to determine whether SMAT supported self-management can be effectively incorporated within SWPBS framework as a secondary non-function-based intervention (Tier 2) and/or an individualised function-based tertiary intervention (Tier 3). Research considering function-based SMAT supported self-management is warranted at present given current widespread support for function-based interventions (Goh & Bambara, 2010; Lane et al., 2013; Mitchell et al, 2016) and recent support for FBA informed self-management interventions (Hansen et al., 2014; Stahr et al., 2006).

7.4.9 Future research. Additional high-quality systematic replications, ideally addressing identified limitations, is warranted to assess the external validity of this intervention, including in other settings, outcomes (i.e., academic productivity and performance) and with other populations (i.e., high-school or special education settings, students across different grades with various diagnoses). Such research is required to determine the merit of using SMAT supported self-management interventions in education. Future research should further investigate generalisability to non-intervention contexts and maintenance to ascertain how such outcomes can be supported and promoted through use of SMAT supported self-management.

Given some uncertainty surrounds the self-management components required for optimal packages (Briesch & Chafouleas, 2009; Davis et al., 2016; Fantuzzo & Polite, 1990; Wills & Mason, 2014), future research conducted in general education settings should investigate varying component combinations to ascertain which packages work best with SMAT (i.e., basic packages like that used in this pilot or elaborate packages incorporating self-reinforcement, goal-setting and/or self-evaluation). One component requiring further investigation is self-monitoring prompt frequency. Identification of optimal prompt interval length through replication studies has the potential to minimise self-monitoring process demands whilst fostering productive class time (Wills & Mason, 2014). Employing optimal interval lengths may ensure users avoid unnecessary disruption caused by excessive prompts while preventing the occurrence of insufficient prompts which may render the self-monitoring ineffective. Multiple-baseline designs incorporating multiple treatments (e.g., Finn et al., 2015) and systematic fading phases (e.g., Morrison et al., 2014) may be used to investigate critical components and/or optimal prompt frequency. Multiple treatment reversal designs (Cooper et al., 2007) may also be of use as these designs allow for the comparison of two or more intervention packages.

In terms of student involvement, current findings support those reported by Davis et al. (2016) in Chapter 5, with positive outcomes of self-management interventions being associated with high levels of student involvement. Given that a potential advantage of self-management is to reduce teacher demand, future work should aim to further minimise adult involvement by investigating *how* to assign greater student responsibility across intervention components. If researchers can identify how to optimise student involvement, self-management interventions may be able to truly live up to their name. Although researchers have endeavoured to undertake such investigations (e.g., Briesch & Chafouleas, 2009; Fantuzzo & Polite, 1990; Chapter 5) the related body of research is minimal and not yet enable to draw strong conclusions.

As SMAT supported self-management is in initial stages future investigations would benefit from further development of the manualised implementation protocol used to guide intervention implementation in this pilot study. Stemming from this, future research may also benefit from larger-scale replication studies trialling a proposed manualised protocol for SMAT supported self-management. Protocol development research is key to informing prospective users of components, processes, and steps required to achieve optimal outcomes and ensuring users have a clear understanding of which critical intervention components should not be fundamentally altered (Dunst, Trivette, & Raab, 2013; Harn et al., 2013). Refinement of implementation protocols in line with current findings may ensure future SMAT supported self-management interventions can (a) better suit the needs of implementation agents (i.e., teachers, aids, behaviour support personnel), (b) address identified limitations, and (c) be implemented with high fidelity. While high fidelity of defined procedures is desirable there may be circumstances in applied settings where intervention components and/or protocols require alterations to ensure successful and sustained intervention implementation (Collier-Meek; et al., 2013; Dunst et al., 2013). It has been long advocated that applied research requires defined processes which allow for flexibility such that procedures can be modified to match individual participant needs and differing applied conditions (Baer, Wolf, & Risley, 1987). Thus, development of a tailorable self-management intervention package containing empirically validated components and associated implementation protocol containing in-built “adaption options” is necessary to support effective and flexible practices.

Despite the identified limitations, promising results documented in the current study demonstrated that SMAT supported self-management holds the potential to yield positive effects on student behaviour in general education classroom settings. Social validity outcomes suggest that additional work may also benefit from development of professional training resources or programs which may be used to teach education staff (i.e., researchers, teachers, intervention specialists, teacher's aids, and other education professionals) how to implement and integrate SMAT supported self-management interventions in classroom settings. Such resources and training may be especially valuable for intervention agents with minimal experience in utilising technology-based initiatives. In addition, it may be advantageous for researchers to work with SMAT developers to produce increasingly simple and intuitive technology applications.

Chapter 8: Summative Overview, Conclusions, Implications, and Recommendations

This thesis has explored the use of self-management interventions as a means of addressing problem behaviour demonstrated by primary school students in general education classrooms. The primary aim of this thesis was to explore and evaluate existing research evidence which documents the effects of self-management interventions for primary students with problem behaviour in general education class settings, and to extend the existing evidence-base. This aim has been addressed via completion of three interconnected studies.

With the goal of systematically identifying, appraising, evaluating, and synthesizing existing high-quality single-case design (SCD) research evidence on this topic an *evidence review* was conducted (Study 1) guided by the What Works Clearinghouse (WWC) design and evidence standards (Kratochwill et al., 2010, 2013; WWC, 2014). This was followed by a *comprehensive intervention analysis* (Study 2) of intervention processes and implementation protocols. An *empirical study* was then undertaken to advance existing research evidence using a SCD study (Study 3), guided by WWC standards, to investigate the application of an evidence-informed, technology-supported self-management intervention approach. Study 3 was conducted to adhere with WWC SCD standards, to ensure the study design was of a high-quality, and demonstrated experimental control. In an effort to contribute to the *evidence-based practice (EBP) movement*, aspects of this PhD research were designed and conducted in a manner which aligns with modern SCD research design and evidence standards.

This report is presented in four sections, with a total of eight chapters as depicted in Figure 8.1. The eight chapters comprise of the three aforementioned methodologically self-contained studies, plus a collection of framing and linking chapters which present an overview of key theory, terminology, concepts, literature, and methodological processes relating to the key studies. While each chapter systematically builds upon the previous chapter, all chapters are independent in that they address unique aims, utilise distinct methodologies, and present separate discussion sections which include conclusions, limitations, implications, and/or recommendations relevant to documented chapter aims and outcomes (where appropriate).

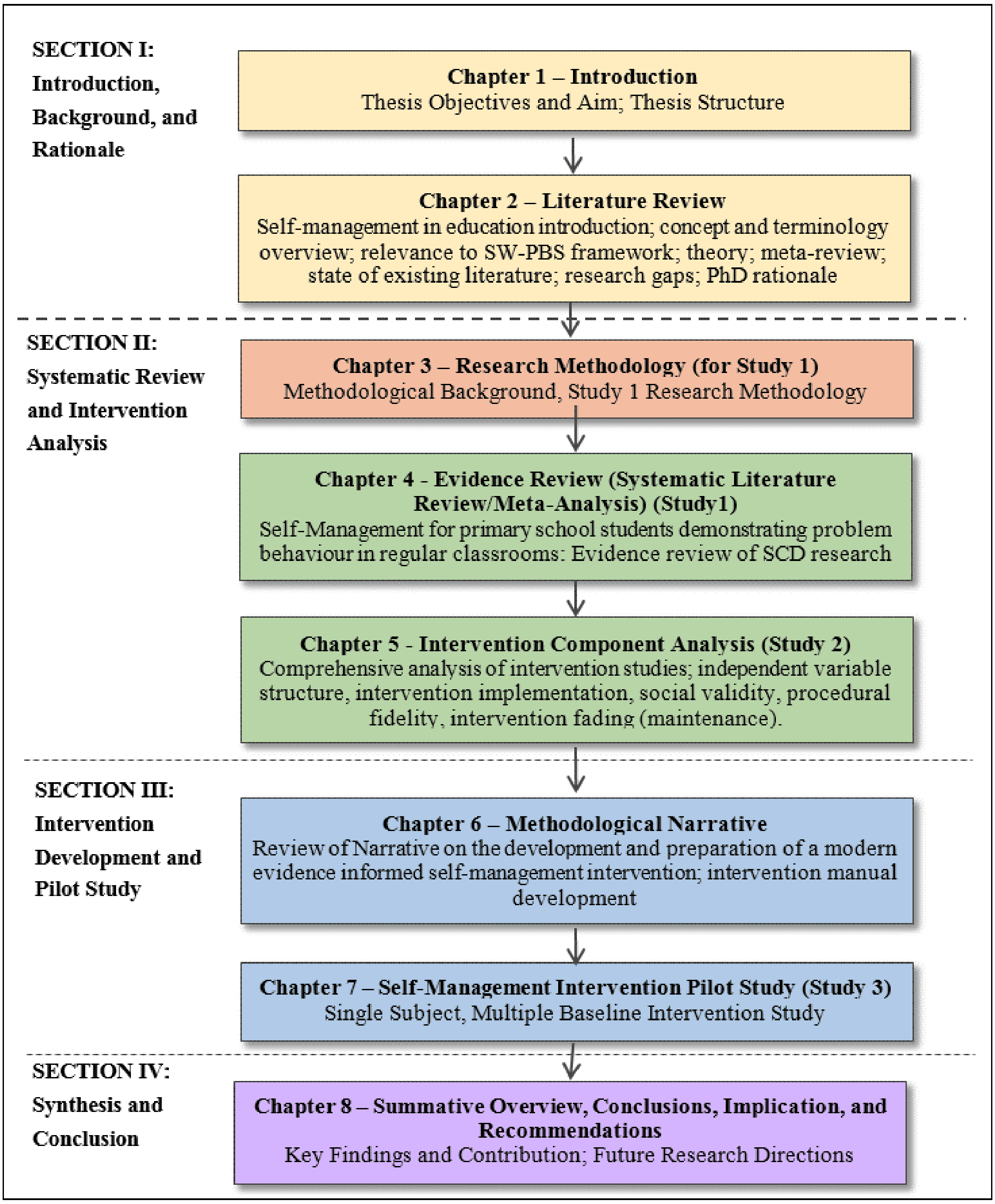


Figure 8.1. PhD framework by section and chapter

This final chapter has been written to provide an overview of the key research findings documented in this PhD. The chapter opens with a research summary and an overview of key outcomes reported in each section. The chapter concludes with an overview of research limitations, implications and directions for future research and practice.

8.1 Section I: Introduction, Background, and Rationale

Section I contains an *introductory chapter* (Chapter 1) and *literature review* (Chapter 2), which broadly introduced behaviour self-management as an intervention strategy for primary students in general education settings; outlined the research agenda for this PhD; detailed key theory, terminology, and concepts related to self-management interventions; and presented a non-traditional literature review which evaluated and synthesized 30 published school-based reviews investigating self-management interventions.

The literature review demonstrated an extensive body of literature exits, extending back to the 1960s, providing widespread support for the effectiveness of self-management interventions in yielding positive behavioural and/or academic outcomes across student populations (e.g., typically developing students; students with diagnosed disabilities; pre-, primary, and high school students) in various education settings (e.g., general, special and inclusive contexts). Although promising intervention outcomes are documented across the identified collection of self-management literature reviews, the Chapter 2 literature review highlighted research gaps which warrant consideration.

Review findings ascertained that published literature reviews were generally very broad in scope. While published reviews document widespread support for self-management effectiveness, they have not explicitly considered the use of self-management for specific populations, settings, or outcomes. Focused literature reviews which concentrate on certain student populations, settings, and outcomes, are warranted as resulting findings may be used to (a) draw explicit conclusions concerning *what works, for whom, under what conditions* and (b) determine whether certain factors are associated with differential intervention outcomes.

Literature review findings also identified that published literature reviews largely lacked consideration of key SCD methodological features. It was determined that, with the exception of a couple of recent reviews, published reviews for the large part do not adhere to current systematic evaluation standards and guidelines for identifying evidence-based practices in SCD research. This demonstrates that updated SCD evidence reviews using current evidence standards and protocols, are warranted to facilitate the development and implementation of evidence-informed self-management interventions, and to enable researchers to conduct valued research which may contribute to the current evidence-based practice movement.

Ending with consideration of the aforementioned gaps, and acknowledgement of problem student behaviour prevalence and impact in primary education settings, this section provided the rationale for Section II of the study.

8.2 Section II: Systematic Review and Intervention Analysis

Section II contained three inter-connected chapters. The *methodology chapter* (Chapter 3) provided an overview of critical methodological elements to consider when undertaking a SCD systematic evidence review. Given the absence of a universally accepted evidence review protocol for SCR research, Chapter 3 presented a justification for the systematic review methodology that was applied in Studies 1 and 2.

To address some of the gaps identified in the initial review of reviews, the *evidence review* (Chapter 4; Study 1), presented an updated systematic research review which adopted the current WWC design and evidence standards to determine if self-management may be classified as an effective evidence-based behaviour management intervention for *primary students demonstrating problem behaviour in regular school settings*. Taken together, findings of this evidence review revealed that sufficient high-quality SCD research evidence exists to conclude that self-management interventions targeting behavioural outcomes may be considered an evidence-based practice for primary students in general school settings. However, analyses at the variable level indicated that additional high-quality research evidence, which *meets WWC standards without reservation*, is warranted to expand and strengthen the existing evidence-base for distinct student populations and targeted outcomes.

The evidence review identified a paucity of high-quality research investigating the effects of self-management across distinct student sub-populations in general primary education classrooms. As such further high-quality research is required to obtain firm conclusions about the effectiveness of self-management interventions for primary students in general education settings at each distinct grade level, and for those with various disabilities or special needs (e.g., ADHD, ASD, EBD, LD etc.). Moreover, additional high-quality research investigating self-management targeting different student outcomes is required. Although, sufficient high-quality research exists, demonstrating that self-management can successfully increase appropriate behaviour (task engagement/on-task), insufficient high-quality research investigates self-management interventions targeting the reduction of inappropriate behaviour (disruptive) in general education classrooms. Such research is necessary to determine whether self-management interventions are differentially effective across student populations and outcome variables.

Finally, to investigate critical factors associated with effective intervention composition, and successful implementation the *comprehensive intervention analysis* (Chapter 5; Study 2), systematically mapped and evaluated the identified high-quality SCD studies across intervention structure, intervention management, intervention complexity, implementation processes and protocols, training procedures, social validity, and procedural fidelity. Using an adapted version of Fantuzzo and colleague's SMIC-2 framework (Fantuzzo & Polite, 1990; Fantuzzo, Polite, Cook, & Quinn, 1988; Fantuzzo, Rohrbeck, & Azar, 1987) to guide the intervention analysis, this study established that intervention package composition varied notably across structure (i.e., type of components incorporated), complexity (i.e., number of included self-management components), and intervention management (i.e., the degree to which students and adults were involved in intervention implementation). Analysis identified the following key findings.

- *Structure:* Despite variability in overall intervention structure, all reviewed intervention packages contained six common core-components which appear to form the foundation of self-management interventions, including; (1) target behaviour selection, (2) target behaviour definition, (3) self-management cue management, (4) target behaviour observation, (5) target behaviour recording, and (6) self-management materials arrangement.
- *Complexity:* Analyses indicated there may be no additional benefit in implementing complex self-management interventions which incorporate "non-core components" (e.g., goal-setting, evaluation, consequence selection, consequence administration, and graphing), thus suggesting that such components are not critical for the formation of effective packages. Findings suggest that simple, self-monitoring based packages appear to form the basis of effective self-management packages.
- *Intervention Management*: Despite the title "self-management", the collection of analyzed interventions were not considered truly student-directed as interventions

tended to involve notable levels of adult-involvement. Interestingly, no significant difference was found between primarily adult-directed and primarily student-directed intervention packages, thus suggesting no apparent gains are evident in implementing self-management interventions which involve higher amounts of adult involvement.

Overall, study findings suggested that there may be an association between the degree of adult involvement, and the complexity of intervention packages, in that basic packages tend to be classified as primarily student-managed, while complex packages tend to be classified as primarily adult-managed. Taken together, Study 2 findings support the idea that optimal self-management packages are simple in structure, primarily comprised of student-managed self-monitoring components.

Analysis of implementation variables across the reviewed studies, as documented in Study 2, revealed a high degree of variability is evident in the way that self-management interventions are adopted in general education classrooms. Examination of prompting and recording devices revealed that use of modern technology has not been widely embraced to date. Given the publication date range of the reviewed studies it was not surprising to see classic prompting and recording devices (e.g., audio-based prompts and paper or pencil recording devices) were favored in classroom contexts. Variability was also evident in the intervention training processes (e.g., number of sessions, when it occurred, and duration) used in each study. Findings from this review were closely considered throughout the development of the intervention packaged presented in Section III.

8.3 Section III: Intervention Development and Pilot Study

Informed by Sections I and II, Section III was conducted to advance and strengthen the identified *high-quality* evidence-base. This was achieved via a *methodological narrative* (Chapter 6) which explored technology-supported self-management interventions, and introduced the novel technology-supported self-management intervention strategy, of which was piloted in a *SCD study* (Chapter 7). Chapter 6 also detailed the development of intervention implementation processes, and training procedures for the evidence-informed *simple, primarily student-directed self-management intervention package* applied in Chapter 7. In response to the range of implementation process identified across the evidence-base (see Chapter 5), Chapter 6 introduced a collection of *intervention manuals* which document clear intervention training steps and implementation procedures. The opportunity was taken to design an operationalized self-management implementation framework denoting the steps of each intervention process. The intervention manuals, which were used to facilitate completion of the pilot study (Chapter 7), may be used by future researchers and practitioners looking to systematically replicate and/or adapt this research.

One goal of this third section was to introduce and pilot the Self-Management Assistive Technology (SMAT) system (Bertram, 2015); an intervention system utilising Pebble Smartwatches and iPads to support the self-management process via tactile-prompts, electronic recording, and real-time behaviour recording feedback. Emerging research has proposed that modern technology can aid in the implementation of socially valid, efficient, user-friendly, discrete, minimally obtrusive, flexible, and automated self-management approaches (Bruhn, McDaniel, & Kreigh, 2015; Mechling, 2007). As such, the third section of this PhD was undertaken with the aim of contributing to the existing evidence-base via investigation of a technology-supported self-management package. The primary aim of Study 3, Chapter 7 was to evaluate the effects of the evidence-informed, SMAT supported self-management intervention on the behaviour (i.e., on-task *and* disruptive behavior) of three primary school students in a general education classroom setting. This study also investigated: (a) behaviour generalizability across classroom circumstances, (b) behaviour maintenance over time, (c) social validity, and (d) treatment fidelity.

Visual and statistical analyses revealed that implementation of the SMAT supported self-management intervention was associated with on-task behaviour increase and disruptive behaviour reduction for two typically developing fifth-grade students, and one fourth-grade student with a Severe Language Disorder (SLD). Overall, the intervention resulted in moderate to strong improvements in student behaviour; participant behaviour gains were generally maintained during a graduated fading program. Interpretation of generalization probe data collected in another context indicated some spontaneous generalization effects may have occurred.

Despite some variability in the data, these findings largely mirror and support the positive findings of previous studies investigating technology-based self-management interventions in school contexts (e.g., Bedesem, 2012; Rosenbloom, Mason, Wills, & Mason, 2016; Vogelgesang, Bruhn, Coghill-Behrends, Kern, & Troughton, 2016; Wills & Mason, 2014). Implementation of the intervention coincided with a broad positive shift in participant behaviour which demonstrated that mean participant behaviour levels had become increasingly more acceptable socially in accordance with the classroom behaviour micronorm established based on comparison peer behaviour. Furthermore, positive behaviour gains were also noted by the teacher who perceived target participant behaviour to be more comparable to that of classroom peers following intervention. Student and teacher participant perceptions of intervention social validity were highly favorable. Participants broadly considered target behaviour important, and were satisfied with observed outcomes. As hoped, the SMAT system itself was viewed appealing due to its novelty, accessibility, and discreteness. These findings showed SMAT supported self-management intervention was implemented with relatively high-fidelity, with the exception of some minor alterations as discussed in Chapter 7.

Review of the MBD graphs indicated that WWC design standards were respectively met with and without reservation for participants Troy and Pete, but were not met for Joey, thereby demonstrating a functional relationship between the implementation of SMAT supported self-management and improvements in behaviour for Troy and Pete. Unfortunately, though a positive behaviour change was also observed for Joey with the introduction of the intervention, a functional relation could not be demonstrated as only two demonstrations of an effect were documented.

8.4 Limitations and Challenges

While each independent study throughout this PhD has provided an overview of study-relevant limitations and challenges, this chapter acknowledges notable limitations and challenges which hold significance for the broader PhD project.

8.4.1 SCD evidence review and analysis methodology. One limitation concerns challenges associated with the task of reviewing, analysing, and synthesising SCD research to identify EBP. Although agreement exists concerning the key dimensions to consider when conducting SCD evidence reviews (e.g., research design quality, research quantity, experimental control, and intervention outcome/effectiveness), there remains a lack of consensus concerning the operationalised standards or criteria used to identify EBPs using SCD methodologies. No universally accepted set of SCD standards exist at this time to guide evidence review processes (Maggin, Briesch, & Chafouleas, 2012; Maggin & Chafouleas, 2013; Smith, 2012; Wendt & Miller, 2012). A second SCD methodological challenge encountered concerns SCD research data analysis methodology. Although, visual and statistical analyses are widely recognized as complementary analysis methods with a strong foundation in SCD research (see Chapter 3), existing SCD evaluation standards, including the WWC standards, lack concrete recommendations and guidelines for these analysis methods. This occurrence may be explained by the uncertainty which underlies the current state of SCD analysis methodology. As noted in Chapter 3, current literature indicates that SCD analysis methodology broadly lacks (a) widely accepted operationalized visual analysis guidelines, and (b) consensus concerning an optimal SCD effect size metric.

In this project efforts were dedicated to development of a comprehensive, and justified evidence review protocol (including a justifiable and replicable visual and statistical analysis approach) which considers the aforementioned limitations. The approach used in this PhD is viewed as reasonable, given that published SCD evidence reviews have similarly adopted approaches where researchers have used professional discretion to develop clear, operationalized evidence review protocol (Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker, 2015; Carr, Moore, & Anderson, 2014; Maggin et al., 2012). However, as the protocol applied in this research is not a widely adopted methodology, future research is warranted to further refine and validate the approach.

8.4.2 WWC standards quality appraisal. Reviewing studies which met WWC standards for SCD research may be viewed as a strength of this PhD research as greater confidence may be held in the individual study results and synthesised review findings. While inclusion of studies on the basis of research quality is a currently accepted research practice for evidence reviews, this approach resulted in the exclusion of some SCD research studies which may be categorised as *just below standard.* Given this approach, use of the WWC standards in the presented evidence review may have resulted in the presentation of findings and conclusions based upon a conservative research-base. When rating studies against the WWC quality standards studies classified as having *not met the design standards* were not distinguished in terms of those which have minor design infringements (i.e., failure to meet one design standard), and those which had major design infringement (i.e., failure to meet all design standards). Moreover the WWC standards were not used to distinguish between studies which report inadequate interobserver agreement (IOA) data, and those which did not clearly report on IOA data.

8.4.3 Meeting WWC standards in applied settings. While it is widely accepted that SCD studies must demonstrate a number of quality indicators to be considered high-quality, completion of the SCD pilot study in this PhD revealed that adhering to WWC design standard criteria within a real-life applied setting can be quite a difficult feat in practice. Efforts to meet WWC standards were challenged by class schedule variables (e.g., lesson timing, duration and frequency, schedule changes etc); extra-curricular activities (e.g., sport, music lessons, excursions and incursions); school holidays, camps and days off school; teacher and student participant absences; observer availability; and uncontrollable (extraneous) classroom and participant variables. These highlight the challenges of applied research, specifically in mainstream school settings, that may make it difficult to conduct optimally designed, high-quality SCD research to the level specified by WWC standards. In the case of this research it was difficult to: (a) co-ordinate researchers to collect sufficient IOA data, (b) collect *stable* data that satisfied WWC data point requirements, and (c) show three clear effect demonstrations in each MBD design.

8.5 Implications and Directions for Future Research and Practice

8.5.1 SCD evidence review methodology. Although SCD research has long been accepted as the cornerstone research method in applied behaviour analysis research, SCD researchers continue to face a number of issues and challenges concerning development of reliable and objective *evaluation standards*, and *analysis procedures.* As such, research efforts must continue to work towards development of universally accepted set of review standards which can guide researchers in appraising, evaluating, and synthesising SCD research to identify EBPs. In addressing this need it may be beneficial to construct a task force which can review, evaluate, refine, and synthesize existing evidence review standards and guidelines (see Chapter 3, Table 3.3) to establish a comprehensive set of evidence guidelines which consider a broader set of SCD dimensions. Ideally work of this nature will one day reduce uncertainty and confusion concerning SCD evidence review and analysis processes, and produce a set of universally accepted evaluation standards along with an operationalised set of visual and statistical analysis procedures.

As a substantial part of this research project is dedicated to developing an evidence review methodology and undertaking a comprehensive evidence review on self-management, implications associated with evaluation standards and analysis methodologies are discussed in more detail here.

8.5.1.1 Evaluation standard scope. As WWC standards (Version 3.0, WWC, 2014) are in *pilot* form, this research is timely in highlighting that the standards may benefit from future efforts to expand and refine the current guidelines. While WWC standards are recognized as a promising tool designed to appraise the empirical basis of SCD intervention research (Maggin et al., 2012), this research project has demonstrated the guidelines presented to direct researchers in determining and documenting the generality (external validity) of interventions across studies, and cases are somewhat limited. The current WWC standards place a larger emphasis on the evaluation of study features critical for determining experimental control (interval validity). While the WWC standards provide a set of *replication standards* that guide users in evaluating and quantifying the amount supportive evidence for a practice across studies and cases, the standards were adapted and expanded in this research such that self-management SCD studies were reviewed in greater detail across participant information, setting descriptions, and variable specifications (independent and dependent). Furthermore, operationalized SCD research guidelines detailing protocol for evaluating generalization, maintenance, treatment fidelity, and social validity data were incorporated in the expanded evaluation protocol used in this research as the current WWC standards also omit guidelines these variables.

Undertaking comprehensive reviews may not only encourage education professionals utilise the reviewed intervention in practice, but may also aid researchers in undertaking evidence-informed systematic replications studies to (a) better determine *what works, for whom, under what conditions,* (b) verify the validity and reliability of findings, and (c) further strengthen the quality of published research (Aljadeff-Abergel et al., 2015). While peer-review journal publication requirements typically prevent researchers from undertaking comprehensive reviews including extensive detailed information, like the one presented in Chapter 5, there may be some benefit to undertaking evidence reviews which include pertinent descriptive information about aforementioned variables that are not currently considered in WWC standards. Further research is needed to revise the current WWC standards in an effort to expand their scope such that researchers may use them to undertake reasonably-sized, comprehensive evidence reviews that may inform both research and practice in future publications.

8.5.1.2 Visual and statistical analysis. Another aspect of the WWC standards which warrants further development relates to operationalized protocols for visual and statistical analysis processes. As noted in the limitations section, the WWC standards do not document clear, operationalized guidelines which can direct researchers in undertaking visual and statistical analysis processes in a manner which can be systematically replicated. In order to overcome the methodological limitations and challenges encountered in this PhD, future SCD evidence review research is warranted to establish an accepted set of standards which incorporates operationalized criteria for visual analysis, as well as explicit procedures for statistical analysis approaches and evidence synthesis guidelines. In an effort to improve consistency among SCD evidence reviews, efforts should be dedicated to further developing and refining visual analysis *and* statistical analysis protocols to supplement the existing WWC standards, or in-built in future versions of the WWC standards. Although the current research efforts do not primarily focus on this particular research agenda, it has established a visual analysis protocol and statistical analysis approach (used in the Section 2 evidence review), which may provide a springboard for such research in future.

8.5.2 Self-management intervention composition. Aligning with previous research findings (e.g., Briesch & Chafouleas, 2009) the results of this PhD show that although self-management interventions consistently bring about positive behaviour outcomes for student in primary school settings, the composition of self-management intervention packages vary notably throughout the literature. This finding may be explained by use of *individualised* nature of interventions applied throughout ABA research. While clear recommendations regarding self-management intervention structure are yet to be developed, current findings have established that a common collection of core components form the foundation of self-management interventions throughout the reviewed evidence-base (core components listed on p. 300). Researchers are encouraged to consider these findings and undertake further research to investigate; (a) whether the core components identified in this research are the key to successful self-management interventions (i.e., are simple *self-monitoring* packages the basis of self-management success?), and (b) the role and value of identified non-core components (i.e., is there any added benefit in utilising complex packages incorporating goal setting and consequence components?).

Though it is typically expected that students will assume a high degree of responsibility for self-management interventions processes, current finding suggest that adults are largely responsible for implementing key intervention aspects. This finding may be explained by the SMIC-2B analysis methodology used to evaluate self-management packages in the identified evidence-base. The SMIC-2B methodology is an established process which involves evaluating self-management interventions based on nominal (or categorical) variables including; component presences (present or absent), and degree of component management (student-, joint-, or adult-managed). As such results from current SMIC-2B analysis process do not reveal that adult-managed components tend to be quite limited in duration and frequency (i.e., mostly occur just once per intervention or session), while student-managed components tend to occur repeatedly, on an on-going basis during interventions (i.e., continuous use of self-monitoring processes). It is suggested that the current SMIC-2B analysis system is in need of an update such that it may consider intervention components across frequency or duration dimensions. Consideration of these dimensions in future research may yield different conclusions in response to the question - are successful self-management intervention packages primarily student-managed or primarily adult-managed?

Although substantial intervention package variability is evident in the reviewed research, findings documented in Study 2, Chapter 5, suggest that use of a *simple, primarily student-managed self-management intervention package containing core components* may prove an optimally effective, efficient, and socially valid approach to yielding positive student outcomes. As such there may be merit in researchers investigating use of *smaller* packages to produce further research evidence for the effectiveness of parsimonious implementation processes, and *primarily student-directed* packages which has implications for the reduction of teacher involvement.

Given that this PhD research targets use of self-management interventions in general education settings (of which may or may not contain behaviour support staff), researchers are encouraged to conduct further research in an effort to establish a ‘standard’ intervention package that can be implemented with ease by teachers or education staff. Through consideration of intervention structure, intervention management, and complexity, researchers may work towards the identification of an operationalized package comprised of fundamental components which can be modified on a needs basis to accommodate for varying student needs if necessary. While the presented PhD project contains preliminary research conducted to address this task (Chapters 5, 6 and 7), researchers are encouraged to build upon the presented work. Such research will require researchers to conduct high-quality research which investigates the systematic manipulation and evaluation of management responsibilities (i.e., student-/adult- involvement), and self-management component presence (i.e., inclusion/ exclusion of differing components). To undertake such research, researchers may adopt the methodology of Hansen, Wills, Kamps, & Greenwood (2013) who used a multiple treatment reversal design to analyse and compare the effects of multiple, varied intervention packages.

8.5.3 Implementation guidelines and protocol. Future research should continue to explore factors associated with the successful *implementation* and *integration* of self-management interventions in general school settings. Investigating factors and issues associated with implementation science (Foreman et al., 2013), or intervention transportability (Schoenwald & Hoagwood, 2001) is thought integral in determining *how* EBP intervention literature can be effectively translated into everyday practices; an important goal given the research-practice gap (Briesch, Briesch, & Chafouleas, 2014; Cook & Odom, 2013; Fitzpatrick & Knowlton, 2009; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005).

Reviewing self-management intervention literature implementation factors, specifically intervention training processes, and implementation agent involvement, may be viewed as a strength of this PhD research given that published reviews and SCD study literature inconsistently report on these facets. Although not surprising, notable variability was identified in the implementation processes documented throughout the evidence-base reviewed in Section 2. Lack of a singular accepted self-management package, in combination with a lack of clear implementation guidelines specifying how self-management interventions can be successfully adopted into general education classroom settings, may function as a significant implementation barrier for education researchers and professionals.

To address this barrier a set of intervention design and implementation manuals were developed for researchers and education professionals to utilise in efforts to implement the technology-supported self-management intervention presented in Section 3. The manuals, introduced in Chapter 6 (presented in Appendix D) contain an implementation framework, which operationalizes (a) the structure of the piloted self-management package, (b) how to teach students self-management (student training), and (c) how to implement the intervention within the classroom setting. As Chapter 7 presents a promising pilot SCD investigation which successfully utilised the manualized implementation guidelines, future research is warranted to advance the manuals developed in this PhD. Future research involving researcher-teacher collaboration, which tests, evaluates, and refines the self-management implementation guidelines may be one way to improve utility and acceptability of the proposed guidelines. Such research will be of value given the evident need for explicit self-management intervention implementation procedures, which can be used by implementation agents, in applied research and practice to adopt simple, effective self-management interventions. Given that replication of high-quality research findings is at the core of EBP research, the development of manualized self-management implementation guidelines to guide systematic intervention replications may prove beneficial.

8.5.4 Self-management and technology. Based on research findings obtained through investigating the role of technology in self-management interventions, and piloting a novel technology-based strategy (Section 3) it is suggested that modern mobile technologies (e.g., mobile phones, tablets, computers, iPads etc) can be effectively utilized as tools to support self-management interventions which target behaviour change for primary school students in general school classrooms. Although findings from the pilot study in Chapter 7 are promising, further investigation is required to advance research concerning self-management and technology. Based on this PhD research the following research agenda is proposed.

First, a systematic evidence review is required to identify, synthesize, and evaluate current research evidence investigating applications of modern technology-supported self-management interventions in education contexts. As noted in Chapter 6, research in recent years has reflected a growing interest in the development of self-management intervention systems infused with fast advancing technology. As such a systematic literature review, is warranted to investigate the promise of technology-supported self-management strategies in terms of research evidence; intervention effectiveness; intervention structure; implementation and training processes; social validity; and implementation fidelity.

Second, systematic replication research based on the Chapter 7 intervention study piloting Self-Management Assistive Technology (SMAT) supported self-management is required to ensure intervention external validity is established across participants and/or settings. As research investigating the use of modern technology devices to support self-management interventions is in its infancy, further work is necessary to explore and refine promising modern technology in facilitating the implementation of progressive self-management strategies for school settings. Such research may address questions relating to whether SMAT supported self-management, is effective (a) with distinct student populations (e.g., typically developing students *and* students with diagnosed disabilities), (b) across distinct education levels (pre-school, primary school, high school), and (c) for use within distinct education settings (e.g., general and special education). Research of this nature is warranted as modern technology use increases within education contexts; and given the relatively recent emergence of literature investigating all-inclusive technology-based self-management intervention strategies (Bruhn, Waller, & Hasselbring, 2015; Rosenbloom et al., 2016; Wills & Mason, 2014).

Although authors of recent research suggest that technology supported self-management offers a socially valid, efficient, practical, unobtrusive, discrete, and automated intervention approach, further research is required to address a number of questions. The following are offered for future consideration: (a) are *technology-supported* self-management interventions classified as EBP according to WWC standards? (b) do self-management interventions with modern assistive technology produce different outcomes compared to more traditional self-management procedures found throughout research literature? (c) to what extent does teacher and student social validity data actually confirm the idea that technology-supported self-management is highly socially valid? (d) are technology-supported self-management packages more effective when used with specific student populations (e.g., typically developing students or students with various diagnoses, students in particular grades)? (e) are modern assistive technologies more suited for use within self-management interventions in certain settings for school students (e.g., kindergarten, primary school, high school, general education, special education)? (f) are technology supported strategies like SMAT designed in such a way that education staff (e.g., teachers, support staff, teacher's aids) can easily adopt and implement the intervention package with high-fidelity for student users? and (g) to what extent can technology be used to maximize student independence in self-management interventions?

8.5.5 Targeted outcomes. As the target of this study was behavioural outcomes, the effects of self-management intervention targeting academic outcomes were not considered. While improvements in student classroom behaviour and task engagement (on-task behaviour) may be associated with improved academic achievement or performance, intervention research is required to evaluate whether self-management interventions can be used to explicitly target improvement academic dependent variables (e.g., performance, work completion/productivity, accuracy). To inform such intervention research an evidence review investigating the use of self-management interventions targeting *academic student outcomes* for primary students in general school settings is warranted.

8.5.6 Generalization and maintenance. Future research is needed to further investigate the effectiveness of self-management interventions targeting behaviour outcomes in (a) maintaining skills and behaviour change when intervention materials are faded and/or completely withdrawn, and, (b) producing generalized skills and behaviour changes across different settings and/or behaviour. Findings reported in Section 2 (Chapters 4 and 5) of this PhD demonstrate underwhelming attention has been directed towards the investigation of response maintenance, setting generalization, and/or response generalization in this research area to date. In an effort to address this identified research gap, the intervention package piloted in Chapter 7 was designed to analyse: (a) response maintenance following the gradual fading of the SMAT self-management intervention, and (b) spontaneous generalization across contexts. Although findings suggested that improved student behavior change maintained after intervention, and a degree of spontaneous behaviour generalization occured, these outcomes must be interpreted with caution given that the study did not collect extensive data. Future researchers are encouraged to actively program for maintenance and generalisation processes when undertaking *high-quality* SCD research investigates self-management interventions for primary school students with problem behaviour in general education settings. This will ensure that implemented interventions aid students in achieving sustainable and generalizable positive behaviour changes. Careful preparation and consideration of potential barriers (e.g., scheduling, time limitations, etc.) during the intervention planning stage will be necessary for successful maintenance and generalisation phases.

8.5.7 Function-based self-management. At the beginning of this PhD (Section I; Chapter 2) it was noted that self-management interventions can be incorporated in the widely accepted School-Wide Positive Behaviour Support (SW-PBS) framework; predominately recognised as Tier 2 strategies (Briesch & Daniels, 2013; Ness, Sohlberg, & Albin, 2011) which can also be utilized as an individualized Tier 3 strategy when informed by Functional Behaviour Analysis (FBA) data (Brooks, Todd, Tofflemoyer, & Horner, 2003; Grandy & Peck, 1997; Hansen, Wills & Kamps, 2014; Lane, Menzies, Ennis, & Bezdek, 2013; Lewis, Mitchell, Bruntmeyer, & Sugai, 2016). In conducting the evidence review (Study 1, Chapter 4) it was identified that high-quality SCD research investigating self-management interventions in mainstream primary school settings are yet to widely explore the potential, of *function-based self-management interventions*.

While this PhD research proposes that simple, non-FBA informed self-management intervention packages omitting consequence/reinforcement components can be effective in general primary school contexts, further high-quality research is required to determine whether there may be any added benefit to implementing FBA informed interventions. As the scope of the pilot study in Chapter 7 focused on investigating technology-based self-management, rather than FBA-informed self-management further research is warranted to address this gap. Conducting such research is necessary as it may determine if self-management intervention outcomes may be enhanced by the inclusion of consequence or reinforcement components derived from FBA data. Although self-management research has broadly recognized the idea of function-based interventions (e.g., Brooks et al., 2003; Grandy & Peck, 1997; Hansen et al., 2013; Hansen et al., 2014; Stahr, Cushing, Lane, & Fox, 2006; Wadsworth, Hansen, & Wills, 2014), further research concerning the importance and role of function in self-management interventions in general school contexts is required.

8.6 Concluding Remarks.

Identifying, evaluating, promoting, disseminating, and implementing evidence-based practice is central to the fields of education and behaviour intervention, given the current demand for reliably effective, empirically supported practices (Cook & Odom, 2013; Horner & Kratochwill, 2012; Maggin, Briesch, Chafouleas, Ferguson, & Clark, 2013). Working within this framework, the presented PhD research has comprehensively explored, synthesized, and evaluated relevant SCD research investigating self-management interventions for primary students in general education classroom settings. Findings established that despite variation in intervention structure and implementation processes in the reviewed literature, sufficient high-quality evidence exists to broadly conclude that self-management interventions may be classified as an evidence-based practice which can be used successfully with primary students in general education classroom settings to improve behaviour outcomes. Through completion of an applied SCD intervention study the current thesis also contributes to the identified evidence-base by demonstrating that technology-supported self-management interventions offer a practical and socially valid modern alternative to classic self-management approaches. The findings of this PhD have important implications for both research and practice in that they support and extend the use of self-management interventions as an evidence-based practice which has great potential to improve student outcomes and address teacher behaviour management demands.

At some stage, all PhD research projects must come to an end - this is by no means suggests that research into this area is complete. This thesis has demonstrated that although self-management is supported by an extensive body of literature (stemming back to the 1960's!), opportunities remain for researchers to address (a) challenges and gaps in the literature base associated with implementation in applied education settings, and (b) the potential for technology-supported self-management approaches. Moving forward, researchers are encouraged to consider the reported outcomes, presented implications, and suggested research opportunities in efforts to expand and advance research investigating the use of self-management interventions with school students in education contexts.

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Appendices

Appendix A: School-Based Self-Management Intervention Review of Reviews: Meta-Review Data

Table 1

Review Details

Review Code	Authors	Date	Title	Journal	Review Form [a]	Primary Studies (n)	Study Design[b]	Date Range
R1	Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker	2015	The effectiveness of self-management interventions for children with autism—A literature review.	Research in Autism Spectrum Disorders	SLR	51	SCD	1970-2015
R2	Briesch & Chafouleas	2009	Review and analysis of literature on self-management interventions to promote appropriate classroom behaviors (1988-2008)	School Psychology Quarterly	SLR	30	SCD	1988-2008
R3	Bruhn, McDaniel, & Kreigh	2015	Self-monitoring interventions for students with behavior problems: a systematic review of current research	Behavioral Disorders	SLR	41	SCD (*n*=39) GC (*n*=1) NS (*n*=1)	2000-2012
R4	Carr, Moore, & Anderson	2014	Self-management interventions on students with autism a meta-analysis of single-subject research.	Exceptional Children	SLR	23	SCD	1992-2011
R5	Davis, Mason, Davis, Mason, & Crutchfield	2016	Self-Monitoring Interventions for Students with ASD: a Meta-analysis of School-Based Research.	Review Journal of Autism and Developmental Disorders	SLR	16	SCD	1990-2014
R6	Fantuzzo & Polite	1990	School-based, behavioral self-management: A review and analysis.	School Psychology Quarterly	SLR	42	SCD (*n*=40); GC (*n*=2)	1967-1988
R7	Fantuzzo, Polite, Cook, & Quinn	1988	An evaluation of the effectiveness of teacher- vs. student-management classroom interventions.	Psychology in the Schools	SLR	26	NS (Presumed to be SCD based on text)	1967-1985
R8	Fantuzzo, Rohrbeck, & Azar	1987	A component analysis of behavioral self-management intervention with elementary school students.	Child & Family Behavior Therapy	SLR	30	NS	1967-1984
R9	Fishley & Bedesem	2014	Self-monitoring by students with high-incidence disabilities in inclusion settings: A literature review	Special Education	SLR	14	SCD (appears to include 2 GC studies)	1991-2012
R10	Harchik, Sherman, & Sheldon[3]	1992	The use of self-management procedures by people with developmental disabilities: A brief review.	Research in Developmental Disabilities	LR	59 (*n*=20 were conducted in classroom settings)	NS[1] (All studies in classroom settings were SCD)	1973-1991

R11	Hughes, Korinek, & Gorman	1991	Self-management for students with mental retardation in public school settings: A research review.	Education & Training in Mental Retardation	SLR	19	SCD (*n*=15) GC (*n*=4)	1972-1987
R12	Hughes, Ruhl, & Misra	1989	Self-management with behaviorally disordered students in school settings: A promise unfulfilled?	Behavioral Disorders	SLR	11	SCD (*n*=10) GC (*n*=1)	1970-1988
R13	Lee, Simpson & Shogren	2007	Effects and implications of self-management for students with autism.	Focus on Autism and Other Developmental Disabilities	SLR	11	SCD	1992-2001
R14	Maggin, Briesch, & Chafouleas	2012	An application of the What Works Clearinghouse Standards for evaluating single subject research: Synthesis of the self-management literature base.	Remedial and Special Education	SLR[2]	30	SCD	1988-2008
R15	McDougall	1998	Research on self-management techniques used by students with disabilities in general education settings	Remedial and Special Education	SLR	14	SSD (*n*=13) GC (*n*=1)	1970-1998
R16	McDougall	1996	Self-monitoring procedures: A review of the literature and implications for training	Emotional and Behavioural Difficulties	LR	NS (Approx. 30 studies noted in review)	SCD	1971-1995
R17	McLaughlin*	1976	Self-control in the classroom	Review of Educational Research	LR	NS (Approx. 20 studies noted in review)	SCD GC	NS
R18	Mitchem & Young	2001	Adapting self-management programs for classwide use (Part 1 of article)	Remedial and Special Education	LR	7	GC	1973-1996
R19	Mooney, Ryan, Uhing, Reid, & Epstein	2005	A review of self-management interventions targeting academic outcomes for students with emotional and behavioral disorders.	Journal of Behavioral Education	SLR	20	SSD (*n*=18) GC (*n*=2)	1970-2002
R20	Nelson, Smith, Young, & Dodd	1991	A review of self-management outcome research conducted with students who exhibit behavioral disorders.	Behavioral Disorders	SLR	16	SSD (*n*=13) GC (*n*=3)	1978-1988
R21	O'Leary & Dubey	1979	Applications of self-control procedures by children: a review	Journal of Applied Behavior Analysis	LR	NS	NS	NS
R22	Panagopoulou-Stametelatou	1990	The use of behavioural self-management in primary school settings: A review.	Educational Psychology	LR	31	SSD (*n*=19) GC (*n*=12)	1969-1989
R23	Reid	1996	Research in self-monitoring with students with learning disabilities: The present, the prospects, the pitfalls	Journal of Learning Disabilities	LR	23	SSD (*n*=22) GC (*n*=1)	1974-1996
R24	Reid, Trout, & Schartz	2005	Self-regulation interventions for children with attention deficit/hyperactivity disorder.	Exceptional Children	SLR	16	SSD (*n*=14) GC (*n*=2)	1974-2003

R25	Rosenbaum & Drabman*	1979	Self-control training in the classroom: A review and critique	Journal of Applied Behavior Analysis	LR	NS	NS –reported that SCD was the most frequent design	NS
R26	Sanders*	1978	Behavioural self-control with children and adolescents: a review and critical analysis of educational applications	The Exceptional Child	LR	NS	NS	NS
R27	Sheffield & Waller	2010	A review of single-case studies utilizing self-monitoring interventions to reduce problem classroom behaviors	Beyond Behavior	LR	16	SSD	1998-2007
R28	Southhall & Gast[4]	2011	Self-management procedures: A comparison across the Autism Spectrum.	Education and Training in Autism and Developmental Disabilities	SLR	24	SCD	1994-2008
R29	Webber, Scheuermann, McCall, & Coleman	1993	Research on self-monitoring as a behavior management technique in special education classrooms: A descriptive review.	Remedial and Special Education	SLR	24 (Review indicates 27 studies, as two articles present multiple studies)	SSD (*n*=22) GC (*n*=2)	1980-1989
R30	Workman & Hector	1978	Behavioral self-control in classroom settings: A review of the literature.	Journal of School Psychology	LR	13	NS	1969-1977

[a] SLR= Systematic literature review; LR = Traditional or Narrative Literature review
[b] GC = group comparison study; SCD = single-case design
NS = Not Specified
*Note: Reviews do not take the typical structure of modern reviews, as such details concerning their structure have been omitted to avoid error in reporting.
[1] Checked all reviewed studies conducted in a classroom (*n*=18); all were single-case designs; [2] Re-review of previously reviewed set of studies identified through a SLR undertaken by Briesch and Chafouleas (2009); [3] Note that the information provided for Harchik, et al. has only been provided based on the 20 studies which were conducted in classroom settings; [4] Only studies which were undertaken in education settings were included in the count for the reviews undertaken by Southhall and Gast

Table 2

Participant Demographics and Setting Details

Review Code	Authors	Date	*n*Participants (Gender)[a]	Diagnosis[b]	Age (Grade)	Setting[c]	Education Level[d]
R1	Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker	2015	71 (gender not specified)	ASD	Mean 11.26 years (3-49years)	Natural Settings including school settings (*n*Studies =20) Clinical settings (*n*Studies=7) Natural/Clinical (*n*Studies=27)	Did not specify; presumably PreS, PS, HS and adult settings based on age range
R2	Briesch & Chafouleas	2009	89 (M) 17 (F)	ADHD; BD; EBD; ED; LD; SED; SLI; TD; At-risk for CD	Mean 11years 7months	GE (*n*Studies= 13) SpecES (*n*Studies=18)	PS HS
R3	Bruhn, McDaniel, & Kreigh	2015	193 (M) 38 (F)	ADHD; ASD; EBD; FAS; FHS; GIF; MTD; LD; OHI; PTSD; SLI; SNS; TS	Age 6-16 years in studies that specified (Kindergarten to Year 12)	GE (*n*Studies=19) SpecES (*n*Studies=17) Inclusive (*n*Studies=5)	PreS PS HS
R4	Carr, Moore, & Anderson	2014	65 (M) 5 (F)	ASD , AS	Age range 3-25years	GE SpecES Other (home, community, clinic)	PreS PS HS Adult
R5	Davis, Mason, Davis, Mason, & Crutchfield	2016	26 (M) 2 (F)	ASD	Age not specified (Classified age as Primary –PreS-2; Elementary – 3-5; Secondary 6-12)	GE (*n*Studies =8) SpecES (*n*Studies=8)	PreS PS HS
R6	Fantuzzo & Polite	1990	817 participants (53% of applications focused on both male and female students; 40% focused on male students and 7% focused on female student)	Children of normal intelligence (no mention of disability status or diagnosis)	Mean age range 6-12years (Kinder to Grade 6)	GE SpecES	PS
R7	Fantuzzo, Polite, Cook, & Quinn	1988	Not specified	Children of normal intelligence (no mention of disability status or diagnosis)	Mean age range 5-12years	GE SpecES	PS

R8	Fantuzzo, Rohrbeck, & Azar	1987	48 (M) 25 (F) 191 (not specified)	"Normal" children with no educational or emotional handicap (no mention of disability status)	Age not specified (Prep- Grade 6)	Unclear (specified regular elementary school)	PS
R9	Fishley & Bedesem	2014	Total = 140 Of the studies that reported gender: 51 (M) 13 (F)	ADHD, BD, LD, MR, OCD, TD ("At-Risk")	Age 8-17 years in studies which specified. Age not specified in all studies.	GE (*n*Studies= 14)	PS HS
R10	Harchik, Sherman, & Sheldon[1]	1992	Did not specify	DD	3-18 years	Classroom settings, did not specify GE or SpecES Other (*n*=41) (Workshop, home, community, hospital, institution & vocational setting)	Did not specify; presumably PreS, PS and HS settings based on age range
R11	Hughes, Korinek, & Gorman	1991	41 (M) 22 (F) 81 (gender not specified)	MR (EMR, TMR, SR)	9-19years	SpecES in public school settings (*n*=19)	Did not specify; presumably PS and HS settings based on age range
R12	Hughes, Ruhl, & Misra	1989	26 (M) 7 (F) 10 (not specified)	Behaviourally disordered students	8years 6months – 16years	SpecES (*n*=11)	Did not specify; presumably PS and HS settings based on age range
R13	Lee, Simpson, & Shogren	2007	31 (M) 3 (F)	ASD	3-17years	School setting; did not specify special or regular settings Other (Community, home and clinic settings) Most studies were conducted across multi-site.	Did not specify; presumably PreS, PS and HS settings based on age range
R14	Maggin, Briesch, & Chafouleas	2012	89 (M) 17 (F)	ADHD; BD; EBD; ED; LD; SED; SLI; TD; At-risk for CD	Mean 11years 7months	GE (*n*Studies= 13) SpecES (*n*Studies=18)	PS HS
R15	McDougall	1998	122 (F) 224 (M) 6 (not specified)	TD, LD, BD, ADHD	6-18years	GE (*n*=11) Other (*n*=3) (Inclusive model school, study hall and vocational school)	Did not specify; presumably PS and HS settings based on age range
R16	McDougall	1996	Not specified	EBD, LD, MR, TD	Ages not specified (reported inclusion of studies involving students in 2nd Grade through to Adulthood)	GE Other (community work settings, shelters workshops) Not all settings were specified, could not determine whether any studies were conducted in SpecES	PS HS Adult
R17	McLaughlin*	1976	Not specified	Not specified	Age not specified	GE SpecES	PS HS

R18	Mitchem & Young	2001	185 (gender not specified)	Not specified	Ages not specified (Preschool- 7th Grade)	GE	PreS (*n*=1) PS (*n*=5) HS (*n*=1)
R19	Mooney, Ryan, Uhing, Reid, & Epstein	2005	78 (gender not specified)	EBD	Age range not specified. Youngest age 5 years (Preschool- 12th Grade)	SpecES in public schools (*n*=16) Other (*n*=6) (Special day schools, home, psychiatic and university settings)	PS (*n* = 5) HS (*n*=6) Combined PS and HS (*n*=2) NS (*n*=9)
R20	Nelson, Smith, Young, & Dodd	1991	86 (gender not specified)	BD	Age not specified (Preschool age to Adolescents)	Classroom settings, did not specify whether GE or SpecEd.	PreS PS HS
R21	O'Leary & Dubey	1979	Not specified	Not specified; presumably TD students and students with disability based on text	Age not specified (Preschool to Adolescents based on text)	Clinical applications; laboratory studies and classroom settings	Did not specify, presumably PreS, PS and HS based on text.
R22	Panagopoulou-Stametelatou	1990	134 (M) 127 (F) 178 (gender not specified)	Based on text it was identified that most studies included TD students or students 'At-Risk'. A small number of students had various disabilities	6-12 years (based on studies in which age was specified)	GE (participants attended mainstream education)	PS
R23	Reid	1996	112 (gender not specified)	LD	7-18years	GE (*n*=6) SpecEd (*n*=18)	Did not specify, presumably PS and HS based on participant age descriptors
R24	Reid, Trout, & Schartz	2005	48 (M) 3 (F)	ADHD (Co-morbid disorders)	6-13years	GE (*n*= 4) SpecES (*n*=4) Other (*n*=8) (Hospital, residential treatment center, clinic, and other education settings)	PS
R25	Rosenbaum & Drabman*	1979	NS	NS	NS	Classroom settings (did not summarise the specific setting)	Did not specify, presumably PS and HS based on text
R26	Sanders*	1978	NS	NS	NS	Classroom settings (did not summarise the specific setting)	Did not specify, presumably PS and HS based on text
R27	Sheffield & Waller	2010	108 (M) 38 (F)	TD; ADHD; LD; ED; MR; DS; At-risk for school failure; Co-morbid disorders	8-15yrs	GE (*n*=9) SpecES (*n*=3) Other (*n*=4)	Did not specify, presumably PS and HS based on participant age descriptors

R28	Southhall & Gast	2011	52 (M) 7 (F)	ASD AS (HFA)	4-25years	GE (*n*=4) SpecES (*n*=6) Other (*n*=14) (Home, clinic, hospital and therapy settings)	PreS PS HS
R29	Webber, Scheuermann, McCall, & Coleman	1993	99 (M) 30 (F) 13 (gender no specified)	LD, BD, MR, SED, ED, VH, TD, Co-morbid disorders	6-19yrs	GE (*n*=2) SpecES (*n*=19) Other (*n*=3) (Worksite, settings, day treatment classrom)	Did not specify, presumably PS and HS based on participant age descriptors
R30	Workman & Hector	1978	259 (gender not be determined) – based on manual tally	TD; Low IQ; Attention Problems; Sch; BD	Not specified	GE (*n*=5) SpecES (*n*=1) Other (*n*=2) NS classroom settings (*n*=5)	Did not specify, presumably PS and HS based on presented text

[a] M= Male; F = Female

[b] Student populations included in studies reviewed within respective review; reported disability status. ADHD = Attention deficit/hyperactivity disorder, ASD = Autism spectrum disorder, AS = Asperger's Syndrome, BD = Behavioural disorder, DD = Developmental disabilities, DS = Down syndrome; CD = Conduct disorder, EBD = Emotional and/or behavioural disorder; ED = Emotional disturbance; EMR = Educable mental retardation; AS = High functioning autism, LD = Learning disorder; MR = Mental retardation; OCD = Obsessive Compulsive Disorder; Sch = Schizophrenia; SED = Serious emotional disturbance; SED = Serious emotional disturbance; SLI = Specific language impairment; SNS = student receiving special education services not specified; SR= Severely retarded; TD = Typically developing; TS = Tourette's Syndrome; VH = Visual handicaps; TMR = Trainable mental retardation

[c] GE=General education setting; SpecES = Special education setting including self-contained class or resource rooms, NS = Not specified

[d] PreS = Preschool, PS = Primary school, HS =High school, Older = Older than high school, NS = Not specified

[1] Note that the information provided for Harchik, et al. has only been provided based on the 20 studies which were conducted in classroom settings

*Note: Reviews do not take the typical structure of modern reviews, as such details concerning their structure have been omitted to avoid error in reporting.

Table 3

Intervention Details and Targeted Outcomes

Review Code	Authors	Date	Research Aim/Objective/Focus	Intervention (Independent Variable)[a]	Targeted Outcome (Dependent Variable) (*n*)[b]	Reported Finding (Regarding intervention outcomes)
R1	Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker	2015	Reviewed literature investigating self-management interventions for individuals with autism. Purpose of review was to extend National Standards Project (NSP) report by evaluating social validity, the extent to which interventions have been conducted in natural settings, and to evaluate methodological quality of studies.	A, B, C, E, K	Not Specified	Results indicate that self-management interventions for children with ASD are effective, in natural, clinical and mixed settings. Few studies have undertaken formal evaluations of social validity.
R2	Briesch & Chafouleas	2009	Reviewed and quantified the literature on behavioural self-management used in classroom settings. Reviewed studies which included school-age children of normal intelligence in regular or special education[#]	A	Task-engagement (n=22), Disruptive (n=2), Combination (n=6)	Self-management interventions continue to vary in terms of the number of intervention components that they include, as well as the degree to which students were involved in their implementation. Adults play a large role in the implementation of self-management interventions. Effect sizes suggest that self-management was moderately effective at improving behaviour in education settings.
R3	Bruhn, McDaniel, & Kreigh	2015	Provided an updated review of literature focusing on the role of reinforcement, feedback, function, and technology in self-monitoring interventions for students with behaviour problems.	A, B, C	Task-Engagement (n=9) Academic (n=2) Disruptive (n=5) Social skills (n=2) Combination (n=20) Other (n=3) (Classroom prep, homework behaviour, adult attention recruitment)	Reported that all reviewed studies documented improvements in behaviour as a result of self-monitoring (study findings focused mostly on reviewing the presences of various self-management elements included in intervention packages).
R4	Carr, Moore, & Anderson	2014	Reviewed self-management literature targeting the skill acquisition and/or improvement of behaviour of students diagnosed with ASD to explore the evidence and evaluate intervention effectiveness[#]	A, L (Adult-delivered reinforcement, peer involvement)	Academic (n= 7), Social Skills (n=15), Other (n=1) (daily living), Collateral reductions in problem behaviour (n=6)	Reported that there is sufficient evidence to suggest that self-management is an evidence-based practice for students diagnosed with autism spectrum disorders. Self-management interventions were found to be effective for increasing both social and academic skills in students with an ASD of all ages regardless of level of functioning.

R5	Davis, Mason, Davis, Mason, & Crutchfield	2016	Reviewed characteristics of students with ASD that respond favourably to self-monitoring interventions, the procedures that are necessary for implementation, and how settings within schools affect outcomes. Evaluated the efficacy of school-based self-monitoring interventions in changing behaviour for students with ASD.	A	Task-Engagement (*n*=7) Disruptive (*n*=2) Social Skills(*n*=6) Other (*n*=3) (Stereotypy, Compliance)	Results revealed strong intervention effects for students with ASD across a range of target behaviours and school settings. Analysis found most intervention effects are based on four key components (e.g. selecting a target behaviour, defining a target behaviour, self-assessment, and self-recording). Results suggest higher levels of student involvement lead to larger intervention effects.
R6	Fantuzzo & Polite	1990	Reviewed literature looking at school-based self-management interventions with elementary school students with normal intelligence. Focused more on identifying the presence or absence of common self-management components and assessing whether interventions are primarily student-or adult-managed[#]	A	Academic (*n*= 21), Problem behaviour (*n*=18), Combination (*n*=3)	Self-management interventions varied in the degree to which they were student-managed. Reported no significant differences between the degree of self-management and age group, sex or type of target behaviour. Review found that less than half of the active intervention components were actually student-managed. A significant positive correlation was found between the proportion of student-management and the magnitude of treatment effect size.
R7	Fantuzzo, Polite, Cook, & Quinn	1988	Reviewed literature which has directly compared school-based teacher-managed vs student-managed interventions. Literature focused on elementary school students with normal intelligence. Focused on evaluating the number of self-management components in each self-management intervention[#]	A	Academic (*n*=15), Problem behaviour (*n*=9), Combination (*n*=2)	The amount of student-management varied across the reviewed studies. Student-management interventions resulted in greater treatment effect sizes than those of teacher-management interventions. A significant positive relationship between the number of intervention components that were student-managed and the treatment effect size was also identified.
R8	Fantuzzo, Rohrbeck, & Azar	1987	Reviewed school-based, behavioural, self-management literature to evaluate the status of self-management training with elementary school students. Aimed to aid the development of effective primary prevention interventions[#]	A	Academic (*n*=18), Problem behaviour (*n*=13), Combination (*n*=4)	Lack of uniformity of self-management interventions for elementary school children. Identified that there is a great deal of teacher involvement in the interventions. Review did not report on effectiveness of interventions.

R9	Fishley & Bedesem	2014	Identified and reviewed research that investigated self-monitoring in inclusion settings with students with high-incidence disabilities. Aimed to determine wither self-monitoring can be effective in improving student behaviours in inclusive settings and to identify the components that contribute to its success.	A, B, E, J, K, L (combined with group contingency, reinforcement, Prevention Plus Program, academic strategies i.e. Spelling Procedure)	Academic (*n*=2), Disruptive (*n*=1) Task-Engagement (*n*=8), Combination (*n*= 2) Social Skills (*n*=2) Other (*n*=2)	Review results indicate that self-monitoring can be successfully implemented in inclusive settings to improve both academic and on-task behaviours. Identified that self-monitoring can be successful when used as a stand-alone intervention or as part of a self-management intervention package.
R10	Harchik, Sherman, & Sheldon[1]	1992	Reviewed literature examining the effects that occurred when people with developmental disabilities were taught to use self-management. This review also looked into a number of other issues relating to the use of self-management.	A, B, C, D, L (combined with token economy)	Academic (*n*= 9), Task-engagement (*n*=3), Problem behaviour (*n*=2), Disruptive (*n*=1), Combination (*n*=2), Other (*n*=3) (stereotypies, nose/mouth picking and headshaking)	Concluded that individuals with developmental disabilities can effectively implement self-management procedures.
R11	Hughes, Korinek, & Gorman	1991	Reviewed literature investigating self-management procedures used with students with mental retardation in public school settings.	A, B, C, E, H, L (combined with modelling and curing)	Academic (*n*= 7), Problem behaviour (*n*=1), Disruptive (*n*=1), Task-engagement (*n*=1), Combination (*n*=5), Other (*n*=4)	Concluded that students with mental retardation can benefit from self-management intervention as the review findings demonstrated positive improvements in target behaviours. Outlined areas in need of more research to be addressed in future.
R12	Hughes, Ruhl, & Misra	1989	Reviewed literature investigating self-management procedures used with behaviourally disordered students in school settings. The review looked at studies including students who were identified as behaviourally disordered or some variation of this (e.g. emotionally disturbed, emotionally handicapped).	A, B, C, E, H, K, L (combined with matching, token economy, cueing, and teacher feedback)	Academic (*n*=4), Task-Engagement (*n*=3), Problem Behaviour (*n*=1), Combination (*n*= 3)	All studies reported positive results in terms of outcome variable changes. Use of self-management resulted in increases in academic performance, homework completion, on-task behaviour and appropriate classroom behaviour. Suggested that there is a need for students to become more active in the self-management process. Identifies areas for further research.

R13	Lee, Simpson, & Shogren	2007	Reviewed literature examining the efficacy of self-management for increasing appropriate behaviour of students with autism.	A, B, C	Disruptive and social skills (*n*=1), Social Skills (*n*=8), Other (*n*=) (schedule following, daily living)	Self-management can be used to increase appropriate behaviours among students with autism. Improvements in socially desired behaviours were found across subjects, settings and particular conditions. Concluded that self-management is not universally effective nor suitable for all students and also highlight a need for further research in certain areas.
R14	Maggin, Briesch, & Chafouleas	2012	Re-reviewed the set of SCD studies identified by Briesch and Chafouleas (2009) through an application of the What Works Clearinghouse (WWC) design and evidence standards. Though the primary focus of this review was to identify strengths and weaknesses of the WWC standards the authors provide findings relevant to self-management	A	Task-engagement (*n*=22), Disruptive (*n*=2), Combination (*n*=6)	Reported sufficient empirical support to class self-management interventions as an evidence-based practice for improving the classroom conduct of students with challenging behaviours. Suggested that there were enough studies with sufficient methodological rigor, demonstrating sufficient visual proof and providing adequate replication to warrant classification.
R15	McDougall	1998	Reviewed literature investigating the use of self-management interventions used by students with disabilities in general education settings.	A, B, C, D, E, G, H, I, J, L (combined with teacher or token reinforcement, feedback, and peer tutoring)	Academic (*n*= 2), Problem behaviour (*n*=5), Task-engagement (*n*=2), Combination (*n*=3), Other (*n*=2) (self- injurious behaviour, vocational skills)	Behavioural self-management were found to be used successfully by students with disabilities to enhance their social and academic performance in general education settings. The authors suggest that review findings provide support for the efficacy of self-management as an inclusive technique.
R16	McDougall	1996	Reviewed literature that investigated behavioural self-control (BSC) interventions which used cued or cover self-monitoring to promote behaviour change in individuals with disabilities. Looked at research which has used self-monitoring to improve academic, social and adaptive behaviours	B (reviewed studies often utilised *self-monitoring* in a multi-component treatment packages –other components often included C, E and J	Academic, Task-Engagement, Problem Behaviour, Combined, Other (work productivity, error rates, completion of daily activities)	Behavioural self-control interventions which use cued or covert self-management are effective procedures for increasing on-ask behaviour and academic productivity, and decreasing inappropriate behaviour. Also concluded that this form of intervention can be successfully applied to many target behaviours in a range of environments with individuals of various ages and various handicapping conditions. It was reported that intervention effects were more robust for outcomes relating to task engagement, than for concurrently measured academic productivity.

R17	McLaughlin*	1976	Reviewed literature investigating the application of self-control procedures in the management of classroom behaviour	A, C, D, G	Academic, Problem behaviour, Task-engagement	Reported that most of the reviewed literature indicated that self-control procedures can be implemented in public and remedial classroom settings. Indicated that a number of issues and research questions need to be addressed so that self-control may benefit individuals in education
R18	Mitchem & Young	2001	Reviewed the literature on acceptability and feasibility of self-management programs to improve behaviour	A	Academic (*n*= 2), Problem behaviour (*n*=1), Task-engagement (*n*=3), Combination (*n*=1)	Classwide self-management interventions brought about improvements in behaviour and academic performance for target students. The degree of improvement varied across studies.
R19	Mooney, Ryan, Uhing, Reid, & Epstein	2005	Reviewed literature investigating the effectiveness and focus of academic self-management interventions for children and adolescents with emotional and behavioural disorders	A, B, E, H, L (combined with strategy instruction)	Academic (*n*=22)	Self-management interventions produced large positive effects on academic outcomes for students with emotional and behavioural disorders.
R20	Nelson, Smith, Young, & Dodd	1991	Reviewed literature investigating self-management outcomes with children and youth who exhibit behavioural disorders.	A, B, D, E, H, L (combined with didactic instruction, modelling and role play, token economy, videotaping)	Academic (*n*= 1), Problem behaviour (*n*=2), Task-engagement (*n*=5), Combination (*n*=3), Other (daily, living skills, social skills, self- injurious behaviour) (*n*=5)	Findings suggest that self-management procedures can be used to promote the social and academic behaviours of children and youth who exhibit behavioural disorders. It was not confidently concluded whether self-management effects generalise due to inconsistent findings. However, it was suggested that the treatment effects generalise if systematically programed.
R21	O'Leary & Dubey	1979	Summarised literature investigating procedures that children can used to effectively control their own behaviour.	A, B, C, D, E, G, H, K, L (other strategies included self-punishment, contingent rewards and token economies)	Academic, Problem behaviour, Task-engagement, Combination, Other (room cleaning)	Suggested that most self-control techniques when implemented alone rather than in combination with other procedures, successfully helped some children to control both academic and social behaviours. Also concluded the self-control strategies are probably as effective as similar, externally imposed procedures. The literature summary presented positive maintenance effects.

R22	Panagopoulou-Stametelatou	1990	Reviewed literature which investigated behavioural self-management as a strategy of improving aspects of children's academic and social behaviour in mainstream primary school settings.	A (combined with token economy, response cost and teacher feedback)	Academic (*n*= 15), Problem behaviour/Task-engagement (*n*=9), Combination (*n*=7)	Self-management procedure have often proved to be effective in changing classroom behaviour by means of increasing children's appropriate or decreasing inappropriate social behaviour. Self-management has also helped student in improving their academic performance. Concludes that there is no uniform classroom based behavioural self-management intervention.
R23	Reid	1996	Reviewed literature investigating self-monitoring used with students with learning disabilities. Evaluated literature in terms of three dependent outcome measures including; on-task behaviour, academic productivity and accuracy.	A, B, D, G, L (combined with teacher assessment, contingent reinforcement)	Academic (*n*= 1), Combination (*n*=17), Task-Engagement (*n*=5)	Self-monitoring can be considered a mature intervention as the body of evidence supporting the positive effects of self-monitoring on important academic variables such as on-task behaviour and productivity is undeniable.
R24	Reid, Trout, & Schartz	2005	Reviewed literature investigating the effects of self-regulation interventions (self-monitoring, self-monitoring plus reinforcement, self-management and self-reinforcement).	A, B, C	Academic (*n*= 2), Problem behaviour (*n*=4), Task-engagement (*n*=5), Combination (*n*=5)	Self-regulation interventions can bring about improvements in student on-task behaviour, academic productivity and accuracy, and reduction of inappropriate or disruptive behaviours.
R25	Rosenbaum & Drabman*	1979	Reviewed and critiqued literature investigating self-control training in classrooms settings. This review (a) presented research dealing with self-control training, (b) evaluated effectiveness, (c) discussed factors associated with effective self-control training and (d) suggested some future directions for research.	A, C, D, E, H, L (combined with token economies, external contingencies etc)	Academic, Problem behaviour, Disruptive, Other	It was concluded that students can be taught to observe and record their own behaviour, determine and administer their own contingencies and provide instructions to guide their own behaviour. This review provides a number of other conclusion – see article.
R26	Sanders*	1978	Reviewed literature investigating behavioural self-control procedures with children and adolescents. Focused on educational applications	A, B, C, D, F, K, L	Academic, Disruptive, Task engagement, Other	The review demonstrated further effectiveness for self-control techniques used with children and adolescents. Techniques were found to be effective across age, personal characteristics, competencies and type of problem. Encouraged further systematic analyses of treatment procedures.
R27	Sheffield & Waller	2010	Reviewed literature investigating self-monitoring strategies implemented by teachers and used by students to reduce problem behaviours in the classroom	A, B, L (combined with social skill development and communication system)	Academic (*n*= 1), Disruptive (*n*=2), Task-engagement (*n*=4), Combination (*n*=4), Task-engagement and social skills (*n*=2), Other (*n*=3) (social skills, preparedness)	Self-monitoring used alone or as an intervention package can be an effective intervention to reduce many problem behaviours. Reported that self-monitoring can be used effectively in classroom settings.

R28	Southhall & Gast[2]	2011	Reviewed literature investigating self-management as a procedure for modifying one's own behaviour, to increase target behaviours in students with either autistic disorders or high-functioning autism/Asperger's syndrome[#]	A, B, C, D, K (combined with token economy and various other interventions)	Academic, Problem behaviour, Task-engagement, Disruptive, Combination, Social Skills, Other (rocking, transition, following instructions)	Interventions resulted in improved desirable behaviours across participants, settings and behaviours. Individuals with high functioning autism/Asperger's syndrome effectively used self-management procedures to address deficits related to the core characteristics of ASD
R29	Webber, Scheuermann, McCall, & Coleman	1993	Reviewed literature investigating the use of self-monitoring as a behaviour management technique in special education reviews.	A, B, L (combined with token economy, teacher assessment)	Academic (*n*= 2), Problem behaviour (*n*=3), Task-engagement (*n*=3), Combination (*n*=13), Other (*n*=3)	Self-monitoring results in behaviour change (disruptive behaviour, learning-related behaviour and social behaviours) for special education students in public schools. The behaviour change procedure in a majority of the studies resulted in an increase in behaviours already established in the student's repertoire.
R30	Workman & Hector	1978	Reviewed literature investigating behavioural self-control procedures with students in classroom settings.	A, C, D, L (combined with token reinforcement conditions)	Academic (*n*=3), Task-Engagement (*n*=5), Disruptive (*n*=5)	Concluded that the use of self-control methods appears promising with on-task and academic behaviour and inconclusive with disruptive behaviour.

[a] Intervention (independent variable) components used across the studies within respective reviews. A = self-management (reviews which incorporated studies which made use of interventions that have combined more than one self-management component, i.e. multi-component intervention packages); B = self-monitoring, C = self-reinforcement/consequences, D = self-recording, E = self-evaluation, F = self-observation, G = self-assessment, H =self-instruction, I = self-modelling, J = self-graphing/self-charting, K = Goal-setting, L = Self-management intervention components combined with another intervention strategy

[b] Outcome variables (dependent variables) targeted in studies reviewed within respective reviews. Task-engagement = Outcome variables including on/off-task behaviours, attention to task and task engagement; Disruptive = Outcome variables including disruptive behaviour, inappropriate vocalisations, talking-out-of-turn, out-of-seat behaviour, problem behaviours etc; Problem Behaviour = Combination of task-engagement and disruptive outcome variables looked at by included studies; Academic= Outcome variables including academic performance, productivity completion and rate of completion; Combination = Combination of academic and problem behaviours looked at by included studies; Social Skills = Outcome variables including social and communication skills; Other = any outcome variables which did not fit into these categories

[#] Review included an intervention component analysis where authors evaluated the self-management components used in interventions across the reviewed studies. See original review papers for details on self-management intervention structures used across the reviewed studies in respective reviews.

*Note: Reviews do not take the typical structure of modern reviews, as such details concerning their structure have been omitted to avoid error in reporting.

[1] Note that the information provided for Harchik, et al. has only been provided based on the 20 studies which were conducted in classroom settings; [2] Only studies which were undertaken in education settings were included in the count for the reviews undertaken by Southhall and Gast

Table 4

Review Methodology Details

Review Code	Research Design	Date	Quality Appraisal[a]	Visual Analysis[b]	Effect Size[c]	Social Validity[d]	Fidelity/ Integrity[e]	Results Presentation[f]
R1	Aljadeff-Abergel, Schenk, Walmsley, Peterson, Frieder, & Acker	2015	Yes (National Autism Center's National Standards Report taking into account Horner, et al., 2005, Horner, et al., 2012 and WWC quality standards)	No	No	Yes	Yes	Narrative with some quantitative information (frequency counts)
R2	Briesch & Chafouleas	2009	No	No	Yes (PND; "No Assumptions" SMD)	Yes	Yes	Meta-Analysis
R3	Bruhn, McDaniel, & Kreigh	2015	No	No	No	No	Yes	Narrative with some quantitative information (frequency counts)
R4	Carr, Moore, & Anderson	2014	Yes (WWC quality standards)	No	Yes (PND)	No	No	Meta-Analysis
R5	Davis, Mason, Davis, Mason, & Crutchfield	2016	Yes (WWC quality standards)	No	Yes (Tau-U)	No	No	Meta-Analysis
R6	Fantuzzo & Polite	1990	No	No	Yes (SMD was computed for both group and single-case designs)	Yes	No	Meta-Analysis
R7	Fantuzzo, Polite, Cook, & Quinn	1988	No	No	Yes (SMD)	Yes	No	Meta-Analysis
R8	Fantuzzo, Rohrbeck, & Azar	1987	No	No	No	No	No	Narrative with some quantitative information
R9	Fishley & Bedesem	2014	No	No	No	Yes	No	Narrative with some quantitative information (frequency counts)
R10	Harchik, Sherman, & Sheldon	1992	No	No	No	No	No	Narrative with some quantitative information (frequency counts)
R11	Hughes, Korinek, & Gorman	1991	No	No	No	No	No	Narrative with some quantitative information (frequency counts)
R12	Hughes, Ruhl, & Misra	1989	No	No	No	No	No	Narrative with some quantitative information (frequency counts)
R13	Lee, Simpson, & Shogren	2007	No	No	Yes (PND)	No	No	Meta-Analysis

R14	Maggin, Briesch, & Chafouleas	2012	Yes (WWC quality standards)	Yes	Yes (PAND and Generalised least square regression)	No	No	Meta-Analysis
R15	McDougall	1998	Yes[1]	Yes[2]	No	Yes	No	Narrative with some quantitative information (frequency counts)
R16	McDougall	1996	No	No	No	No	No	Narrative
R17	McLaughlin*	1976	No	No	No	ND	No	Narrative
R18	Mitchem & Young	2001	No	No	No	Yes	No	Narrative
R19	Mooney, Ryan, Uhing, Reid, & Epstein	2005	No	No	Yes (did not specify form of effect size)	No	No	Meta-Analysis
R20	Nelson, Smith, Young, & Dodd	1991	No	No	Yes (Group Studies – Glass' delta; Single-case – PND)	No	No	Meta-Analysis
R21	O'Leary & Dubey	1979	No	No	No	No	No	Narrative
R22	Panagopoulou-Stametelatou	1990	No	No	No	No	No	Narrative
R23	Reid	1996	No	No	No	No	No	Narrative with some quantitative information (frequency counts)
R24	Reid, Trout, & Schartz	2005	No	No	Yes (Group Studies – Glass' delta; Single-case – Swanson & Sachse-Lee, 2000 effect size calculation)	No	No	Meta-Analysis
R25	Rosenbaum & Drabman*	1979	No	No	No	No	No	Narrative
R26	Sanders*	1978	No	No	No	No	No	Narrative
R27	Sheffield & Waller	2010	No	No	No	No	Yes	Narrative with some quantitative information (frequency counts)
R28	Southhall & Gast	2011	No	No	No	Yes	Yes	Narrative with some quantitative information (frequency counts)
R29	Webber, Scheuermann, McCall, & Coleman	1993	No	No	No	Yes	No	Narrative with some quantitative information (frequency counts)
R30	Workman & Hector	1978	No	No	No	No	No	Narrative

ND = Not determined

[a]Indication as to whether the reviewers applied a set of design standards to appraise the methodological rigor (or quality) of the studies included within the review. WWC = What Works Clearinghouse (Kratochwill, et al., 2010).

[b] Indication as to whether the reviewers explicitly referred to the use of a visual analysis procedures or protocol to evaluate evidence of experimental control or a functional relation.

[c] Indication as to whether the reviewers have computed an effect size metric to evaluate the magnitude of intervention effect. No = No effect size metric has been reported; PND = Percentage of nonoverlapping data; PAND = Percentage of all non-overlapping data; SMD = Standardised mean difference;

[d] Indication as to whether reviews noted if social validity was evaluated in the reviewed studies

[e] Indication as to whether reviews noted if integrity/fidelity checks were conducted in the reviewed studies

[f] Indicates the way in which the results were presented in the review. Narrative = Review has presented a non-statistical commentary, summary or critical review of the literature; Quant = Review has provided a narrative commentary of reviewed studies paired with statistical summary information i.e. frequency counts, proportions – No effect size present; Meta-analysis = Review has evaluated and combined estimates of treatment effect;

*Note: Reviews do not take the typical structure of modern reviews, as such details concerning their structure have been omitted to avoid error in reporting.

[1] McDougall (1998) indicated that studies adhered to recognised standards for quality research, however it was not indicated what standards were considered and how they were applied (pg 318); [2] No formal application of visual analysis protocol, however, the author indicates visual analysis was conducted

Appendix B: Visual Analysis Protocol

Visual analysis for graphically displayed behavioural data in single-subject design research

Guidelines and Procedure Manual (Version 1.0)

Developed by:
Margherita Busacca
Dr Angelika Anderson
Prof Dennis Moore

Visual Analysis Guidelines and Procedures (Visual Analysis Protocol)

Introduction

This document, henceforth referred to as the *Visual Analysis Protocol*, has been developed as a guide for evaluating documented evidence within single-case design (SCD) research through visual analysis. The following coding criteria has been developed to assist the current authors with the evaluation of SCD visual evidence throughout their application of the What Works Clearinghouse (WWC) design and evidence standards (Kratochwill, et al. 2010, WWC, 2014). As such these guidelines are intended to be used on studies which have been deemed to meet the WWC design standards *with or without reservations.*

The guidelines have been intentionally designed to help researchers code SCD data in a manner which aligns with the approach specified by the WWC standards. That is the visual analysis criteria have been developed to determine whether there is evidence of a functional relation (or a causal relation[1]) between an independent variable (intervention) and a dependent variable (outcome). The guidelines have also been created to determine the strength of any identified functional relation (i.e. strong, moderate or weak).

As specified in the WWC standards a SCD study documents evidence of a functional relation, when the design demonstrates at least three replications of a predicted experimental effect[2] at three different points in time with either a single participant or across different participants (Horner, Carr, Halle, McGee, Odom, & Wolvery, 2005, Horner, Swaminathan, Sugai, & Smolkowski, 2012; WWC, 2014).

To demonstrate evidence of a functional relation it may then be inferred that there is a tentative cause-effect relationship between the independent variable and the outcome variable (i.e. specific changes in the outcome variable have been brought about by the systematic, planned and active manipulation of the independent variable) (Cihak, 2010; Cooper, Heron, & Heward, 2007; Horner, et al., 2012; Plavnick & Ferreri, 2013).

Application

Prior to undertaking visual analyses researchers are encouraged to read and become familiar with the next three sections of this protocol: (1) ***Ratings System***, (2) ***Coding Considerations: Visual Features*** and (3) ***Coding Procedure and Criterion***. Agents undertaking visual analysis are henceforth called '*coders*' throughout the following guidelines.

[1] The terms functional relation and causal relation can be used interchangeably. Although the WWC standards have utilised term causal relation, this protocol has used the term functional relation.

[2] An experimental effect is evident when predicted changes in the targeted dependent variable follow the manipulation of the independent (Horner, et al., 2005)

Author Note

Development and Application

The primary author of these guidelines is a PhD candidate student who has conducted extensive research in the area of Single-Case Design evaluation and analysis over the duration of her candidateship. Throughout the development of this protocol the primary author worked extensively with two experienced supervisors, whom have a long working history in educational psychology and special education. Both supervisors also hold doctoral level degrees and have substantial experience in teaching, supervising, conducting and analysing single-case-design research methods.

While developing the final protocol the lead author consulted with both supervisors to refine and test the criteria outlined below. The criteria were evaluated and trialled at various stages of development to ensure that it was assessing graphed SCD data appropriately. Numerous trails were also undertaken at stages to collect agreement (reliability) data across the authors. Once the protocol was finalised and the authors were satisfied with the level of agreement obtained from trials the protocol was applied to the studies reviewed in a SCD evidence review; *Self-management interventions for primary school students demonstrating problem behaviour in regular classrooms: An evidence review*. This review was completed as part of a PhD thesis.

It should be noted that although preliminary trials have been undertaking with this protocol, it has not been widely tested or formally piloted in further studies. This is so as the protocol was intended to be used as a guide for the visual analysis process conducted within the aforementioned evidence review. As such the guidelines may be used to assist other researchers in objectively evaluating single-case design research, however the protocol should be piloted further prior to their widespread application.

The current author has attempted to create a protocol which can be used to guide coders in attending to critical features of graphed data. However, due to the highly varied nature of single-case design data it is possible some data presentations may not be accurately evaluated by the presented protocol. Furthermore, it is possible that some visual features may be evaluated in a manner which differs to other existing approaches presented within the extensive visual analysis literature. Coders should always apply their professional judgement when considering this set of guidelines and make informed adjustments to the protocol as deemed necessary. It is recommended that researchers apply this protocol once they have a sufficient knowledge base in the single-case design research and visual analysis.

Literature Acknowledgements

As these guidelines are intended for use within the WWC standards process, the procedures and coding criteria outlined, have been primarily developed in line with the WWC standards (Kratochwill, et al., 2010; WWC, 2014). It is acknowledged that notable visual analysis literature (listed below) presenting a range of approaches, procedures and methods were considered in the development of various aspects of the final protocol.

Bourret & Pietras, 2013; Cooper, et al., 2007; Engel & Schutt, 2005; Gast & Spriggs, 2010; Horner, et al., 2005; Horner, et al., 2012; Kazdin, 2011; Kennedy, 2005; Kratochwill, et al., 2013; Maggin, Briesch, & Chafouleas, 2012; Members of the Task Force on Evidence-Based Interventions in School Psychology, 2003; Richards, Taylor, Ramasamy, & Richards, 1999; Scruggs, Mastropieri, & Regan, 2006

Procedures and Coding Criterion

(1) Ratings System

This Visual Analysis Protocol presents a systematic rating system designed to assists coders in considering a number of visual features when evaluating evidence of functional relations and determining the strength of identified relations. The protocol has been designed to help SCD coders determine whether there is evidence to reliably support the conclusion that the expected behavioural outcomes occurred in a study as a result of introducing the intervention. The system is presented in terms of stages.

Stage 1**:** The first stage has been designed to guide the analysis of a number of key visual features that are critical to consider when determining the presence or absence of intervention effects (Section 2 provides an overview of each feature). *Figure 1* details three steps in which various visual features are considered in this analysis process. The features analysed at this stage are examined within and/or across different phases and conditions.

Stage 2 involves using items responses and ratings obtained throughout Stage 1 to obtain scores for the four *Stage 2 Overall Effectiveness Items* **(i.e.** various items and ratings from Steps 1, 2, and 3 inform the items coded in Stage 2). Each item in Stage 2 is coded as *Strong, Moderate* or Weak/*No Evidence.*

Figure 1: Stage 1 Visual Analysis Rating

Step 1: Appropriateness of Visual Data/Graph Construction

- Design Type
- Evaluation of graph construction

Step 2: Quality of Baseline (Within-Phase Comparision)

- Level
- Trend
- Stability (Variability)

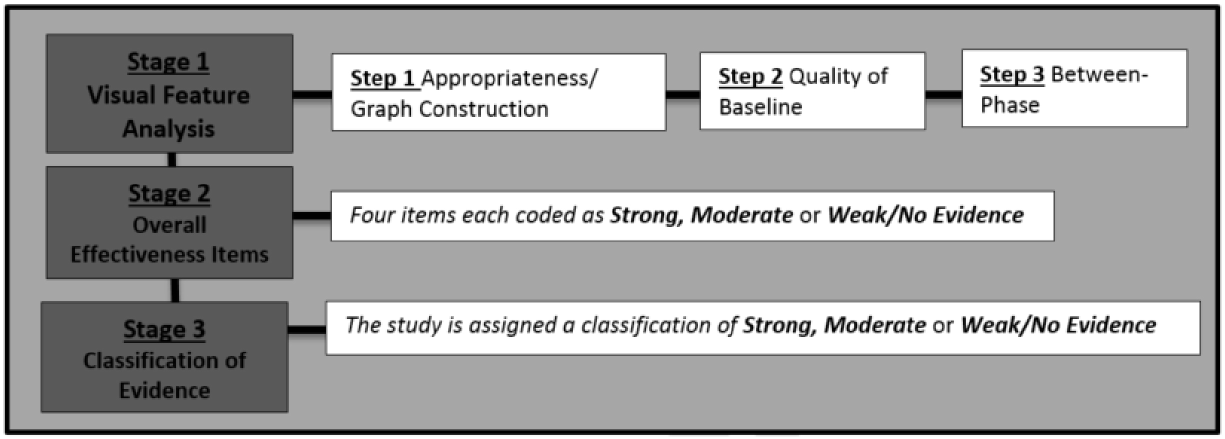
Step 3: Between-Phase Comparisions

- Level
- Trend
- Variability
- Overlap
- Immediacy of Effect
- Observed vs Projected Pattern

Stage 3 draws upon the four *Stage 2 Overall Effectiveness Items* to obtain a final *classification of evidence* for the study. Each study is assigned a rating of *Strong, Moderate* or Weak/*No Evidence.* This rating is intended to demonstrate whether a study has demonstrated *Strong Evidence, Moderate Evidence or Weak/No Evidence* of a functional relation for each outcome.

The Figure 2 provides an overview of the coding process in the Visual Analysis Guidelines and Procedures. It can be seen that each stage is used to inform the next so coders can determine whether each study provides strong, moderate or weak/no evidence of a functional relation.

Figure 2: Coding Overview



(2) Coding Considerations

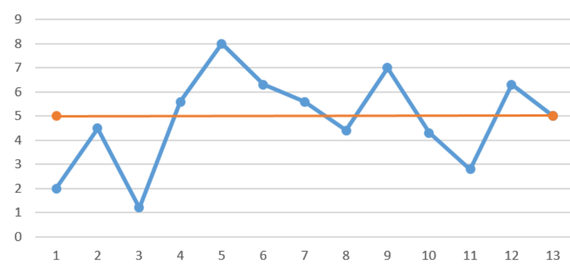
Level: "*measure of central tendency (e.g., mean, median) of all data points within the phase*" (Horner, et al., 2012, pp. 277)

Level, or the absolute average value of a series of data points, can be evaluated in terms of **mean** or **median** (Bourret & Pietras, 2013, Cooper, et al., 2007). Within this coding procedure level is considered in terms of a ***median.***

While the WWC visual analysis guidelines (WWC, 2014) suggest level be considered in terms of mean, we propose that median is a more appropriate measure of central tendency given that mean can be greatly influenced by data which contains variability, extreme outlier values or trendedness (Bourret & Pietras, 2013; Cooper, et al., 2007; Engel & Shutt, 2005). The median level of a series of data points is less likely to be heavily impacted by extreme values and variability.

Analysing level in terms of *median* is also desirable due to its simplicity. Examination of the *median* is a simple process which requires coders to <u>find the value at which 50% of scores in the phase are above and 50% of scores are below the level line</u>. This process can be easily achieved though visual analysis, whereas obtaining the *mean* is a bit more complex and would involve finding the average of all data points within each phase (this would entail extracting numerical data from graphs) (Engel & Shutt, 2005).

Finding the Median: Draw a line through the data (parallel to the x-axis) where half the data points fall above the line and where half fall below the line (*Phases with <u>even number of data points</u>* - ensure that the line falls in the *middle* of the two middle data points; *Phases with <u>odd number of data points</u>* – ensure that the line falls on the middle data point). This line represents the median.



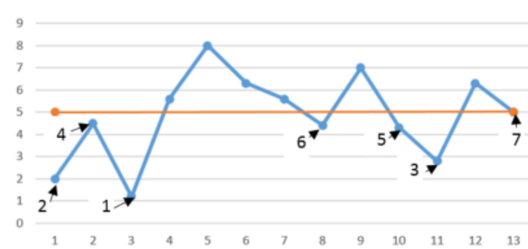
Example. <u>Phase data point values unknown</u>

If analysing a study conducted by other authors where the exact numerical values of data points within a phase are unknown (this is often the case) you can identify the median through the following process. This will require a ruler and pen/pencil.

1. Count number of data points in the phase — n=13
2. Identify the middle data point — Of 13 data points the 7th data point will equate to the median i.e. 6 data points will fall on either side of this point

NOTE: If there is an even number of data points, the middle data point will fall half-way between the two central data points.

3. As the data cannot be sorted in order from least to greatest due to no original data we can identify the median by using a ruler to identify the middle data point in terms of its distance from the x-axis
4. Once you have identified the median point use the ruler to draw a line through it to show the median level.



In the graph above you can see that the data points have been numbered in terms of their distance from the x-axis until the 7th data point was identified.

5. To ensure that you have indeed identified the true median you can count the number of data points falling above the median line. If this number is equivalent to the number below the median line you have identified the median.

Example. Data point values known

If the numerical values of data points within a phase are known the median can be found by ordering data values from least to greatest and finding the middle value (Gast & Spriggs, 2010). The following represents data from the above graph.

(n= 13 points) *Median = 7th point*
Original Data: 2.0, 4.5, 1.2, 5.6, 8.0, 6.3, 5.6, 4.4, 7.0, 4.3, 2.8, 6.3, 5.0
Ordered Data: 1.2, 2.0, 2.8, 4.3, 4.4, 4.5, 5.0, 5.6, 5.6, 6.3, 6.3, 7.0, 8.0

Trend: "*slope of the line that best fits the data (i.e., either linear or quadratic*") (Horner, et al., 2012)

Trend is analysed by observing the *overall* direction taken by a data path within each phase (Cooper, et al., 2007). Data paths are often evaluated in terms of direction in performance (i.e. increasing, decreasing or flat), magnitude and variability of data points around the trend (i.e. is the path stable) (Cooper, et al., 2007; Gast & Spriggs, 2010). To evaluate trend this protocol has adopted the *Split-Middle Line of Progress* developed by White (1971, 1980; as cited by Cooper, et al., 2007; Gast & Spriggs, 2010). The split-middle line of progress technique provides a known, reliable *estimate* of trend which is recommended for data containing variability (Gast & Spriggs, 2010). A split-middle line of progress can be drawn for data within individual phases (i.e. baseline, intervention) to gain an idea as to what direction the plotted data is heading.

Note the split-middle line of progress should not be drawn through a series of data points spanning a scale break on the vertical and/or horizontal axis (i.e. across phases or conditions) (Cooper, et al., 2007).

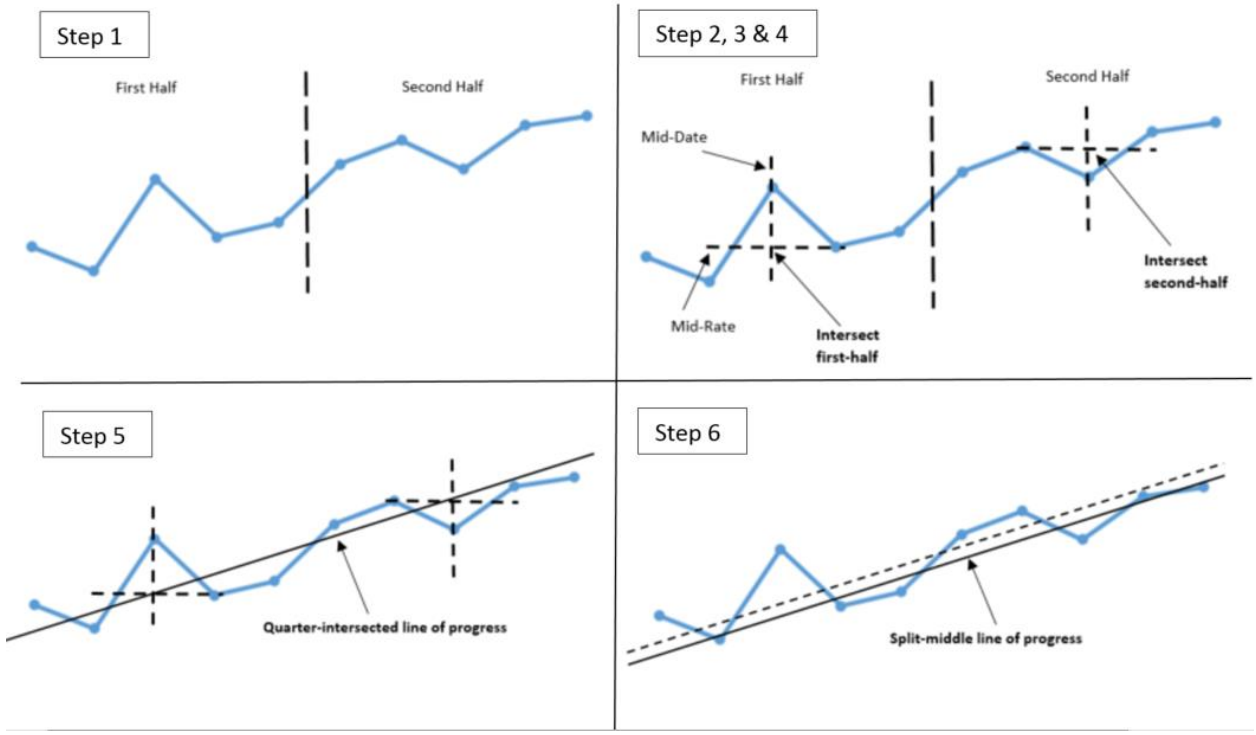
Plotting the Trend: The **Split-Middle Line of Progress** technique

1. Divide the phase data in half by drawing a line through the *mid-date* along the x-axis. To find the mid-date count the data points from left to right along the x-axis and find the middle point (if there is an even number of data points draw the line half-way between the two central data points as seen in the example)
2. Find the mid-date for each half by dividing each half in half again along the x-axis.
3. Identify the mid-rate for each half of the split graph. The mid-rate is the middle data point identified by counting up or down the data path way.
4. Mark the point at which the mid-date (along the x-axis) and mid-rate (along the y-axis) intersect for each half of the split graph.
5. Plot line that intersects the two points marked. This is known as the quarter-intersected line of progress.
6. To find the split-middle line of progress, adjust the plotted line so that 50% of the data points are above and below the line. To do this shift the line up or down parallel to the original line until there is an equal number of data points fall above/on the line and below/on the line.

Method adopted from Cooper, et al., (2007) and Gast & Spriggs, (2010)

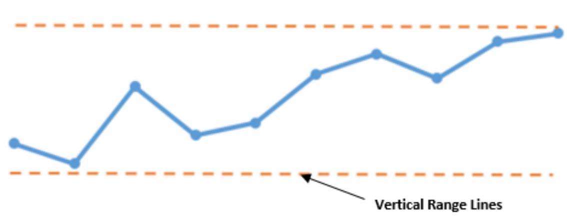
NOTE: Some phases of a study may not have a sufficient number of data points to calculate a trend line for each half of a data series (i.e. three data points) – in these instances that the *freehand method* may be used (Gast & Spriggs, 2010). The *freehand method* is a simple inspection process which involves imposing a straight line over the data then altering the slope of the line until an appropriate line is found -this typically involves finding a line which evenly divides the data on or above the line (or on or below the line) (Herson, Sugai, & Horner, 2005).

Example: Split-Middle Line of Progress

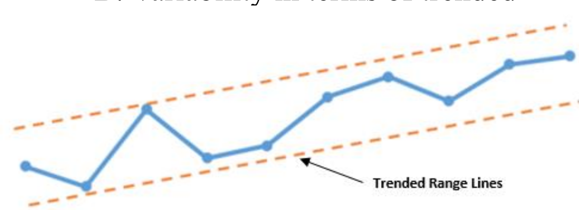


Variability: *"deviation in scores about the <u>trend</u> line"* (Horner, et al., 2012).
Variability refers to the extent to which an individual's performance fluctuates around the mean (or median) or slope (or trend) during a phase (Horner, et al., 2005). Evaluating variability basically involves observing how divergent scores are within a baseline or intervention phase (Engel & Schutt, 2005). Evaluating variability between phases can be an important indicator of treatment effect (Horner, et al., 2012) (i.e. intervention may reduce behaviour variability). Evaluating the range of scores around a mean (or median) (i.e. vertical data range in a phase) is one approach to measuring variability (Cihak, 2010; Engel & Schutt, 2005), however this method is limited to phases which demonstrate minimal trend (Horner, et al., 2012). Although the plotting of vertical range lines enables coders to evaluate how much the data deviates from the measure of central tendency (i.e. level) it may overestimate the variability of phase data which present with a steadily increasing or decreasing trend (See Image A for vertical range line approach to variability).
This protocol has opted to evaluate variability in terms of the range (or deviation) of data about the best-fitting straight line (or trend) (Gast & Spriggs, 2010; Horner, et al., 2012; WWC, 2014). It is suggested that evaluating variability from the trend is a more appropriate measure of variability - it is more likely to be relevant no matter what the slope of the trend line is (Horner, et al., 2012). As such this procedure will make use of ***trended*** **range lines**- this approach to evaluating variability involves plotting range lines to capture the phase data about the *trend* line (See Image B for trended range line approach).

A. Variability in terms of vertical range



B. Variability in terms of trended



Stability: ***"the amount of variability, or range in data-point values in a data series"*** **(Gast & Spriggs, 2010 pp. 202)**
Variability of data may be referred to as being high, medium, or low (i.e. high-variability indicates that data points are scatted widely around the trend line whereas low-variability indicates that data points fit quite closely to the trend line) (Kennedy, 2005). Another way of referring to variability is in terms of *stability* (i.e. consistency) – i.e. was the data within a phase considered to be stable (low-variability), or unstable (medium to high variability). By analysing data variability in terms of stability visual analysts can evaluate how much variability can be in a data series for the data to be considered *stable* (Gast & Spriggs, 2010). It is important to consider data stability (particularly within baseline data) as the greater the data variability the more difficult it is to make strong, convincing conclusions about the effectiveness of the intervention (i.e. it is difficult to detect effects and demonstrate experimental control) (Bourret & Pietras, 2013; Cihak, 2010; Gast & Spriggs, 2010).

Stability Envelope
To evaluate variability/stability this manual adopts an adapted approach of Gast & Spriggs' (2010) '**stability envelope'**. For full details on Gast and Spriggs' approach please refer to Chapter 9 Visual analysis of graphic data in D. L. Gast (Ed.), Single-subject research in Behavioral Sciences (2010).
In this context a stability envelope refers to two parallel lines, one plotted above and one plotted below the trend line. The distance between the two lines indicates how much variability the data set can demonstrate for it to be considered "stable". More simply, trended range lines are plotted on either side of the trend line at a specified range, and stability is determined by evaluating the portion of data points which fall within the range lines.

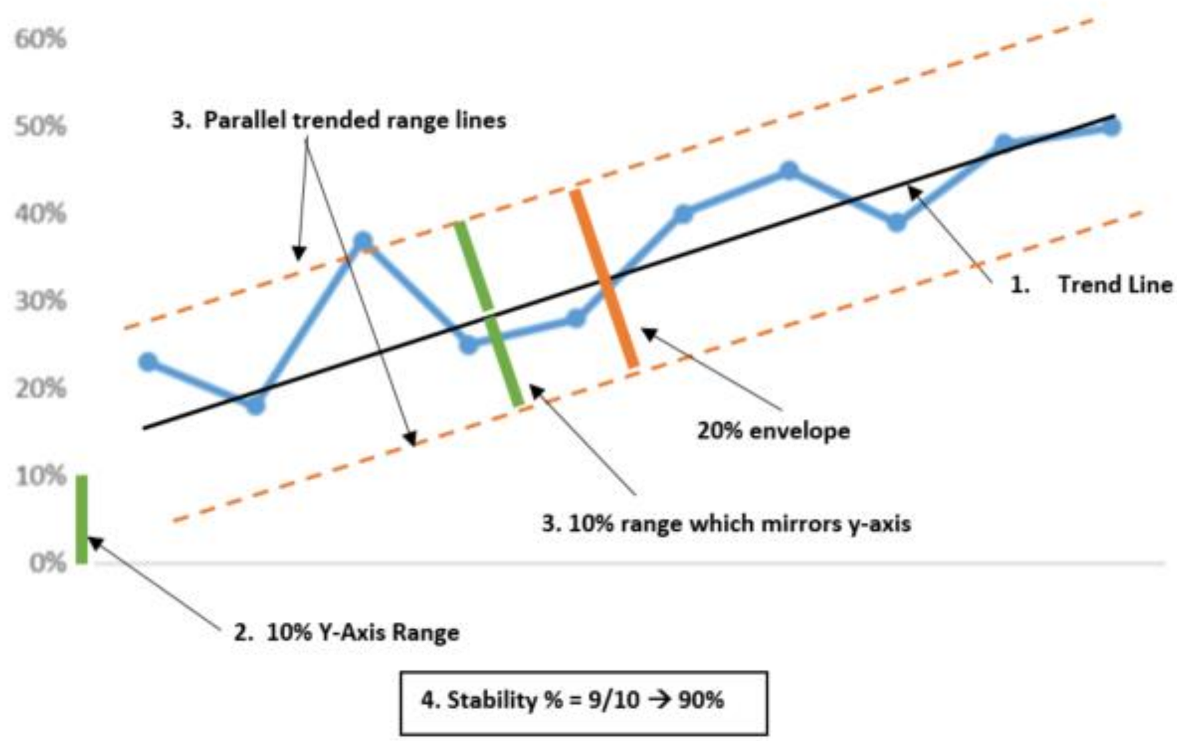
By Gast & Spriggs' (2010; 2013) approach a stability envelope is calculated by finding 25% of the phase median (.25 x MEDIAN value). This approach involves evaluating trend stability by plotting two lines to form the stability envelope on either side of the trend line; the lines are equal distance from the trend line (above and below) plotted at a distance representative of 25% of the median. It is proposed that phase data may be considered stable if ***at least 80% of all data points must fall on or within the plotted stability envelope.***
Given the nature of published SCD data in self-management literature (i.e. graphs are often presenting data as a proportion or percentage) the approach presented by Gast and Spriggs has been slightly adapted to suit the form of data reviewed in this research project.

The decision was made to apply a universal **20% stability envelope** (10% on either side of the trend line) across all studies being analysed. In this case 20% stability envelopes directly reflecting the scale presented on the y-axis are plotted about the trend line (i.e. the 20% stability envelope directly equivalent to 20% on the y-axis). This approach was deemed appropriate as all but one study in our collection of studies presented graphed *percentage data*. A 20% stability envelope was selected to remain conservative, and to ensure that all coding remained simple and consistent across studies and behaviours.
For the purpose of this manual a data series is considered stable if **80% of the data points within the 20% stability envelope.**

Evaluating Stability: The following guidelines demonstrate how to determine the proportion of data points that fall within the stability envelope. This proportion will here on in be referred to as *Stability%.*

1. Plot the trend line in the phase being evaluated
2. Measure the 10% range on the y-axis with a ruler – record the size of this 10% range (in mm or cm)
3. Plot two parallel trended range lines falling 10% either side of the trend line to create the 20% 'envelope' – use a ruler to measure the 10% range obtained in step 2 on either side of the trend line
4. Finally calculate the proportion of data points which fall within the stability envelope in the phase in question. To calculate the Stability% use the following formula:

$$\text{Stability\%} = \frac{\text{Number of phase points within envelope}}{\text{Total phase data points}}$$



The Stability% obtained by from this calculation can be used to: (a) determine whether the data in a particular phase is stable (and able to adequately predict patterns of future responding) ; and (b) determine whether there has been changes in variability between adjacent phase pairs (i.e. has the Stability % reduced of increased from Phase A to Phase B?).

Frequency Graph: One graph in our data set presented data in the form of frequency count. In a numerical figure was obtained to find the 20% stability envelope. The following calculation was used for this task (example used is a scale which ranges from 0 to 9):

20% range = Maximum y-value multiplied by (.20) [Example = 9 x.20 =1.8]

Then simply measure out the value obtained and plot stability envelope as required. This approach was adopted to remain consistent with the approach taken with the graphs that presented percentage data.

Overlap: ***"proportion of data from one phase that overlaps with data from the previous phase"*** **(WWC, 2014).** Overlap is evaluated by observing the amount of data in adjacent phases which overlaps on the vertical axis. In other words the degree to which data in adjacent phases share similar quantitative values (Kennedy, 2005). Consideration of this feature is important in SCD visual analysis as low overlap in data is generally indicative of a larger experimental effect (Horner, et al., 2012). More confidence can be placed in identified intervention effects when all data points in one condition fall outside the range of values in the adjacent condition (Cooper, et al., 2007).
To evaluate the degree of overlap this protocol makes used of Scrugg and Mastroperi's (1987) *Percentage of non-overlapping data (PND)*. PND allows analysts to obtain a percentage which describes the proportion of Phase B (Intervention) data which exceeds the single most extreme Phase A (Baseline) data point in the direction of the desired or expected therapeutic effect (Parker, Vannest, & Davis, 2011; Scruggs, Mastropieri, & Casto, 1987).

Calculating PND (The instructions below have been developed based on the guidelines provided by Scruggs et al. (1987) and examples provided by Parker, et al., (2011):

1. Count the total number of Phase B (Intervention) data points
2. Identify the single most extreme data point in Phase A (Baseline) -in the direction of the desired or expected outcome
3. Use a ruler to then count the number of Phase B (Intervention) data points that exceed the identified Phase A data point.
4. To calculate PND divide the number of data points identified in Step 3 by the number of data points in Step 1. Then, multiply by 100 in order to get a percentage value

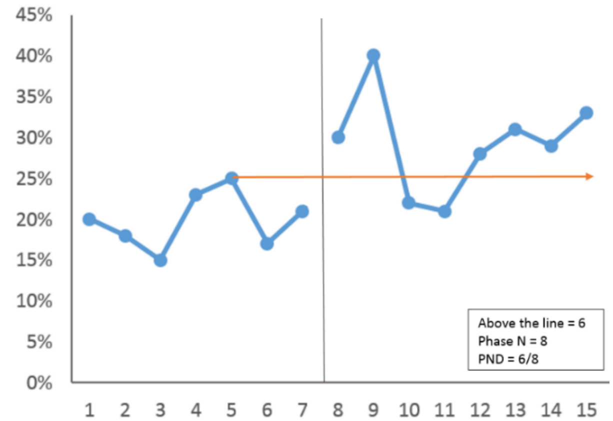
<u>Phase B Data Points Above Extreme Phase A</u>
Total Phase B Data Points

Data points Phase B = 8

Most extreme data point is at 25%

Number of Phase B data points exceeding the most extreme Phase A data point = 6

PND = 6/8 = .75
.75 x 100 = 75%



NOTE: There is no need to obtain an overall PND estimate for the study. Only a PND estimate for each pair of phase comparisons is necessary to evaluate the degree of overlap between-phases.

<u>Interpretation (</u>Scruggs & Mastropieri, 1998)
PND>90% = Very Effective
PND 70 – 90% = Effective
PND 50 – 70% = Questionable
PND<50% = Ineffective

Coding Exception – Be wary that significant trends reduce the weight given to overlap measures (Horner, et al., 2012). For instance if two adjacent phases demonstrate have an increasing trend with <u>no overlap</u> (i.e. increasing or decreasing trend continuing across phases) then the absence of overlap would not necessarily indicate that the introduction of the independent variable resulted in an effect.

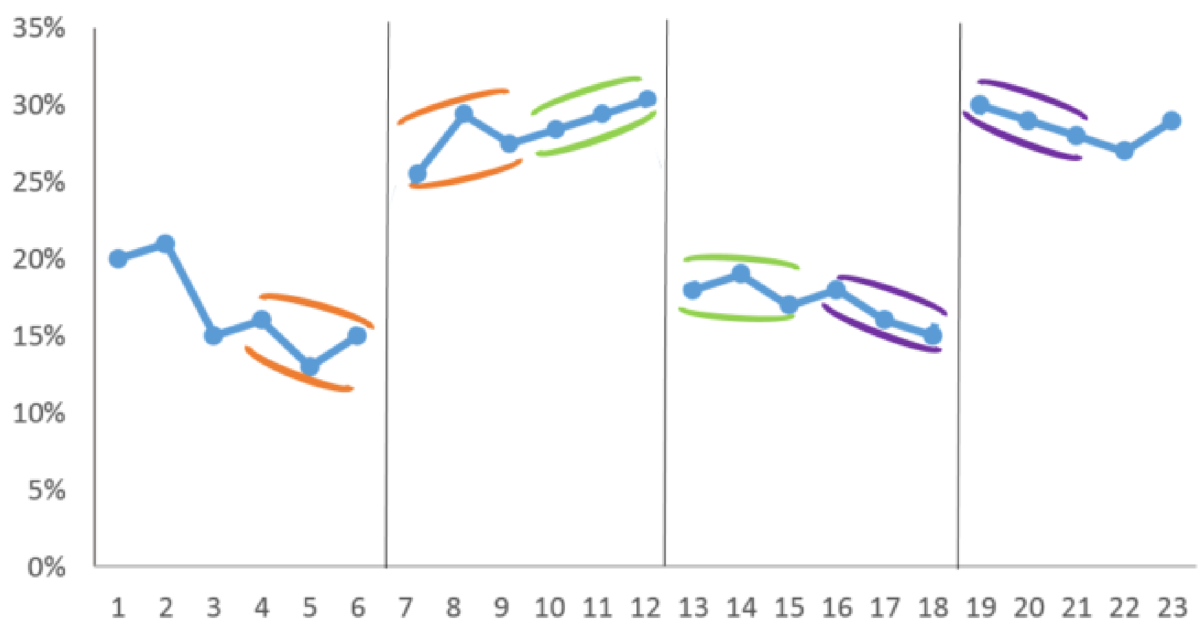
Although there are a number of overlap indices present within the literature (Parker, et al., 2011) PND was selected on the basis that it is : (a) is the most widely recognised single-case nonparametric effect estimate, (b) has a number of coding conventions to account for its well-known limitations (Scruggs & Mastropieri, 2013), (c) can be easily calculated by hand (Parker, Hagan-Burke, & Vannest, 2007), and (d) is consistent with aspects of visual analysis logic (Maggin, Swaminathan, Roger, O'Keeffe, Sugai, & Horner, 2011).

Immediacy of Effect: ***"the immediacy of any change in data patterns following manipulation of the independent variable"*** **(Horner, et al., 2012)**
Immediacy of effect (or rapidity of change) looks at how quickly a change in the data pattern is produced after the phase change (Kennedy, 2005) (i.e. After an independent variable has been introduced -or removed -has a change occurred immediately at the condition change?).

Evaluation of immediacy of effect typically involves observing the extent to which level, trend and variability of the last data points in one phase are notably different from the first data points the next phase (Kennedy, 2005; WWC, 2014). This feature can be described in terms of rapid (i.e. immediate change) or slow (i.e. no immediate change, but there is a gradual change over time) (Kennedy, 2005). The greater the immediacy of effect the more convincing the conclusion that change between experimental conditions is associated with the manipulation of the independent variable (Horner, et al., 2012; WWC, 2014).

Similarly, to Maggin, et al. (2012) and the WWC standards (2014) this protocol evaluates immediacy of effect by observing the pattern of the last three data points in one phase and comparing the observed pattern to that of the first three data points observed in the following adjacent phase. In this protocol immediacy of effect largely looks at whether the data is noticeably different from the **last three data points of the first phase** and the **first three data points of the second phase** when considering the level, trend and/or variability. This protocol also looks at overlap when evaluating immediacy.

The figure below demonstrates how to evaluate immediacy of effect – In this example the observed effects are immediate in each of the three comparisons

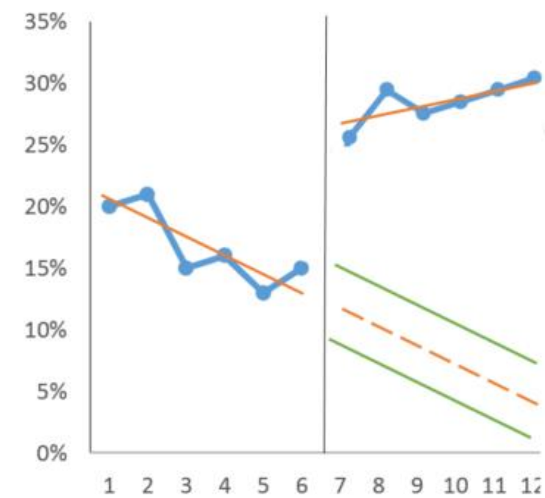


NOTE: While rapid or immediate changes are associated with more convincing demonstrations of experimental effects, some SCD experiments may predict a gradual or delayed intervention effect (WWC, 2014). It is imperative that coders remain aware that immediate effects may always be predicted for every SCD and coding must take this into account. This coding manual guides coders on how to approach study data of this nature.

Observed vs Predicted Data Comparison: ***Comparison of data from the second phase to the "projected" or predicted results from the first phase*** **(Horner, et al., 2012)**
When undertaking visual analysis to evaluate the presence of an experimental effect between the data within two adjacent phases it is important to consider the extent to which data following the manipulation of the independent variable differs from what would be predicted from the prior phase (i.e. does the data in the intervention phase differ from what would be predicted if the intervention was not implemented after baseline). It may be noted that the five previous visual features have all focused on examining the documented data from within phases.

Horner, et al. (2012) propose that to evaluate whether an experimental effect has been demonstrate across any two phases, data from the second phase must be compared with (a) data from the first phase, and (b) with the expected or predicted data pattern (i.e. extension of the data pattern from the first phase into the second phase). The WWC standards (2014) also indicate that analysts should examine observed and projected data between phases. Projected data patterns can be analyses based on the data trend, variability and level in the first phase (Horner, et al., 2012).

An example of how data may be compared to the expected or predicted data pattern can be observed below. In this example the predicted data pattern is demonstrated by the green trended range lines and the orange dashed predicted trend line. It can be seen that the data in the second phase does not fall within the predicted data in this instance.



For the purpose of these guidelines Observed vs Predicted Data Comparisons are interpreted as follows:

- Strong experimental effect: The **Observed Data** in the second phase follows a different data path to that of the **projected data** from the first preceding phase to demonstrate strong experimental effects. **Projected data** from the *first phase* does not intersect the **Observed Data** in the *second adjacent phase*
- Moderate experimental effect: The **Observed Data** in the second phase should ideally follow a different data path to that of the **projected (or predicted) data** from the first preceding phase to demonstrate strong experimental effects. **Projected data** from the *first phase* should also minimally intersect the **Observed Data** from the *second adjacent phase*
- Weak/no experimental effect: The **Observed Data** in the second phase follows the same pathway as the predicted data from the preceding phase (i.e. observed data does not deviate from predicted pattern).

(3) Coding Guidelines and Procedure

This section outlines the step-by-step coding guidelines and procedure for undertaking the visual analysis (the criteria correspond directly to the ***Visual Analysis Coding Form*** which is to be utilised during the coding process).

Coding Materials

This manual, the Visual Analysis Coding Form, Single case graphs for coding and coding materials (i.e. ruler and pen)

Guideline Structure

Stages and analysis steps

Stages and steps are presented throughout the document and are labelled clearly to indicate what state and step you are undertaking. The purpose of this is to guide coders systematically through the visual analysis process.

Coding Criteria

All coding criterion is presented in the grey boxes (such as this) throughout this document. The coding criteria has been designed to guide coders in making analysis decisions regarding various visual features. Coders are required to assess visual features and provide ratings on a number of items; items are rated on dichotomous or trichotomous scale where specified. The coding criterion correspond with the ***Visual Analysis Coding Form.***

Rating Guidelines

Each stage and some steps also have a **Ratings** box. Rating boxes are presented like this and contain instructions on how to complete the rating procedures where they are required.

IMPORTANT CODING NOTES

- These guideline are intended to code adjacent baseline and intervention phases pairs (i.e. A-B, B-A). Individual phase pairs are the base unit of analysis. While some designs may include maintenance and follow-up data these conditions are not considered in this protocol.
- When coding a study containing more than one dependent variable (i.e. on-task behaviour and disruptive behaviour) the visual analysis procedure should be applied to each dependent variable separately (i.e. first code on-task data and then conduct a second visual analysis for the disruptive data).

Coding Steps

Pre-Analysis: Coding Considerations

Prior to formal analysis, coders must first consider the *Coding Considerations* detailed in Section 2 of this document. The *Coding Considerations* section provides a detailed description of *how* the graphed data will be evaluated in terms of each specific visual features. Read over the coding considerations prior to using these guidelines.

Stage 1, Step 1: Appropriateness of Visual Data/Graph Construction

Code *Appropriateness of Visual Data/Graph Construction.* This process requires coders to evaluate whether the graphed data presented in a study is appropriate for visual analysis. Coders are to evaluate the study's graphed data as a whole to analyse graph construction and to ascertain whether any visual distortions may be present in the data. It is important for coders to identify any notable feature presentations (i.e. how various elements of the graph are presented) and possible distortions as they may result in coding errors throughout the visual analysis.

(Stage 1, Step 1) Appropriateness of Visual Data/Graph Construction

DIRECTIONS: **Answer the following items**

i. Report the design

____

ii. Is there a minimum of three data point per phase? **YES NO (if NO do not proceed)**

If YES indicate what the **minimum number of data points** is within any Baseline <u>or</u> Intervention phase (across the whole study excluding any follow-up or maintenance phases):_______________________

iii. *Graph Construction*

Based on the features listed below (*Pre-Analysis Graph Construction Considerations)* evaluate whether there are any feature presentations or distortions which may impact upon the visual analysis process and coding.

Are there any notable feature presentations or graph distortions present which may impact on the analysis process?

NO YES (if YES be sure to remain aware of the distortions throughout the coding)

If any notable feature presentations or visual distortions are present in the graph report on the coding sheet as they must be taken into consideration throughout coding (Example, coders must consider scaling of the y-axis as it may alter the appearance of variability and influence how stability envelopes are plotted; graphs may present frequency or proportions)

Pre-Analysis Graph Construction Considerations

-Is a figure legend presented? **(YES NO)**

- Is it clear who the data belongs too? (e.g.participants name?) **(YES NO)**

- Are axis labelled clearly? **(YES NO)**

- Is each axis scaled appropriately? **(YES NO)**

i.e. x-axis scale represents chronological succession of equal time periods

i.e. y-axis scale represent a consistent unit of measurement which captures all possible data points

- Are condition changes lines clearly in place? **(YES NO)**

- Are conditions clearly labelled? **(YES NO)**

- Are data points properly connected (i.e. data in adjacent phases should not be connected) **(YES NO)**

Stage 1 Preparation: Preparing for Within-Phase and Between-Phase Inspections

Prior to conducting Stage 1, Steps 2 and 3, it is recommended that coders plot *Level*, *Trend Lines,* and *Stability Envelopes (Variability)* in all phases. This part of the analysis does not contribute directly to the rating procedure, however it is important to undertake this process to prepare for the next steps in the guidelines. Plotting these features in all baseline and intervention phases simple eases subsequent coding procedures.

Level: Plot the **level** line using the *median* as demonstrated in the coding consideration section.

Trend: Plot the **trend** line using the *split-middle line of progress* technique detailed in the coding consideration section.

Stability (Variability): Plot the **20% stability envelope** using **trended range lines** in all intervention and treatment phases as demonstrated in the coding consideration section. Calculate the Stability% as demonstrated in the coding considerations for each phase so that stability/variability can be evaluated with ease in the following steps.

Within-Phase Inspections

Stage 1, Step 2: Quality of Baseline

This step involves evaluating the quality of the baseline data. The WWC standards (Kratochwill, et al., 2010; WWC, 2014) proposed that coders must evaluate baseline data for two reasons. First, it must be determined whether baseline data documents a concerning/problematic pattern of behaviour (i.e. high levels of disruptive behaviour). Second, the WWC indicate that coders must evaluate whether the pattern of baseline data can be appropriately used to assess the effect of an implemented intervention. According to the WWC (2014, pp. E.8), "if a proposed concern is not demonstrated or a predictable pattern of concern is not documented, the effect of the independent variable cannot be assessed". Stable baseline data which is also free of trend is considered ideal for identifying the effects of an independent variable (Cooper, et al., 2007). While stable, un-trended data is ideal, published SCD baseline data may not always present this pattern due to various practical, environmental and ethical factors. The purpose of this step is to evaluate the appropriateness of baseline data to determine whether it can be used to reasonable evaluate the effects of the independent variable upon its introduction.

(Stage 1, Step 2) Quality of Baseline

DIRECTIONS: Each *individual baseline phase* in the study is to be coded based on the following features. Each separate baseline phase in a design is to be assigned a rating of *Strong*, *Moderate* or *Weak/No.* Rate each baseline for every participant and every reversal baseline phase.

Baseline Features	Ratings	Considerations
A. **Level** (does the level document a pattern which allows for observable target behaviour changes in the desired direction)	• Allows for change in desired direction (X) • Does not allow for change in desired direction (0)	*To score X the level must allow the intervention to have an impact and show change in the desired direction within the data series.* **Evaluate in terms of *median (See Coding Considerations)***
B. **Trend** (is the trend heading in an undesirable direction)	• Flat or trending in the opposite direction of the anticipated intervention outcome (X) • Heading towards anticipated outcome (0)	*To score X baseline data should not demonstrate clear slope in the direction of desired intervention effects.* ***Plot the split-middle line of progress (See Coding Considerations)***
C. **Variability/Stability** (is the degree of **variability** acceptable for establishing a stable baseline?) [**Predictability –** can data be used to predict future patterns of responding].	• Stable, suitable for making predictions (X) • Unstable, unsuitable for making predictions (0) NOTE: In the case of unstable data evaluate whether there may be a within-phase level change	*To score X 80% of data points must fall within a 20% stability envelope about the trend line.* ***Variability/Stability is considered in terms of trended stability envelopes (See Coding Considerations)*** **Prediction-** A stable baseline may be used to predict future patterns of responding (i.e. a stable baseline demonstrates a pattern of responding with little variation)

Baseline Phase Coding

Each individual baseline will receive an independent rating based on the criteria below.

Strong Evidence (Evidence score =2) – a 'X' rating must be coded for all three criteria (A, B & C).

Moderate Evidence (Evidence score =1)– a 'X' rating must be coded for a minimum of two the three criteria (Must include a rating of 'X' for level indicating that the level of behaviour allows for a desirable change in behaviour)

Weak to no evidence (Evidence score = 0) – a rating of 'X' must be coded for one or no criteria.

[Stage 1, Step 2 Quality of Baseline Rating]

Once each individual baseline phase in a study has been assigned a score (i.e. 2, 1 or 0) the average rating is to be computed. This is obtained by obtaining the sum of the total ratings and dividing this number by the number of baselines coded. Round the result up or down as required to the nearest whole number. This number is used to determine the overall Quality of Baseline Rating.

e.g. MBD design with 3 participants

A1=2 A2=1 A3=2

(2+1+2)/3= 1.67

Rating of 2

This information contributes to Item 1 in the following Stage of this protocol (Stage 2).

Between-Phase Inspections

Stage 1, Step 3: Between-Phase Comparisons

This step involves evaluating data patterns across or between adjacent phase conditions. The between-phase coding is based on observations and calculations undertaken for each individual phase in Stage 1 Preparation. When undertaking this step remember that only data in adjacent phases can be directly compared. Each adjacent pair of phase conditions in a study will be coded using the following guidelines. According to Gast and Spriggs, (2010, pp. 211), the purpose of undertaking between-phase inspections is to "determine what effect, if any, a change in condition has on the dependent variable" (i.e. A→B, B→A, B→C). This step involves comparing the observed pattern of data in one phase with the pattern of data in an adjacent phases to evaluate whether an effect has occurred.

(Stage 1, Step 3) Between-Phase Comparisons

DIRECTIONS: In every study each *adjacent baseline and intervention phase pair* (i.e. **AB and BA**) is to be coded using the following six items. Phase pairs are coded independently on all items. Each item guides coders in assigning a rating of *Strong, Moderate* or *Weak/No*. These ratings, *Strong, Moderate* or *Weak/No*, respectfully correspond with scores of 2, 1, and 0. The scores assigned for each item are then summed to obtain a *between-phase comparison rating* for each phase pair.

<table>
<tr><th>Between-Phase Features</th><th colspan="3">Rating</th><th>Important Considerations</th></tr>
<tr><td></td><td>No/Weak (0)</td><td>Moderate (1)</td><td>Strong (2)</td><td></td></tr>
<tr><td>A. Level
Evaluate whether there is a change in overall level between adjacent phase conditions</td><td>No Change in level</td><td>-</td><td>Change in overall level occurs in the anticipated direction [1]</td><td>Evaluate in terms of median (See Coding Considerations)</td></tr>
<tr><td colspan="5">[1] For A →B comparisons consider whether the outcome level change by means of behaviour increase or decrease as hypothesised or expected? For B→A comparisons does the outcome level return back to the expected level (or does the level appear to be returning back to the initial baseline level?). If behaviour level changes in an unexpected manner (i.e. behaviour worsens when improvements are expected) or if behaviour does not return back to baseline level (i.e. in ABAB designs where behavioural changes are not reversed) it is important to make note of these observations in the analysis.</td></tr>
<tr><td colspan="5">Level Special Consideration: If coding a graph which demonstrates (a) a flat stable data in both phases and (b) a desired change in level (see below) a between-phase comparison rating of 12 is automatically assigned. Adjacent phase data of this nature demonstrate a clear effect and do not require further coding in this step.
</td></tr>
<tr><td>B. Trend
Evaluate whether there is a change in overall trend between adjacent phase conditions</td><td>Scores 0 if:
a) No change in trend (Example 1)
OR,
b) The change in trend direction (Example 2) or trend rate (Example 3) is unexpected or undesirable</td><td>Trend change observed in terms of rate of change (Examples 4a and 4b)*

*Rate of change: refers to changes in the gradient/slope. I.E. behaviour change occurs in terms of slope improvement or reduction, however here is no change in trend direction</td><td>Trend changed observed in terms of direction - Change in observed trend occurs the expected or predicted direction (i.e. change in the desired direction of the primary outcome) (Examples 5a and 5b)</td><td>Plot the split-middle line of progress (See Coding Considerations)

Exception: NOTE: If the change in rate is inhibited due to a ceiling or floor effect rate as Moderate (Example 6)</td></tr>
</table>

C. Variability (Stability) *Evaluate whether there is a change in <u>overall</u> **variability** between adjacent phase conditions* Criteria: Stable data is evident when ***80% of the data points within the phase fall within the 20% stability envelope.*** Stability is measured in terms of Stability% (the proportion of data which falls in the stability envelope)	Score 0 if: **1. No change** in variability between the (i.e. the proportion of data points within he stability envelope does not change between phases) OR, **2.** Change is **unexpected or undesirable** (i.e. stable baseline to unstable intervention)	Change in variability is shifting towards the desired or anticipated degree of stability **AB Example** Unstable Phase A (i.e. Stability% - 34%) may be adjacent to an unstable Phase B (i.e. Stability %- 75%). Data is becoming stable as desired but not yet stable. **BA Example** Unstable Phase B (i.e. 75%) reverts back to a more unstable Phase A (i.e. 34%). Unstable data has reverted back to being more unstable as anticipated.	Change in variability is desirable or as anticipated **AB Example** Unstable Phase A → Stable Phase B OR Stable A (i.e. 81%)→ More stable Phase B (i.e. 90%) **BA Example** Stable Phase B → Back to unstable Phase A OR Stable B (i.e. 90%)→ Reverts to less stable Phase B (i.e. 81%)	***Variability/Stability is considered in terms of trended stability envelopes (See Coding Considerations)***
D. Overlap *Evaluate the <u>overall</u> amount of **overlap** between adjacent phases* Criteria: No overlap is given the highest rating as the greatest level of confidence can be placed in the effect of the independent variable (IV) (i.e. introduction of the IV was associated with change in the pattern of the dependent variable)	PND<50%	PND = 50-99%	PND = 100% (no overlap)	***Overlap is considered in terms of PND (See Coding Considerations)***
E. Immediacy of Effect *Evaluate whether an **immediate effect** has occurred between the **last three data points in one phase and the first three data points in the adjacent phase***	Score 0 if: 1. **No immediate effect** OR 2. Change is **unexpected or undesirable**	Expected or desirable immediate effect observed. Includes change in level, trend and/or variability, however minor overlap in data observed (Example 7) (i.e. maximum of one data point from the **last three data points in one phase** overlaps with the **first three data points in the adjacent phase**)	Expected or desirable immediate effect observed. Includes clear change in level, trend and/or variability with no overlap **Coding Consideration**: *Code a 2 if study predicted a gradual change will occur and a gradual change did occur (i.e. expected a gradual change rather than immediate/rapid change).*	***Immediacy of effect is considered in terms of level, trend, variability and overlap (See Coding Considerations)***

F. Predicated vs Observed Data *Evaluate the overall extent to which data in one phase differs in basic pattern compared to what would be predicted from the prior phase (i.e. does data change from what you would expect prior to manipulation of the independent variable).*	Observed data (2nd phase) FOLLOWS the same pathway as the predicted data from the preceding phase - observed data does not deviate from the predicted pattern of phase 1 (Example 8)	Observed data (2nd phase) **does not** follow the pathway predicted by the first phase. HOWEVER the predicted data pattern **intersects** the observed data or data trend line (See Example 9)	Observed data (2nd phase) does not follow the pathway predicted by the first phase AND the predicted data pattern does not intersect the observed data or data trend line (See Example 10)	***Predicted vs Observed data is is considered in terms the observed data from the second phase and the predicted data of the 1st phase (See Coding Considerations page 15)***

Between-Phase Coding (*Individual* Phase Pairs)

Each adjacent phase pair will receive an independent rating based on the criteria listed above. Phase comparison ratings can be obtained by summing the scores (0, 1, or 2) given for items visual feature analysed (A to F).

Strong Evidence (SCORE 9-12)
To achieve a **strong evidence rating** the phase comparison must obtain a score of ‘2’ for ***level*** *(Criteria A)* and the final score must be equal to or greater than 9.

Moderate Evidence (Promising) (SCORE 5-8.99)
To achieve a **moderate evidence rating** the phase comparison must obtain a score of ‘2’ for ***level*** *(Criteria A)* and the final score must be greater or equal to 5 and greater or less than 8.99.

Weak/No Evidence (SCORE 0-4.99)
To achieve a **weak/no evidence rating** the phase comparison must obtain a score which is less or equal to 4.99 OR have obtained a score of ‘0’ for **level** (*Criteria A)*.

[Stage 1, Step 3 Between-Phase Comparisons Rating]

Computing Overall Between-Phase Comparison Score

Stage Rating: Once each individual adjacent phase pair has been assigned a score (out of 12) the average rating is then computed for the overall study. This involves summing the total number of phase-pair ratings for the study and divide by the number of pairs coded. Round the result up or down to the nearest whole number to determine the overall Between-Phase Comparisons Rating.

e.g. ABAB for two participants design with 6 phase pairs
Participant 1: AB1=12 BA=11 AB2=8 Participant 2: AB1=10 BA=9 AB2=7
(12+11+8+10+9+7)/6= 9.5
Between-Phase Comparison Rating of 9.5 (Strong)

This rating contributes to Item 3 in the following Stage of this protocol (Stage 2)

Effect Demonstrations

Ratio of Effects: Coders must also indicate the number of effect vs non-effects present within the study (i.e. The number of *Strong and Moderate effects vs the number of Weak/No Evidence effects* presented in the study). *This information contributes to Item 4 in the following Stage of this protocol (Stage 2).*

Stage 2 Overall Effectiveness Items

The second stage of this protocol requires coders to code four *Overall Effectiveness Ratings*. Coders rate whether the graphed data in a study provided *Strong*, *Moderate* or *No Evidence* based on the various visual information and ratings obtained throughout Stage 1.

Stage 2: Overall Effectiveness Items

The following rating will be applied to each study (for each dependent variable dependent variable. Each of these four items is rated *Strong*, *Moderate* or *No Evidence* (as noted throughout this protocol the ratings for each item is based on information obtained throughout stage 1).

1. **Data Points (**Minimum number of data points per phase**)**

Strong ☐	*Moderate* ☐	*No/Weak* ☐
(2) 5 or more	(1) 3-4 points	(0) less than 3 points
See **Stage 1, Step 1** item (*ii*)		

2. **Overall Baseline Quality**

Strong ☐	*Moderate* ☐	*No/Weak* ☐
(2) Overall baseline rating of strong evidence	(1) Overall baseline rating of moderate evidence	(0) overall baseline rating of weak/no evidence
See **Stage 1, Step 2** for ***Quality of Baseline Rating***		

3. **Were there at least three demonstrations of between-treatment effects? [What was the B*etween-Phase Comparisons Rating*?]**

Strong ☐	*Moderate* ☐	*No Evidence* ☐
Yes [overall between-phase comparison rating was strong {9-12)]	Yes [however the between-phase comparison rating was moderate (5-8.99)]	No OR Yes [however the between-phase comparison rating was *weak/no evidence* (0-4.99)]
See **Stage 1, Step 3** for ***Between-Phase Comparisons Rating***		

4. **What is the ratio of effects to non-effects?**

Strong ☐	*Moderate* ☐	*No Evidence*☐
No-Instances of non-effects [A strong rating may be assigned to a study which includes strong and moderate effects with no non-effects provided that the number of strong effects is **greater** than the number of moderate effects]	**The ratio of effects to non-effects is equal to or greater than 3:1** - there must be a minimum of 3 effects to every 1 non-effect, if the ratio of effects to non-effects is less than 3:1 (i.e. 2:1) then a rating of no-evidence is assigned). [Moderate ratings may also be assigned to studies which includes strong and moderate effects with no non-effects in cases where the number of strong effects is **less** than the number of moderate effect]	**The ratio of effects to non-effects is less than 3:1 –** the study demonstrates more non-effects than effects OR it does not demonstrate and adequate evidence ratio (i.e. 2:1)
See **Stage 1, Step 3** for ***Number of Effect Demonstrations***		

Overall Effectiveness Item Ratings

The four items from the Overall Effectiveness Items contribute directly to the **Classification of Evidence** in Stage 3

Stage 3 Classification of Evidence

The final stage of this protocol requires coders to obtain the final classification of evidence for the study being coded. Each study will obtain a final classification of *Strong evidence for a functional relation, Moderate evidence for a functional relation* or *Weak/No evidence supporting the presence of a functional relation* based on the Overall Effectiveness Items coded in Stage 2.

Stage 3: Classification of Evidence

Strong ☐	*Moderate* ☐	*Weak/No Evidence*☐
All responses to the four Overall Effectiveness Items above were coded a "2"	At least one response to an Overall Effectiveness Items was coded a "1" (no ratings of "0")	At least one response to an Overall Effectiveness Items was coded a "0" (If a "0" is coded then the study is rated to have no/weak evidence regardless of what the other ratings were present).

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Appendix C: Study Coding Protocol

(1) Demographic and Setting Information

Participants

1.1. Number of target participants
1.2. Participant Age (average/range)
1.3. Participant Gender:
- ☐ Male
- ☐ Female

1.4. Participant Grade:
- ☐ Grade 1
- ☐ Grade 2
- ☐ Grade 3
- ☐ Grade 4
- ☐ Grade 5
- ☐ Grade 6

1.5. Participant Condition/Diagnosis/Disability Status

Setting

1.6. Education Setting (i.e. public, private, general education, general education with support)
- 1.6.1. Class size
- 1.6.2. School type
- 1.6.3. General education (classroom and intervention processes occurred naturally within a typical classroom)
  General education with supports (supports were specifically provided to the student participants)

1.7. What type of class/task was the intervention used in? (i.e. Maths, reading, whole group work, individual work etc)

Study Aim

1.8. *What was the aim of the study?/Study Research Question?*

(2) Dependent Variable (Targeted Behaviour Outcome)

2.1. Dependent Variable (Targeted Behaviour Outcome)- Detail
- 2.1.1. Reported Teacher Challenges -Detail

2.2. Subtype of dependent variable:
- ☐ Disruptive (inappropriate vocalisation, distracting other students, out of seat behaviour, shouting out etc)
- ☐ Off-task/On-task (noncompliance, task refusal, off-task behaviour)
- 2.2.1. Goal of intervention
  - ☐ Increase display of positive behaviour
  - ☐ Reduce display of problem behaviour
  - ☐ Increase positive and reduce problem behaviours
  - (☐ Both behaviour and academic outcomes)
  - (Specify detail)

2.3. Did the study report any other dependent variables/concomitant behaviours? – i.e. academic or performance outcomes (Detail)

(3) Intervention (Independent Variables)

3.1. Name of Intervention
3.2. Intervention Description (detail**)**
3.3. Intervention Components (SMIC-2B): Did the study contain the following components? If so who was responsible for managing the component?

Component	Present in Intervention	Management (if present)
1. Selection of Target Behaviour	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
2. Definition of Target Behaviour	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
3. Selection of Primary Consequence	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
4. Goal Setting	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
5. Response Prompt for Target Behaviour	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
6. Prompt/cue for self-management tactic	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
7. Observation	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
8. Recording	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
9. Evaluation	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
10. Administration of Conditioned Consequences	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
11. Administration of Primary Consequences	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
12. Graphing or Charting Behaviour	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable
13. Self-management Materials	☐ Yes ☐ No	☐ Adult-Managed ☐ Student-Managed ☐ Joint-Managed ☐ Not-Determinable

Component Details

If present…

- What target behaviour was self-monitored by the student participants?
- What type of goals were set?
- What forms of target behaviour prompt were used?
- What forms of self-management prompt/cue device was used?
- What form of recording device was used?
- What forms of consequences were used?
- What form of graphing/charting materials were used?

(4a) Intervention Implementation Details (Additional Independent Variable Info)

3.4. What target behaviour was self-monitored by the student participants? Detail in terms of its characteristics:
  - Was it discrete (had a distinct beginning and end)?
  - Was it one behaviour or a behaviour representative of a range of behaviours? What were they?
  - Did the participant self-monitor an academic skill or performance?

3.5. Did the intervention involve someone providing performance feedback (i.e. correction/praise) to the student on their self-management? (Detail)

3.6. Did the intervention involve any addition independent variable elements in addition to the self-management components? ☐ No ☐ Yes (If yes specify)

3.7. Did the intervention involve a functional behaviour analysis/assessment? ☐ No ☐ Yes
If yes, was the function of the behaviour determined so that the intervention could be designed to support that function (Detail)

3.8. Was technology incorporated into the intervention procedure? If so what form of technology and what was its function/purpose? (detail)

(5) Intervention Training Procedures

4.1. Intervention agents (Who delivered the intervention in the study? – Indicate if there were multiple providers)
  ☐ Researchers
  ☐ School clinician (specify, social worker, psychologist, counsellor etc)
  ☐ Teacher
  ☐ Other school personal (specify – learning aid etc)
  ☐ Non-school Master's or PhD candidate
  ☐ Other (specify)

4.2. Did the intervention agent/s receive special intervention training? (If so detail) ☐ No ☐ Yes (If yes, detail - i.e. who delivered training, who received training, how long did training last, what setting was training delivered in and what occurred in training)

4.3. How were student participants trained in self-management procedures? (Detail) – i.e. who delivered training, who received training, how long did training last, what setting was training delivered in, what occurred in training, what teaching modalities were used in training [modelling, practice, rehearsal, discrimination training, lessons, manuals)

(4b) Intervention Implementation Details

5.1. Was the target behaviour defined negatively or positively? (i.e. presence, positive replacement behaviour, absence, cease a problem behaviour, increase on-task behaviour, reduce off-task behaviour etc

5.2. If goal setting component was included, what was the student goal?

5.3. If present, what target behaviour prompt was used in the study?

5.4. If present, what self-management prompt/cue device was used in the study?
  5.4.1. Number of intervals on prompt device? Interval length?

5.5. If present, what type of recording device was used (i.e. assistive digital device, paper-and-pencial, etc) _
  5.5.1. Number of recording device options? (i.e. yes/no)

5.6. If present, what type of reinforcement was used? (i.e. positive reinforcement, negative reinforcement, both)

(6) <u>Study Design Analysis: Data Collection and Method of Analysis</u>

Data Collection

6.1. Dependent Variable Data Collection (What type of measure was used to collect data for the evaluation of behaviour change?)[List multiple if appropriate]

- Teacher Observation
- Researcher Observation
- Student Self-Report/Self-Observation (specify)
- Standardised Instrument (specify)
- Other
- Not specified

6.2. In instances where observational data was collected, what method of data collection was used? (For example, time-sampling, frequency counts etc)

6.3. How was the reliability for outcome data evaluated? (i.e. what processes were used to collect IOA and what proportion of sessions were evaluated in terms of IOA?)

Analysis

6.4. Report the analytical strategy used to assess behaviour change? (i.e. Visual analysis, effect size, percent and/or frequency(*n* occurrence of behaviour/non-occurrence of behaviour) etc)

6.5. **Design Details**

6.5.1. Type of design:

6.5.2. Number of phases?

6.5.3. What phases were compared for analysis purposes?

6.5.4. Description of baseline condition

6.6. How did the study determine when participant students had demonstrated an adequate improvement in the target behaviour?

6.7. If data from comparison peers was collected, were comparisons drawn between the target student data and comparison student data? (if so what was the purpose of this?)

(7) <u>Social Validity</u>

7.1. Did the study collect social validity data: Yes No

7.1.1. If yes how was this data collected? Who was it collected from?

7.2. What did the study report in terms of social validity?

7.3. Were target student outcomes compared to a form of comparison peer data?

(8) <u>Procedural Fidelity</u>

8.1. Was integrity/fidelity data collected? Yes No

8.2. If yes, what form of fidelity data was collected?

- Intervention Agent Training (i.e. data collected for intervention agent training procedures?) (detail)
- Student Training (i.e. data collected for the student training procedures in training conditions?) (detail)
- Intervention Implementation (i.e. data collected during intervention conditions?) (detail)

8.3. For what agent was fidelity data collected for?

- Student-Implemented Variables (i.e. measured when student implemented self-monitoring)
- Adult-Implemented variables (i.e. measured when adults were training students)

8.4. How was fidelity measured? (i.e. researcher observations, checklists, surveys, records etc)

8.5. To what extent were variables implemented as intended (i.e. results of measurement); Were procedures adhered to? What level of adherence was recorded? (i.e. percent/level)

(9) <u>Intervention Outcomes</u>

9.1. Study Findings/Outcomes (detail)

(10) <u>Generalisation Data</u>

a. Was generalisation data collected (i.e. how behaviour generalised to other settings, times of the day)? Yes No

(11) <u>Fading and Maintenance/Follow-Up</u>

a. Were intervention procedures faded in the study? Yes No

b. Was maintenance/follow-up data collected in this study (did programing for maintenance occur; was intervention faded after a period of successful outcomes)? Yes No

Appendix D – SMAT-IM-IF

MONASH University

SELF-MANAGEMENT INTERVENTION MANUAL INTERVENTION FACILITATOR EDITION SMAT-IM-IF

Monash University

PhD Research Project 2015

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Introduction

Manual Introduction

This manual was developed to guide a postgraduate research student (henceforth, the researcher) in conducting a single-case design (SCD) study to investigate the effectiveness of a novel technology-based self-management intervention system with primary school students who demonstrate high-frequency problem behaviours a regular classroom setting. It contains a detailed description of the procedures involved in conducting the proposed self-management intervention pilot study (hence forth referred to as the *self-management study**). This manual serves two main purposes. First, it is intended to guide the researcher in working collaboratively with a voluntary primary school teacher to implement the developed self-management intervention system (henceforth, *self-management system**) in a regular primary school classroom. Second, this manual serves to direct the researcher in completing all aspects of a single-case design pilot study which will form the third and final study within the researchers PhD project.

GLOSSARY NOTE: Terms contained in the glossary have been italicised and *starred**

Self-Management Intervention Pilot Study: Rationale and Aim

Self-management may be defined as the personal application of behaviour change techniques or actions to bring about a desired change in one's own behaviour (Cooper, Herson, & Heward, 2007; Shapiro & Cole, 1994). An alternative definition specifies that self-management is an "individual's use of specific documentation procedures to monitor, evaluate, and/or reinforce his or her own behaviour" (King-Sears & Carpenter, 1997).

Past research demonstrates that self-management techniques have been successfully used with numerous student populations, in various education settings, to target a wide range of behavioural and academic outcomes (Briesch & Daniels, 2013; Moore, Anderson, Glassenbury, Lang, & Didden, 2013). Research has shown self-management to be successfully used by students who are in kindergartens/preschools (e.g. Storey, Lawry, Ashworth, Danko, & Strain, 1994); elementary/primary schools (e.g. Vance, Gresham & Dart, 2012); middle schools (e.g. Cihak, Wright, & Ayres, 2010) and high schools (e.g. Prater, Joy, Chilman, Temple & Miller, 1991). Self-management intervention success has also been demonstrated with students presenting with attention deficit/hyperactivity disorder (ADHD) (e.g. Mathes, & Bender, 1997); autism spectrum disorders (ASDs) (e.g. Holifield, Goodman, Hazelkom, & Heflin., 2010); intellectual/cognitive disabilities (e.g. Gilberts, Agran, Hughes, & Wehmeyer, 2001) emotional and behavioural disabilities (EBDs) (e.g. Gulchak, 2008); and learning disabilities (LDs) (e.g. Wolfe, Heron, & Goddard, 2000) as well as with typically developing students (e.g. Wood, Murdock, & Cronin, 2002). In terms of outcomes previous research has also demonstrated positive improvements when using self-management to target both academic (i.e. work completion, productivity and performance) and behavioural (i.e. disruptive behaviours, task engagement, off-task behaviours) outcomes (Koegel, Harrower & Koegel, 1999; McDougall, 1996; Rafferty, 2010; Rock, 2005).

In an education sense self-management procedures or strategies are designed to aide individuals in changing or maintaining their own behaviour (Wilkinson, 2008). Education-based self-management interventions broadly involve teaching students a range of procedures/strategies which they can then use in bringing about positive changes to their own behaviour in education contexts (Shapiro & Cole, 1994).

Self-management intervention packages vary in terms of strategies/composition and degree of student involvement (Briesch & Chafouleas, 2009; Hoff & Sawka-Miller, 2010). Typically, interventions include combinations of one or more of the following strategies: self-monitoring (self-observation and self-recording), goal setting, self-evaluation, self-charting, and self-reinforcement (Cooper et al., 2007; Rafferty 2010).

- *Self-monitoring* usually forms the basis of self-management interventions and involves students systematically observing their own behaviour and self-recording the occurrence or non-occurrence of a target behaviour (Cooper et al., 2007). Self-monitoring is comprised of two actions: self-observation and recording one's own actions on a recording device (i.e. I can see that I was not working then and was disrupting Sammie by talking to her so I will mark that I was off-task on my recording device) (King-Sears & Carpenter, 1997).

- *Self-evaluation* often requires students to evaluate their own behaviour against a set standard, whereas *goal setting* involves students actively creating behavioural target goals (Maag, 1999; Rafferty, 2010). These strategies are usually used in combination with self-monitoring.
- *Self-charting/self-graphing* involves students graphing their behaviour performance after they have engaged in self-monitoring. Self-graphing may lead to students spontaneously creating goals for themselves and evaluating their performance (Rafferty, 2010).
- Self-management may also involve *self- reinforcement*; delivery of an earned reward contingent upon performing certain behaviour or meeting a set standard/goal (Cooper et al., 2007; Maag, 1999). To self-reinforce students must be able to self-monitor (i.e. recognise the occurrence/non-occurrence of a specific behaviour) and detect whether their behaviour meets a criteria or goal through self-evaluation – if the student is successful they may have themselves a reward (King-Sears & Carpenter, 1997).

Past self-management interventions have largely involved processes whereby students self-monitor by observing and recording the own behaviour using paper/pencil when cued by an audio prompt (CD player/timer beeps) (Bedesem & Dieker, 2013). Unfortunately, these approaches can be impractical, disruptive, and may draw attention to students using them. Assistive technology has recently gained popularity throughout literature as researchers attempt to develop covert, minimally intrusive/ disruptive, flexible self-management strategies. While studies investigating self-management assistive technology have reported promising outcomes for the use of technology in self-management (e.g. Bedesem & Dieker, 2013; Blood, et al., 2010; Cihak, et al., 2010; Mechling, 2007; Morrison, et al., 2014), more research is warranted to further document the effectiveness and acceptability of technology use in these interventions.

Aim of Project: The current project aims to investigate self-management as an intervention strategy which can promote primary students' appropriate behaviours in regular classroom settings. The intervention has been specifically designed to involve high levels of student involvement, with the intention of having minimal teacher involvement in the behaviour management strategy. This study will involve the piloting of a novel, simple self-management strategy incorporating all-inclusive self-monitoring assistive technology (i.e. technology which (a) can prompt students to self-monitor and (b) be used as the self-recording device) – this assistive technology will take the form of Pebble Smartwatches and Apple iPads.

Study Benefits. The development of a self-management system which can be used in regular primary school classrooms by students with high-frequency disruptive classroom behaviours may benefit both students and teachers. Students who use self-management to manage their own problematic classroom behaviours may experience greater independence, increases in appropriate behaviours, and greater educational opportunity/academic progress. Additionally, the successful use of self-management may prevent the need for more intensive student behavioural interventions in classrooms. Student use of self-management may also result in reduced levels of disruptive classroom behaviours, thus all students in the classroom may experience less interruption to learning processes. Teachers on the other hand may experience reduced classroom behaviour management demands, increased time for academic instruction, and notice positive behaviour change in classroom environments.

Self-Management Intervention System

The structure of the proposed *self-management system* has been largely informed by the results of two preceding studies conducted as part of the researcher's PhD project: (Study 1) a SCD systematic evidence review/meta-analysis and (Study 2) a study evaluation of the identified evidence-base (studies were analysed in terms of intervention structure and procedures). The previous two studies investigated and explored the use of self-management interventions in regular classroom settings with primary students demonstrating problematic/ inappropriate behaviours. More detail on these studies can be viewed in Chapters 4 and 5 of the researcher's final PhD.

The self-management package to be piloted in the current study will be comprised of the following intervention components:

Select Target Behaviour – *Adult-Managed*
Define Target Behaviour – *Adult-Managed*
Material Management – *Joint-Managed**
Self-Monitoring Cue – *Student-Managed*
Self-Observation – *Student-Managed*
Self-Recording – *Student-Managed*
Self-Charting – *Student-Managed*

**Joint-Managed =* Both adult and student involvement

The intent behind this pilot study is to train participating students to use the self-management intervention in way which will enable them to be their own interventionist (i.e. students will be in charge of or involved in most aspects of their own intervention). Large emphasis is placed on the active participation of students throughout this intervention to ensure students are proactive in the intervention process. Beside the selection and definition of the target behaviour (which is the responsibility of the teacher and researcher), participating students will be responsible or partly responsible for all of the components that form the *pilot study intervention package* (i.e. self-monitoring cue, self-observation, self-recording, prompt for target behaviour and self-graphing/self-charting). Once trained students will even be responsible for preparing and obtaining their own intervention materials/devices when using the intervention in the classroom setting.

Manual Development

The guidelines detailed in this manual have been developed based on: (a) Study 1 and 2 findings, and (b) various step-by-step guides published throughout the self-management literature. Drawing on these sources ensured that a practical set guidelines were prepared in line with the effective approaches published throughout an established self-management literature.

The current researcher guidelines have been primarily adapted based on the *SPIN: Self-Management Design and Implementation Phases* framework proposed by King-Sears & Carpenter (1997) as presented in King-Sears & Bonfils (1999), King-Sears (1999), King-Sears (2006) and King-Sears (2008). The SPIN framework consists of four phases, two of which relate to intervention design, one to intervention instruction, and one to progress monitoring. The Student Training procedures in this manual have also been adapted from the 10-Step Instructional Sequence for Teaching Students to Use Self-Management as presented within the SPIN approach proposed by King-Sears and Carpenter (1997) (used in King-Sears, 2008; King-Sears, 2006; King-Sears & Bonfils, 1999).

In addition, this manual has also been developed based largely on the step-by-step guidelines presented by:

Bedesem & Dieker (2014), Busick & Neitzel, (2009); Cooper, et al., (2007), Ganz (2008), Koegel, Koegel & Parks (1990), Maag (1999), McConnell (1999), McDougall, Morrison, & Awana (2012), Menzies, Lane, & Lee (2009), Morrison, et al. (2014), Rafferty (2010), Rankin & Reid (1995), Wilkinson (2008).

How to use this manual?

This manual belongs to a set of resources to be used in conjunction for intervention implementation. These resources include:

- **Researcher/Intervention Agent Manual (this manual)** provides an outline of all study processes/guidelines in a step-by-step instructional format – to be used as an intervention guide throughout all *study stages*.
- **Teacher manual** provides a brief overview of implementation guidelines and student training processes in a step-by-step format for participating teachers – to be used by teachers as an intervention guide throughout study stages. Can also be used throughout researcher/teacher collaboration in planning stages.

- **Intervention Information Booklet** includes a description of the intervention intended for key education professionals (i.e. principals) whom require information on the intervention but do not require thorough knowledge on intervention processes
- **Intervention workbook** is intended to be used by the researcher and teacher to document details on specified study procedures throughout the pilot study.

The manuals have been created to (a) facilitate collaborations between the researcher and the classroom teacher, and (b) help implement the proposed program in a regular classroom setting in a way that meets the needs of the research agenda as well as the needs of the teacher and participating students.

These manuals do not provide detailed explanations for why specific steps are undertaken or why various components/elements have been incorporated over others in *proposed self-management system* – for more detail on the latter refer to Chapter 6 in the PhD.

Study Details, Implementation Approach and How to Get Started

Study Details
Setting
Regular classroom setting

Participants
Teacher Participant
One (possibly two) classroom teachers whom meet the following criteria: (a) have potential student participants who meet the criteria outlined below, (b) are willing to collaborate with a researcher for a few months to implement this intervention in their classroom setting, and (c) can allow each student participant access to an iPad in the classroom setting for the purpose of this study.
Student Participants
This research requires participation of 2-6 primary students demonstrating high-frequency problematic, difficult, disruptive or inappropriate behaviours during class time. Students will be selected for participation through a brief screening process to be undertaken by the researcher and teacher. Students who participate in the current research project must meet the following criteria.
Participants must:

- (a) participate in a general education classroom
- (b) be in any primary grade above Prep
- (c) be typically developing OR have an educational, behavioural or developmental diagnosis (i.e. learning disability, ADHD, ASD, etc)
- (d) be exhibiting problematic classroom behaviour at a high-frequency which disrupts the classroom environment and/or interferes with academic tasks
- (e) demonstrate the problem behaviour at a high-frequency across at least three different subjects
- (f) be observed by the researcher in the classroom setting as exhibiting the reported problem behaviours at a high frequency
- (g) have daily access to an iPad
- (h) have a high attendance rate (i.e. 85-90% attendance during Term 1)
- (i) have consent to participate from a parent/guardian for participating in this study
- (j) be willing to engage in self-monitoring of behaviour in a classroom (student assent to participation is required)

Target Behaviour*
The aim of this intervention is to increase appropriate/positive classroom behaviours for students who exhibit inappropriate/problematic classroom behaviour at a high-frequency which disrupts the classroom environment and/or interferes with academic activities (for the student demonstrating the behaviour or other peers).

Guidelines for selecting target behaviour are provided in Stage 1 Teacher's Workbook (page 3-6) illustrates common classroom behaviours be suitable target behaviours.

Problem behaviours which may be targeted through this intervention include (Angus, et al., 2009; Sullivan, et al., 2014):

> *Low-Level Disruptive Behaviour* (i.e. Behaviours that disrupt the flow of the lesson - talking out of turn, inappropriate interruptions, making distracting noises intentionally, interfering with or destruction of property, moving around the room unnecessarily, making inappropriate remarks, and mucking around/being rowdy).
>
> *Disengaged/Off-Task Behaviour (i.e.* Behaviours where the student does not attend to current task/activity – may be passive or active disengagement/off-task behaviour – avoidance of school work, distraction, lack of concentration)

NOTE: To address the aims of this study participating students must present with at least one form of *disruptive behaviour*. Participating students may present with a combination of both disruptive and off-task behaviour.

Intervention Agents
The researcher is responsible for leading most aspects of this study including guiding the teacher through initially study processes, ensuring the students are adequately trained in the self-management system and for the collection of data.

The participating classroom teacher is responsible for various aspects of the intervention including (a) the nomination of student participants, (b) determining the suitability of intervention processes, (c) helping the researcher to train students in the self-management system using their teaching expertise, and (d) working with the teacher to implement the intervention in a minimally disruptive fashion.

NOTE: Ideally the classroom teacher will assist the researcher in the delivery of this intervention. If this is not possible a learning aid or some other education professional to assist the researcher. This decision will be left to the discretion of the participating classroom teacher.

Materials/Resources
The following materials, tools and resources are required to implement the self-management intervention and to undertake study data collection:

- Researcher/Intervention Agent Manual
- Teacher Manual
- Assistive Technology Manual
- Intervention Workbook
- Screening materials
- Pre-and post-behaviour measure (Student Behaviour Rating Scale; SBRS)
- Data collection questionnaires/surveys developed for this study (Participant profile forms, post intervention feedback questionnaires/surveys)
- Training resources
- Numerous copies of the three observation forms (1. rotational observation system forms, 2. classroom log forms, and 3. observation note forms) – also required: a clip board and pen
- Pebble Smart Watch (one for each observer)
- *Material required for students to use the self-management system*: An apple iPad and Pebble Smart Watch (one for each participant); materials to develop a self-graphing materials.

Anticipated Timeline
It is anticipated that the proposed study will span the length of one to two school terms depending on the nature of student behaviour, scheduling, participant availability and barriers to implementation.

Study Stages

This instructional/implementation approach contains five study stages described Table 1. The **Preliminary Preparation Stage** involves the researcher meeting with the participating classroom teacher after they have read the explanatory statement to introduce all aspects of the self-management system and to make initial arrangements (i.e. student nominations) During the next two stages (**Select & Pre-Intervention Observation** and **Final Preparation**) the researcher is to collaborate with the teacher to complete intervention preparation tasks and to finalise arrangements. In the third phase (**Student Training**), the researcher will work with the teacher to train students in the self-management system use. The last phase (**Intervention Implementation & Observation**), involves monitoring of students' ongoing use of the self-management system to determine if desired behaviour change occurs and is maintained

Table 1: Study Stages

▪ **[Preliminary Preparation]** Researcher meets with classroom teacher in a consultation to (a) introduce the self-management study, (b) inform the teacher of all study requirements, processes and commitments, and (c) make initial study arrangements. This stage also involves arranging student nominations/recruitment and conducting preliminary classroom observations (to determine suitability of nominated students)
▪ **[Stage 1] [SELECT] Select Target Behaviour** This stage involves selecting the student's target behaviour (involves consideration of the following questions- *What's the specific behaviour of concern, what's the current performance level? What's the more ideal behaviour*) ▪ **[Stage 2] [PREPARE] Prepare for Self-Management**. This stage requires familiarisation with the self-management system and final preparation of various *self-management strategies**, *study procedural steps** and *student-training procedures**. ▪ **[Stage 3] [TRAIN] Train students to use Self-Management**. This stage involves using the student-training procedures to train the student in how to use the self-management system. ▪ **[Stage 4] [IMPLEMENT AND OBSERVE] Implement the intervention and observe outcomes.** This stage involves the researcher collecting intervention data while the student implements the self-management system to determine effectiveness

This framework has been adapted from the SPIN approach proposed by (King-Sears, 2006; King-Sears, 2008; King-Sears & Bonfils, 1999; King-Sears & Carpenter, 1997).

Implementation Approach: Stages and Steps

To complete the proposed self-management study the implementation agents must progress through described study stages, study procedural steps *and phases*.* Figure 1 presents a visual representation the study timeline which demonstrates the interactions between study phases, stages and procedural steps. Though procedural steps are presented in logical sequence (Figure 2), stages and procedural steps overlap during particular phases of this study (For example, Figure 1 demonstrates that in the *Preliminary Phase* the Preliminary Stage, Stage 1 and Stage 2 all overlap and Steps 1, 2, 3 and 7 are completed during Session 2). Overlapping stages and procedural steps can be observed vertically in Figure 1.

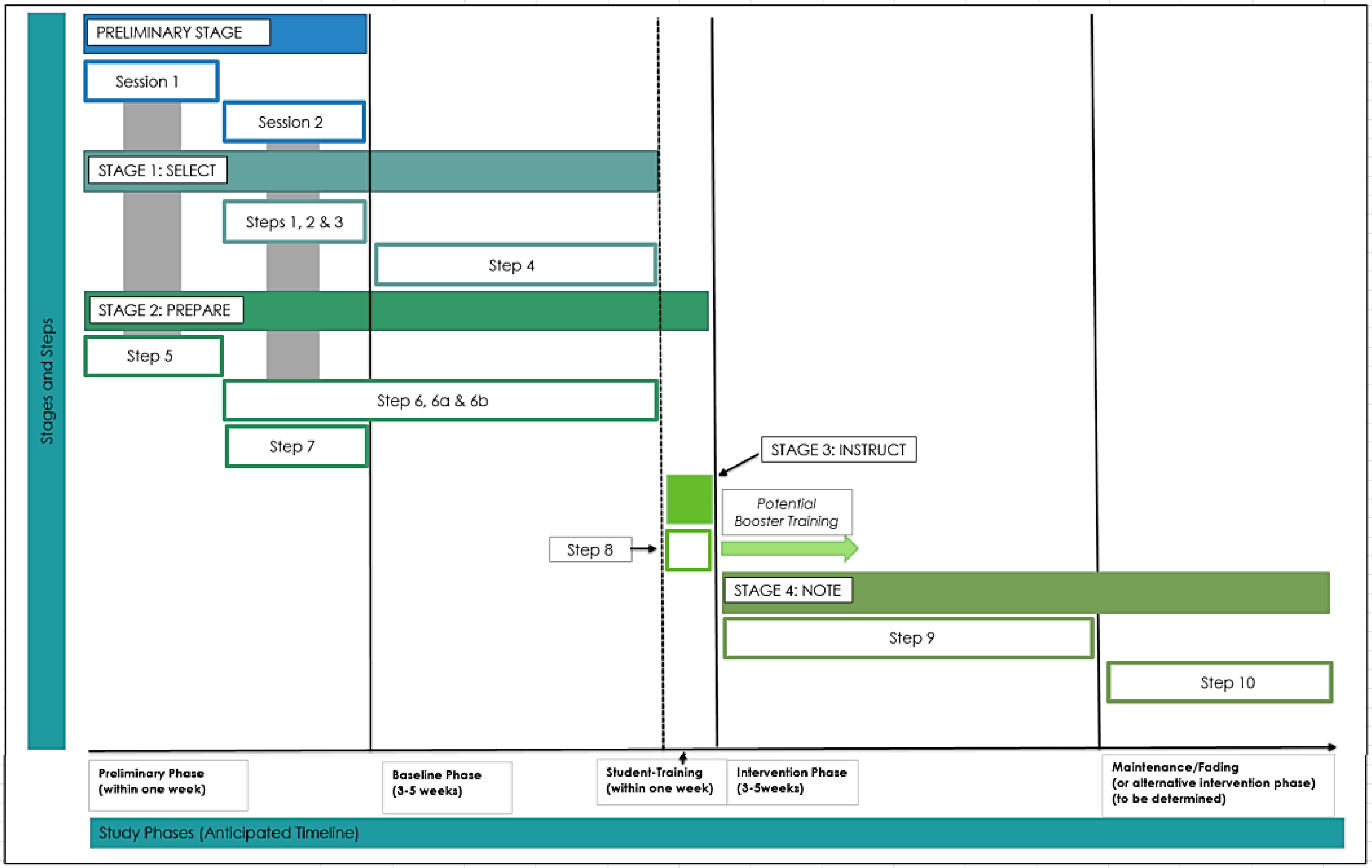
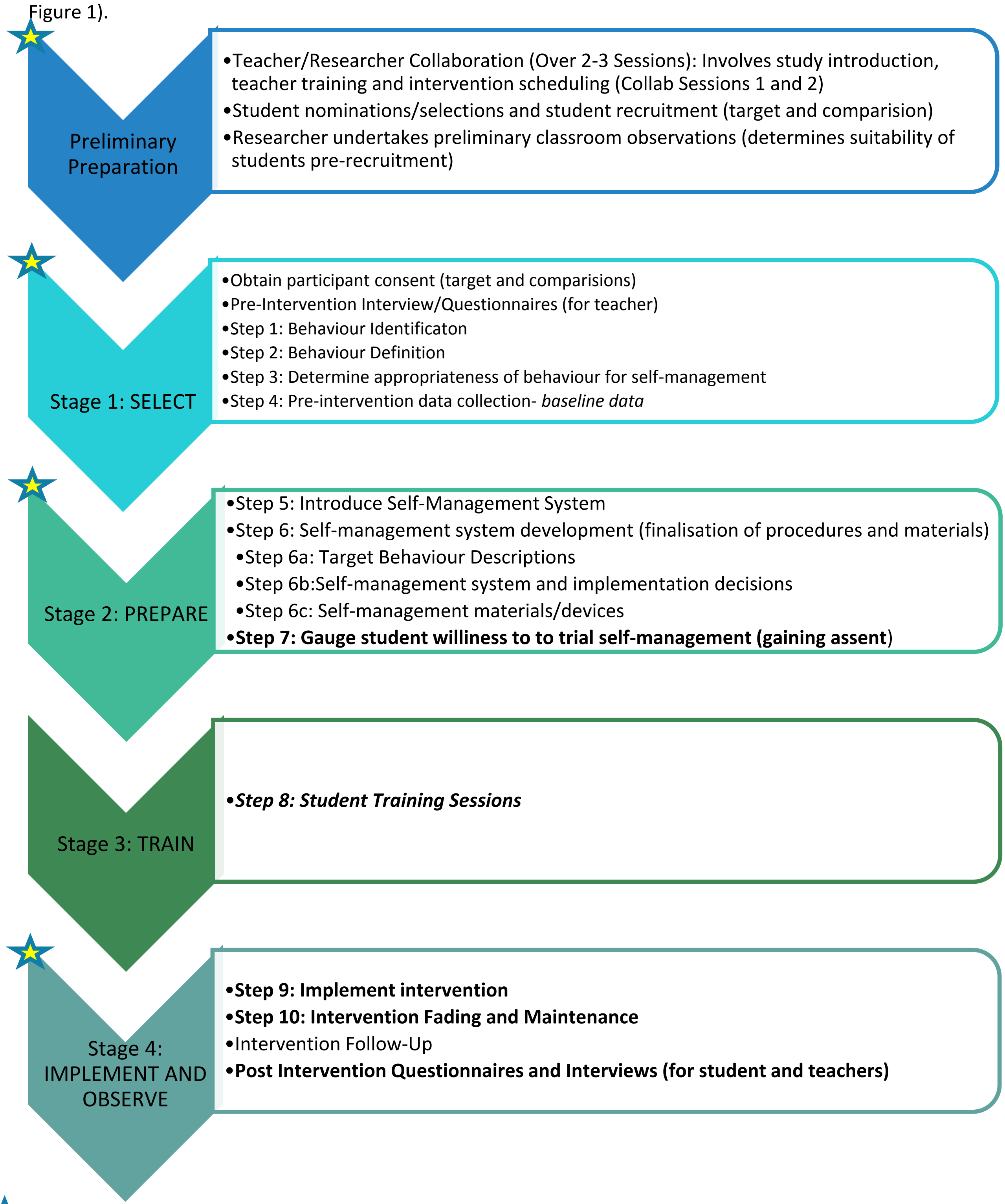


Figure 1: Self-Management Intervention Timeline

Study Procedural Steps

Each of the five study stages contains various procedural steps to guide intervention agents through tasks which must be undertaken to successfully complete this intervention study. The flow chart (Figure 2) summarises all steps across the study stages (Reminder: These steps do not occur in a sequential manner – See Figure 1).



In class student observation required for data collection

Bold = Student involvement required

Figure 2: **Study Stages and Study Steps/Procedures**

<u>(Stage 3, Step 8) *Student Training Procedures*</u>

Table 2 (below) outlines step-by-step Student Training Guidelines required for Stage 3, Step 8. This study requires the researcher and participating classroom teacher to work together in teaching the participating students how to make use of the self-management system to manage their own behaviour. The step-by-step procedure outlined below should act as a guide for training participating students. Adhering to these steps will help to ensure that: (a) students develop an understanding of the target behaviour and behavioural expectations, (b) the self-management system is appropriately introduced to students and (c) students are provided with practice opportunities in a supported context (King-Sears, 1999).

Table 2: Student Training Procedures

Student Training Procedures	
SESSION 1: Introduce Self-Management and Target Behaviour	
a)	Introduce Concept of Self-Management Strategies: Provide rationale for self-management
b)	Identify Target Behaviour: Demonstrate examples and non-examples through behaviour discrimination
c)	Student practice of target behaviour (Create Target Behaviour Prompt#)
SESSION 2: Introduce SMAT System	
d)	Introduce SMAT System
e)	Adult Models Self-Management Strategy through think-aloud examples
SESSION 3: Provide Practice, Assess Mastery and Transfer to Authentic Setting	
f)	Guided practice opportunities for students (under adult supervision) *(Mastery and Procedural Accuracy)*
g)	Discuss the When, What, Who, How (Intervention House Keeping)
h)	Independent practice in classroom setting *(Mastery and Procedural Accuracy)*

This framework has been primarily adapted from the SPIN approach proposed by (King-Sears & Carpenter, 1997). Aspects of the current framework have also been modelled off the training procedure proposed by McDougall, et al., (2012) - used in the Teaching Elementary Students How to Manage their Own behaviour: A Training Video (McDougall, 2003).

<u>*Intervention Implementation: Participant Involvement and Commitment*</u>

ADULT INVOLVEMENT (Teacher Participants)

Majority of teacher involvement is required in initial stages when the teacher is required to work with the researcher to finalise intervention processes, to select student participants (i.e. nominate, screen and select) and deliver student training. Minimal teacher involvement is anticipated in later study stages as students will develop assume responsibility for behaviour management throughout intervention sessions.

STUDENT INVOLVEMENT

Participating students are subject to student-training sessions run by the teacher and researcher – training can involve small group sessions, one-on-one sessions or a combination of so students have get the opportunity receive individualised instruction. After training, students are to make use of the self-management system during everyday class scheduling.

STUDY SESSIONS

Study sessions will vary in number, duration and scheduling based on setting variables (i.e. session disruptions, student availability, class scheduling, research requirements etc). Thus, a level of flexibility is require in undertaking this study

Procedural Fidelity and Intervention Flexibility
Although, it is ideal that the proposed guidelines in this manual are adhered to in future investigations it is anticipated that in future research alterations/accommodations may need to be made to the proposed self-management strategies so the intervention can be adapted to suit the unique needs of the teacher, student and/or classroom setting. As such this manual does not outline a strict set of rules, but more of a set of flexible guidelines which can be altered to suit research needs. Thus in undertaking further research the following attitude must be adopted by researchers:

- INTEND to undertake these study guidelines with 100% procedural fidelity
- BUT remain aware that unexpected adjustments may need to be made to suit setting and participants needs (teacher and student)
- NOTE any alterations made to the manualised guidelines so that any changes can then be documented in the research produced from this study

IMPORTANT NOTE – ALTERATIONS

Study Stages – *Detailed study stages have been presented as a general guide for this study. Study stages should not require any alteration, however they may be altered if required.*
Study Procedural Steps- *Detailed procedural steps may be altered accordingly to suit the needs/preferences of the setting, participants and/or teacher.* For example, procedures indicates that two 1 hour researcher-teacher consultation sessions must be completed prior to the intervention commencing - this step may be altered such that four 30minute sessions are engaged in to fit within the teacher’s schedule.
Student-Training Procedures- *Student-training procedures may also be altered as required to suit the needs/preferences of the setting, participants and/or teacher.* For example, the student-training procedures indicate that students should ideally be trained using role play type scenarios – the teacher and researcher may make the decision to train students various processes through other means (i.e. stories).

Getting Started: Intervention Scheduling
This manual has been developed under the assumption that the classroom teacher has consented to participating in the student. Once a teacher has been recruited the first Collaboration Session can then be scheduled to commence the study. In the first Collaboration Session the teacher and researcher will make arrangements for other self-management sessions. The researcher should use Figure 1 to guide the scheduling of various self-management sessions. (NOTE: Not all sessions can be scheduled at once; scheduling will be an iterative process that occurs throughout the study).

To ensure that this study remains minimally disruptive to the natural classroom setting/schedule it is important that all self-management sessions are arranged at times deemed suitable by the teacher.

In this Manual

Glossary

Manual Terminology

Phases: Single-case design research design term referring to the study phases which are undertaken at various instances throughout this pilot. For example, Baseline Phase, Intervention Phase and Maintenance/Fading Phase – this study also contains a Preliminary Phase.

Self-Management Strategies: The approaches/techniques/processes which form various aspects of the *self-management system*.

Self-Management Study: The single-case design being undertaken to pilot a developed self-management system as part of the researchers PhD project.

Self-Management System: The self-management intervention approach being piloted in the current research project. A number of self-management components have been combined to form the current self-management system – the combination of components has been informed by the comprehensive intervention analysis undertaken in Chapter 5 of this PhD project. See page 3 for a detailed description of the system being used - the description of the self-management system outlines the *structure* of the self-management system in terms of components.
This term is used to capture the following labels; self-management package, intervention, method.

Student-Training Procedures: The procedural steps taken by the researcher and teacher to train the participating students in how to make use of the self-management system in class. The outlined steps provide a general guide which is to be followed in sequential order.

Study Procedural Steps: The procedural steps taken by the researcher and teacher to implement the *self-management system.* Detailed steps provide a general guide which may be followed in sequential order to complete the single-case design pilot study. All steps are outlined on page 9.

Study Sessions: The sessions which the researcher, teacher and student will need to engage in throughout various stages of this intervention process. There are **five** different types of self-management sessions which vary in terms of purpose, number, length, participant involvement, and stage in the study. The sessions include: (1) Collaboration Sessions, (2) an Assent Session, (3) Baseline Sessions, (4) Student Training Sessions, and (5) Intervention Sessions.

Study Stages: Refers to the five stages which the researcher and teacher must progress through to implement the self-management system in the classroom. Study stages contain a number of *Study Procedural Steps.* The five stages are outlined on page 7.

Target Behaviour: Refers to the positive, desired or appropriate alternative behaviour(s) that the student will ideally learn to use increasingly in place of the problem behaviour(s). Target behaviours are the behaviour of primary focus for self-management interventions.

[PRELIMINARY STAGE]: RESEARCHER/TEACHER COLLABORATION SESSIONS

The first stage of this study requires the researcher to meet with the classroom teacher for two Collaboration Sessions to introduce various aspects of the self-management study and to start making initial arrangements. It is anticipated that two sessions – each lasting approximately 60 minutes - will be required. Scheduling of these sessions will depend on the teacher's schedule and availability – if needed the format of sessions can be adjusted (i.e. rather than two one hour sessions, four 30 minute sessions may be better suited). While it is estimated that one hour will be sufficient for each session it is possible that more time may be required to cover all material – if more time is required the researcher and teacher should make appropriate arrangements. The following section outlines two session guides for the Collaboration Sessions – the researcher should use the following guidelines to cover all material and complete all detailed tasks with the participating teacher.

Collaboration Session 1

Participants: Researcher and Classroom Teacher
Expected Duration: Approximately 1 hour
Required Material: Explanatory Statement (Teacher and Student), Consent Form (Teacher and Student), Teacher Profile Questionnaire, Teacher's Manual, Assistive Technology Manual and Workbook
Expectation: ***Ensure that the teacher has read the explanatory statement prior to undertaking this session.*** *It is assumed that the teacher has read the study explanatory statement and possibly consented to participation in this study prior to the first collaboration session.*

Teacher/Researcher Collaboration Session 1

Session Aim: Discuss the study – discuss explanatory statement (ensure that all questions are answered). Provide more information concerning the purpose/rationale behind this study. Introduce teacher to the various aspects of the self-management study. Ensure teacher is informed about what this study involves, and more importantly what is required of them as a participant and what is required of students as participants. Commence student nomination and recruitment process.

Study Introduction

1. **Introduce yourself:** If not already done so, introduce yourself to the teacher: include qualifications, experience and current role/position. State connection to the current study.
2. **Introduce study:** Use the explanatory statement to guide introductory discussion.
   - Ask teacher if they have any questions that have arisen from the explanatory statement.
   - Provide the teacher with the *teacher manual,* explain the purpose of the manual and then direct the teacher to the Collaboration Session 1 section. Specify that the manual is to help guide the teacher through the study processes with the help of the researcher. Indicate that the teacher is to read over the manual so they can understand the study as a whole process. The teacher needs to read the manual by the second collaboration session – ask the teacher to consider the appropriateness of the study processes while they read the manual (any ideas/questions can be brought up in the next collaboration session)
   - Cover the following information in brief (all details are contained within the teacher manual):
     (a) What is self-management? What is self-monitoring? Purpose of the study? Potential benefits to teacher and students?
     (b) **Study Details** (i.e. Setting, participants, target behaviour, intervention agents, materials, timeline)
       - Emphasise target behaviour and they type of students that you are looking to recruit (discuss student criteria) and provide definition of the target behaviour
       - Indicate that researcher will be responsible for organising materials/resources
     (c) Implementation Approach: Study Stages and Steps
       - Use intervention overview Figure 1 this document to illustrate study processes. Describe the following:
         - Study phases (preliminary, baseline, intervention phase and fading/maintenance phase). Note that students will need to be observed by the researcher across ALL study phases to collect behavioural observation data
         - The five study stages and steps
     (d) Participant Involvement and Commitment
       - Use teacher manual to briefly summarise the various sessions required for this study

- Indicate that all sessions are to be scheduled at times deemed suitable by the classroom teacher to ensure minimal disruption to classroom processes. Indicate that if possible it is preferable for all sessions (with the exception of the Collaboration sessions) to be conducted in the classroom setting.
- Provide detail concerning what is required from the teacher and how much time the teacher will need to dedicate
- Provide detail what is required of students and how much time students will need to dedicate to the study

<u>*If consent has not already been obtained by the teacher gain it at this stage*</u>.

3. **Outline the self-management system:** Briefly detail the self-management system. Indicate that a thorough explanation of procedures will be provided in the Session 2 along with demonstrations/practice with the system. Describe the self-management strategies (i.e. all-inclusive device that prompts and enables recording).
   - Discuss appropriateness of system for the classroom setting. Gauge teacher concerns/questions

Student Participants: Nominations and Selection

4. **Discuss student nominations:** Ask teacher to **nominate** potential student participants (i.e. students who meet the participant criteria and may benefit from this intervention). Determine student suitability by discussing the specific behaviours which the teacher would like to target through intervention - determine whether the identified problem behaviour aligns with the operationalised problem behaviour definition for this study
   - ***Target Participants:*** Inform the teacher that **direct observation** of potential participant students will be required in the natural classroom setting to determine whether the self-management study will be suitable for their presenting behaviours. Direct observation will likely occur within the preliminary phase. Indicate that direct observations should ideally occur over a couple of day across a number of classroom activities/subjects so that the researcher can gain an overall understanding of the nominated students' behaviour. Make arrangements with the teacher to undertake observation within the classroom setting. *After the researcher undertakes direct observations, the observations should be **discussed** with the teacher to reach a **decision** concerning the appropriateness of self-management for the nominated student.*
   - ***Comparison Peers:*** Notify the teacher that they will also need to nominate a number of students who engage in appropriate classroom behaviours for social comparison purposes. Ask the teacher to think about who these students might be before the next collaboration session.

<u>*Future Planning*</u>

The following tasks will not be completed within the first collaboration session, however they should be discussed with the teacher during the first collaboration session. These tasks should ideally be completed before the second collaboration session AFTER suitable participants are identified by the researcher and teacher.

After Participation Selection…. Consent/Assent, Informing Class, and Questionnaire Completion

5. **Obtain parent consent:** Inform teacher that they will need to pass on parent/guardian consent forms and explanatory statements once students are deemed eligible for participation in this study. The teacher will need to inform parents to return consent back to the researcher and to direct any questions/concerns to the researcher as well. The researcher will arrange to obtain the consent forms back from parents/guardians. Indicate that study processes involving the student cannot commence until parent/guardian consent has been granted.
6. **Obtain student assent:** Inform teacher that researcher will obtain assent from student during class time – this would be best done in a resource room, however it can occur in the classroom. Assent must be obtained to inform the student of the study, to gauge students' willingness to participate and to avoid any possible coercion from parents and/or teacher. The researcher will need to arrange a suitable time with the teacher to gain assent from the participating student (this will occur once consent has been obtained). Discuss the appropriateness of the student assent form in this session.
7. **Teacher background info:** Provide the teacher with the *Participant Profile Form –Teacher Information Questionnaire* to complete for data collection purposes. Ask teacher to complete in their own time and to return it to the researcher in the next Collaboration Session.
8. **Student Profile Questionnaire:** Once consent has been obtained from nominated students provide the teacher with a *Student Participant History Questionnaire (Profile Form) – Teacher Version* and a pre-intervention behavioural measure (School Behaviour Rating Scale) for each participant. Indicate that the teacher needs to complete the measures for the purpose of pre-intervention background data collection.

Finishing Up: At the end of the first collaboration session arrange a time for a second collaboration session with the teacher and indicate that the teacher should read through the provided teacher manual prior to the next session.

**Ideally Session 2 should be undertaken AFTER students have been selected and student consent has been obtained. If consent has not been obtained prior to this next collaboration session then it can be split into two smaller sessions – Session 2a including Steps 1, 3, 4, 5, 6, 7, 8, 9, and 10; and Session 2b including Steps 1 and 2.*

Collaboration Session 2
Participants: Researcher and Classroom Teacher
Expected Duration: Approximately 1 hour
Required Material: Teacher's Manual, Assistive Technology Manual and Workbook, iPad and Pebble watch
Expectation: *It is expected that the teacher has read over the first section of the teacher manual given to them in the previous collaboration session. The teacher is also expected to have read over the explanatory statement if they did not do so in the previous session.*

Teacher/Researcher Collaboration Session 2 (approx.1hour)

Aim: Identify and define student target behaviour for nominated students. Explain intervention procedures and training process (include demonstrations). Ensure that the teacher understands the processes well enough so they can help the researcher in training students in the self-management system and assist where necessary throughout the study. Ensure that all final intervention preparation is completed and is suitable for the classroom setting. Include discussion concerning the appropriateness of intervention procedures and the training process – discuss any necessary adjustments/accommodations. Discuss teacher expectations during intervention. Commence making arrangements for various study sessions.

Student Participants: Nominations and Selection (Discussion Continued…)

1. If the selection of student participants has not been finalised since the previous session discuss progress. Ensure that arrangements are in place such that participant selection will occur and that consent can be obtained.

Select/Define Student Target Behaviour

2. **Selection of Target Behaviour [Stage 1]:** Work with the teacher to complete steps 1, 2 and 3 of *Stage 1* in the teacher manual/workbook. Make use of data from direct observation and completed participant profile questionnaire to complete this task.
   It is best if the target behaviour is identified/defined at the start of this session so that it can be used to illustrate examples when the researcher explains the study procedures and training procedures. If not simply present the study procedure and training procedures with an example target behaviour.

Study Procedures: Explanations and Demonstrations

3. **Discuss and Demonstrate Self-Management System (Teacher training) [Stage 2 Step 5]:** Discuss/detail the structure of the self-management system. Demonstrate the self-management intervention procedure to the teacher. Teach the teacher how to use the self-management system –this will ensure that the teacher can help in teaching students the process. Indicate that all materials will be arranged by the researcher, with the exception of the iPad as students will already have in class.
4. **Intervention Finalisation and Alterations [Stage 2 Step 6]:** Though strict adherence to the self-management system is required, some strategies/approaches may be altered to suit the needs/preferences of the setting, teacher and/or participants. The researcher must collaborate with the classroom teacher to evaluate the suitability of various strategies and/or steps - thus determining whether any alterations are required. If alterations are necessary the researcher must work with the teacher to agree upon more suitable approaches. Indicate to the teacher that all alterations will be dealt with by the researcher.
5. **Explain Student Training Approach [Stage 3, Step 8]:** Explain the instructional approach that will be used to train students. Obtain teacher's input/feedback on this approach –is it an appropriate/realistic approach to take?
6. **Summarise/Review:** Nearing the end of the session determine whether the teacher has a clear understanding of the self-management system. Also check whether the teacher is able to use the self-management system independently. Check whether the teacher understands and/or can identify the step-by-step self-management instructional process.

Intervention Scheduling/Planning

7. **Determine Accessibility to Classroom/Student iPads:** Determine whether the researcher will be able to access the classroom and student iPads in the lead up to the intervention to make appropriate preparations. Explain that the researcher will need to access the iPads in order to set up the self-management devices. Arrange a time for this to occur with the teacher.
8. **Establish Timeline and Intervention Scheduling:** Remind the teacher that all scheduling must occur at a time that suits their classroom schedule and that of the students. Also indicate that sessions must fit between school

holidays, staff days, excursions and lessons outside of the class. Review the different sessions which are part of this study – briefly remind the teacher of their required involvement. Arrangements will need to be made for the following intervention sessions. *Session arrangements may need to be made as the study progresses.*

- (If not already completed) Student Assent Session: The teacher needs to determine when it is appropriate for the researcher to gain assent from participating students.
- Pre-Baseline Data Collection sessions: Discussions will need to be held with the teacher to determine when it is suitable to undertake these observation sessions.
- Baseline Data Collection Sessions: The teacher will need to indicate when it is suitable for the researcher to collect baseline data in the classroom setting (i.e. Days, session times etc). Indicate to the teacher that baseline data will be best collected across various days and lessons to gain a clear picture as to when problematic behaviours are most prominent. The teacher may like to provide the researcher a copy of the class schedule.
- Student Training Sessions: Sessions will need to be scheduled during class time so that the teacher and researcher may train the participating students together in the classroom setting. Indicate to the teacher that it would be best if the remainder of the class was engaging in other forms of independent work which did not require high levels of teacher instruction.
- Self-Management Sessions: The teacher and researcher will need to collaborate to determine when it is best for the student to engage in the intervention sessions. Indicate that student/teacher schedules and baseline data will need to be taken into account to determine this schedule

9. **Informing the class:** Inform the teacher that they will be required to tell the class that researchers will be present within the classroom for a period of time. It is not expected that the teacher will provide the whole class with all details concerning this study – merely that there will be researchers in the room throughout the term observing how the class works and working with some students. The teacher will also need to forward all classroom parent/guardians a form to notify them of the research taking place.

Teacher Behaviour

10. **Teacher Behaviour:** Finally, discuss with the teacher expectations for their behaviour throughout the intervention study. Indicate that the teacher keep their behaviour consistent throughout the study – i.e. provide the same level of instruction, feedback, praise, correction etc. All individual and group behaviour management strategies that were in place prior to the study should remain in place. Emphasise that the teacher should interact with the student participants the same way throughout the study as they did prior to the study.

Student Nomination and Selection

Identifying possible participants and inviting them to participate (obtaining consent/assent)

Screening/Selection

i. **TEACHER NOMINATION:** Students will be considered for inclusion based on teacher referral of students with high-frequency inappropriate (problematic/disruptive) behaviour (or low levels of appropriate classroom behaviours).
ii. **DIRECT OBSERVATION:** Researcher will undertake direct observation of the nominated children prior to recruitment over a period of time in the regular classroom setting ***(approx. 1-2 school weeks).*** The behaviour of nominated students (potential participants) will be compared to that of students who are considered to engage in appropriate classroom behaviour.
iii. **DECISION MAKING:** The researcher and teacher will discuss observations made by the researcher and make a final nomination of students who consistently display high-frequency inappropriate/disruptive behaviour – students who might potentially form the proposed intervention.

Recruit/Consent-Assent

iv. **OBTAINING CONSENT:** Teacher will be asked to pass on consent form and explanatory statement to parents with an invitation for their child to participate (parents will be asked to return consent forms directly to the researchers via email, mail or in person at the school).
v. **OBTAINING ASSENT:** The researcher will then meet with each student participant to obtain their assent where appropriate – meetings between the researcher and students will occur during class at a time which is deemed suitable by the classroom teacher.

Additional Notes:

♦ *(i) Teacher Nomination-* This step will involve a discussion with the teacher (either informal of formal) focused on identifying students who will potentially be suitable for this intervention.
The teacher will be provided with examples of the types of behaviour that this intervention is looking to target. The teacher must be provided with clear operationalised definition examples that lists the types of behaviour which will be suitable.

Emphasise that this intervention is looking to address high-frequency behaviours (i.e. those which are persistent and occur often).

When discussing possible student participants with the teacher be sure to inquire about the following:

- What the student is most likely to be doing when they are considered to be *disruptive*
- How many different ways does this child behave in a disruptive manner?
- What is the most frequent/notable thing that this student does that you would like to address?

[This step may be completed by helping the teacher complete Step 1 Stage 1 of the workbook]

♦ (iv) *Obtaining Consent* – It is important that the teacher invite the parent to have their child participate. Indicate to the teacher that the intervention is focusing on <u>improving classroom behaviours</u> rather than reducing disruptive behaviours.

♦ (v) *Obtaining Assent* - The researcher must then invite the student so that there is no chance of coercion by the teacher. Assent will need to be gained prior to the baseline phase. Will need to re-consider how this will be approached here… rather than give the student a full description of the intervention process at this point indicate the following..

- Introduce one's self
- Indicate that I am conducting research and want to learn about self-management
- Brief overview of what self-management is
- What its benefits are for students like them
- Emphasise that I would like to learn about how self-management can help students to improve their involvement and performance in class by teaching some students how to use self-management and then watching what happens.
- Indicate that I would like to teach the student self-management at some point (not yet) – but first I just want to get a gauge of the class to see how everyone is going (or something along those lines) [Basically – gain their willingness but do not detail too much as you are indicating that they are not going to be participating in training yet-when you start the training THEN you may give a more in depth run-down of the intervention].

STAGE 1 [SELECT]

The first stage of this intervention pilot involves the identification and definition of the student behaviour that is in need of behavioural intervention. This stage also involves determining if the selected behaviour is appropriate; making arrangements for the measurement of students' current performance of the identified behaviour, and identification of a desired level of behaviour performance.

Behaviour Identification and Definition

This self-management intervention focuses on teaching students to manage positive, appropriate, or socially desired target behaviour. Ideally, positive behaviour will be identified as a replacement to identified problem behaviour. Although self-management interventions can be used to teach students to reduce problem behaviour, it is best to identify desired behaviour which can be targeted by students so that they can learn a strategy which will help them to engage in positive and constructive behaviour (Wilkinson, 2008).

(1) BEHAVIOUR IDENTIFICATION

The first step involves selecting behaviours of for intervention. For guidelines illustrating the types of common behaviours which may be selected for this intervention see Appendix i (Section 1 and 2).

(1a) *Problem Behaviour(s):* Identify the most problematic behaviour(s) the teacher wishes to address through self-management (i.e. behaviours that the teacher would like the student to stop or reduce). Selected behaviour(s) should be those which are of greatest concern and may be having the greatest negative impact on the student's classroom successes.

(1b) *Target Behaviour(s):* Identify an alternative positive behaviour(s) that the student would ideally engage in, in place of the problem behaviour(s) listed (i.e. envision what the student would be doing instead).

> *Example: If a student is constantly disrupting other students during quite work time (problem behaviour), the target behaviour may be framed as appropriate silent time behaviour or on-task behaviour during quite work time*

If multiple target behaviours have been identified it may be necessary to specify *one target* behaviour (or a group of target behaviours). Generally, it is recommended that students work on one behaviour at a time – some students may be able to work on multiple behaviours throughout the intervention if the behaviours can be grouped and labelled appropriately.

> *Example: The target behaviour may be labelled "appropriate classroom behaviour" to encompass numerous behaviours such as, "working on tasks when instructed by teacher", "working silently", "remaining seated", "engaging in topic related discussion" or "listening when the teacher is talking"*

Ensure selected behaviours are those which are likely to have the greatest impact on students' involvement, participation and learning at school (King-Sears & Carpenter, 1997).

*NOTE: Identified problem behaviour and target behaviour must include at least one form of *low-level disruptive behaviour* which disrupts the flow of the lesson (See page 5)

(2) BEHAVIOUR DEFINITION

After identifying the problem behaviour(s) *[1a]* and the target behaviour(s) *[1b]* in Step 1, the next step (Step 2) involves creating a clear, detailed operational description of these behaviours. See Appendix i (Section 2 and 3) for detailed guidelines on how to *define* the behaviours.

(2a) *Problem Behaviour(s):* Create definition of the problem behaviour(s) listed in 1a.

> *Example: Disrupting peers during silent work time (problem behaviour) may be defined as- talking to peers, trying to get peers attention, making noise (i.e. laughing loudly or making various sounds), calling out to teacher, inappropriate use of class materials, moving about without teacher permission, physical play or fighting involving physical contact with other students, touching, aggression etc*

(2b) *Target Behaviour(s)*: Create definition of the target behaviour(s) listed in 1b.

The target behaviour should be positively worded. Phrasing behaviours in positive terms will enable students to focus on improving positive/desirable target behaviour rather than simply decreasing *problematic/undesirable behaviour (Bedesem & Dieker, 2013). To identify positively framed target behaviour the problem behaviour may be rephrased in positive terms.*

Example: Appropriate silent time behaviour (target behaviour) may be defined as- remaining silent during activities when instructed by teacher, paying attention to or actively working on the task at hand, remaining seated unless given teacher permission to leave seat, focusing on walking to a new position during transitions, raising hand to ask questions relevant to the work being undertaken , eyes on the speaker or relevant material that is being used at that time in the lesson, etc

(3) DETERMINE APPROPRIATENESS OF BEHAVIOUR FOR SELF-MANAGEMENT

Prior to subjecting any student (participant) to this self-management intervention it is necessary to determine (or confirm) whether or not self-management is appropriate for the student and the behaviour to be targeted.

To determine whether this intervention approach is suitable for potential participants consider the following criteria (Table 4) (Adopted from Menzies, et al., 2009; Rafferty, 2010; Reid & Rankin, 1995; The IRIS Centre, n.d.a)

Table 4

Items to determine potential participant suitability for self-management

Yes/No	1. Is the target behaviour one that most students this age are usually able to control?
Yes/No	2. Are the problem behaviour and the desired/target behaviour easily observed? [#]
Yes/No	3. Does the student have the necessary skills to perform the desired (target) behaviour? [A#]
Yes/No	4. Does the problem behaviour occur frequently during a given time period? (i.e. several times during a 20 minute time period? Or 30minute? Or 45minute?) [B#]
Yes/No	5. Is the desired (target) behaviour developmentally and cognitively appropriate for the student? (i.e. will it be of benefit to the student?)
Yes/No	6. Can the student control the problem behaviour? [C]
Yes/No	7. The problem behaviour does not harm the student, others around them and does not physically damage the environment* [D]
	If you answered 'yes' for ALL questions, then self-management may be an appropriate intervention to use for the student/s you were thinking about.
	If you answered 'no' for any of the questions, then self-management may not an appropriate intervention to use for the student/s you were thinking about.

If NO this intervention may be deemed unsuitable and immediate intervention should be sought

[#]The hashed items may be better evaluated after collecting baseline data (see next step)

[A] If participants cannot perform the desired target behaviour then the self-management intervention may be inappropriate as students cannot monitor behaviours they cannot engage in or perform (Rankin & Reid, 1995). Determine whether the student can perform the target behaviour (i.e. has it been demonstrated in the past, in other settings or during other activities?). If a student *knows* how to perform a target behaviour, but does not do so consistently then a *performance deficit* is evident and may be addressed through self-management. If a student performs a desired behaviour intermittently, then self-management may be an appropriate intervention as it will help teach the student to control or manage the behaviour more consistently (King-Sears, 2008). However, if a student cannot perform the target behaviour, then an intervention must focus on *skill acquisition* rather than behaviour management (i.e. the behaviour must be taught first).
[B]In order to see meaningful immediate changes, self-management interventions should be used with frequently occurring behaviour – for low frequency behaviour other interventions may need to be considered (i.e. differential reinforcement schedules) (Menzies, et al., 2009).
[C] If a student's behaviour is out-of-control or impulsive more intensive intervention may be required initially (i.e. a functional assessment based intervention may be more suitable for very aggressive behaviour) (Menzies, et al., 2009).
[D] If there are any concerns about student safety alternative intervention strategies should be sought

(4) DATA PRE-INTERVENTION DATA COLLECTION- BASELINE DATA

Once both problem and target behaviours have been identified and defined, baseline data will be collected to provide an objective measure of the identified behaviours and to document patterns in student behaviour. Measurement of current performance enables the researcher and teacher to determine whether the identified problem behaviour may be suitably targeted by self-management.

The collection of baseline data will involve an interval-recording procedure where the researcher will obtain estimates of the time that a student is engaged in the target behaviour during various class sessions. Alternatively the researcher may measure the frequency and/or duration of the target behaviour (and/or problem behaviour). The method used to collect baseline data will be based on the identified behaviours and determined by the research team.

As indicated on the explanatory sheet, the researcher will undertake direct observation of participating students in the classroom to collect data throughout this study (at times a secondary observer will also be present). The researcher will arrange to collect data at times deemed suitable by the classroom teacher (and when the participating students are most likely to engage in the problem behaviour).

It is expected that baseline data will be collected for a minimum of five sessions over a period of 2-4 weeks for each participating student. Baseline observation sessions will be undertaken across school days and across academic subjects (i.e. Maths, Literacy and Religion). A minimum of five observation sessions will be collected for each subject.

Reasons for collecting baseline data:

- To determine <u>when</u> the student is most likely to engage in the problem behaviour, and is most in need of the self-management intervention.
- To determine whether the target behaviour does in fact require intervention (i.e. will be able to determine whether behaviour is severe or frequent enough to warrant self-management intervention).
- To provide a benchmark from which we can evaluate the effectiveness of the intervention (can be used to monitor improvement).

<u>After Baseline Data Collection….</u>
The teacher and researcher will use the data to reach a decision as to when it would be most beneficial for the student/s to use the self-management intervention. Specific times when students can monitor their behaviour include the following (McConnell, 1999):

- Specific times (i.e. during a seatwork activity, during whole-group instruction, at the beginning or end of a class assignment, or at the beginning or end of the day.
- During specific activities (i.e. maths, reading, science, independent writing activities)

Mastery Criteria
In addition to selecting and defining a desired target behaviour a mastery criteria will need to be established (King-Sears & Carpenter, 1997). That is, you must identify what performance of the behaviour (i.e. level or amount) would be indicative of a skilful or adequate behaviour improvement made by each participant student.

In this study mastery criteria will be determined by considering two factors: (a) the students prior performance of the behaviour (as measured in baseline), and (b) the typical performance for same-aged (or same-grade) peers in similar situations (King-Sears & Carpenter, 1997). To establish a mastery criteria the researcher will collect measurements of the behaviour as performed by peers during sessions across the school day during baseline and intervention phase.

This step will involve the teacher identifying a number of students who perform the target behaviour at adequate levels in the class. These students will form a comparison for the participating students – behaviour observation data obtained from comparison students will be evaluated to determine a potential behaviour mastery criterion for the target students. Target students may be viewed to have demonstrated adequate behaviour improvement once they perform the behaviour at a level which is consistent to that of their peers.

STAGE 2 [PREPARE]

(5) INTRODUCE SELF-MANAGEMENT SYSTEM

The current intervention involves a trial application of a self-management intervention package based primarily on the simplest form of self-management – *self-monitoring.* Self-monitoring is a two-step procedure which requires students to observe his or her behaviour to discriminate whether or not a target behaviour has occurred, and then record the occurrence or non-occurrence of the specific behaviour (Bedesem, 2012; King-Sears & Carpenter, 1997; Wilkinson, 2008). Self-monitoring typically involves a cuing device which emits prompts to alert students to monitor their behaviour (King-Sears & Carpenter, 1997) and a recording device on which the student can track the occurrence or non-occurrence of the targeted behaviour (Bedesem, 2012).

The intervention package will commence with the following components:

- *Selection and definition of the target behaviour for self-management* – the teacher and researcher will determine key behaviour that the student will monitor during the intervention. The student may have input into this –the monitored behaviour may differ from the selected problem/target behaviour in stage 1 (see 6a for discussion on this).

The self-management package will incorporate the following self-monitoring components, all of which will ideally be managed by the participating students:

- *Self-monitoring cue or prompt* – Students will be taught to respond with self-monitoring behaviour when prompted or cued by a device throughout regular everyday classroom activities. Students will be responsible for managing and using their own self-monitoring prompting device (i.e. they will be responsible for getting it ready for each self-management session, responding to the device when prompted, and putting it away at the end of each session).
- *Student self-observation* – students will learn to observe whether or not they are (or have) engaged in their target behaviour when cued
- *Student self-recording* – students then record whether or not they are (or were) engaged in their target behaviour on a self-monitoring device when cued, after which they continue along with their current task until the next self-monitoring cue.

In brief, self-monitoring involves students observing and then recording their behaviour on provided materials when they are cued/prompted at specified times – for example, students may be cued to observe and record a target behaviour at 5min intervals while engaging in regular class activities in the general education classroom. At every interval the student will then observe their current behaviour or consider their behaviour from the previous interval and then record the occurrence or non-occurrence of the target behaviour.

For this pilot study the self-monitoring procedure will be paired with an additional self-management component to form the *pilot study intervention package*. Ideally this component will also be managed by the students themselves.

- *Self-graphing/charting* – the student will then engage in a charting task which will enable them to graph their behaviour progress over time (Rafferty, 2010)

Potential Alterations - In the event that the self-management intervention does not bring about the desired behaviour change the self-management intervention system will be altered to incorporate additional self-management components which may further help students in bringing about positive effects.

- *Prompt for target behaviour* – prompt(s)/cue(s) to engage in the targeted behaviour; involves having students create a stimuli that will be placed in their field of vision during the intervention to function as a cue/reminder for the desired behaviour (Cooper, et al., 2007). Students will be assisted in creating their own prompt for target behaviour – having students personalise the behaviour prompt will ideally help the students take ownership over their behaviour
- *Goal-setting* - involves having students create behaviour targets/goals (Rafferty, 2010)
- *Self-evaluation* - involves teaching students how to assess their own behaviour against a set standard or goal (Rafferty, 2010)

Limited detail is provided here concerning these potential alterations; more information will be provided in the event that the alterations need to be made.

(6) SELF-MANAGEMENT SYSTEM DEVELOPMENT (FINALISATION OF PROCEDURES AND MATERIALS)

As indicated in the introduction of this manual, this pilot study requires the researcher and the teacher to work collaboratively in developing various intervention aspects. While the researcher will be responsible for determining aspects of the intervention approach, the classroom teacher will be consulted on a number of aspects given their professional knowledge of the participating student(s) and experience within the classroom setting. The teacher's knowledge, input and feedback will help the researcher in finalising certain aspects of the proposed self-management system. Teacher involvement will help to ensure that the applied self-management program is appropriate for participating students (i.e. in terms of complexity, processes and materials).

This step involves making decisions about the following aspects of the self-management program:

6A) TARGET BEHAVIOUR DESCRIPTIONS

Behaviour Measurement: Observation vs Student Self-Management

The behaviour that the researcher measures during the baseline/intervention may not be the same behaviour, or set of behaviours that the student self-manages throughout the intervention (King-Sears & Carpenter, 1997). In this study the researcher has focused on measuring the occurrence of students' *problem behaviour* (as identified and defined in Stage 1 Step 1a and 2a).

In the intervention phase of this study students will be taught to self-manage *positive target behaviours* such that they can learn to use alternative desired behaviours in place of the problem behaviour(s) identified in Steps 1a/2a. It is hoped that by increasing the occurrence of appropriate target behaviour students will conversely reduce the occurrence of problem behaviours.

Collaboration with the teacher will be required to identify appropriate target behaviour for each participating student.

It is suggested that target behaviours be framed in terms of the two categories below:- *On-Task Behaviour* and *Appropriate/Expected Classroom Behaviours.* Below are some examples of what these behavioural clusters may contain. Target behaviour examples should be modified in terms of the teacher's behavioural expectations.

Behaviours must be defined in observable terms so that they can be easily described and shown to the participating students.

<u>**Example Target Behaviours**</u>

- **ON-TASK BEHAVIOUR**
  - **Doing my work or thinking about my work**
  - **Remaining focused (even when class mates try to distract me with talking or inappropriate behaviour)**
  - **Actively working with classmates or group members**
  - **Removing things that I find distracting from my work area (for example, things I may fidget with)**
- **CLASSROOM EXPECTATIONS/RULE-FOLLOWING**
  - **Following directions straight away AND the first time they are given**
  - **Listening when the teacher (or speaker) is talking**
  - **Starting assigned tasks/work straight away (i.e. less than 2 minutes to get to my work area and make a start)**
  - **Moving about the classroom ONLY for the purpose of my learning (i.e. Going on Envirowalks, asking the teacher for help or gaining materials for the current activity)**
  - **Engaging in on-task learning conversations if appropriate AND allowed by teacher**
  - **Asking permission to leave the room**
  - **Using materials and iPads in an appropriate way**

6B) SELF-MANAGEMENT SYSTEM AND IMPLEMENTATION DECISIONS

Decisions must be reached concerning the use of the self-management intervention. These decisions must be reached based upon the collected baseline data and the classroom teacher's preferences/feedback.

- How often the student will use the intervention during class – will intervention sessions occur every day every second day, multiple times a day? will the intervention be best used during individual work, during group work, during specific subjects such as maths, reading, spelling etc
- When will self-management sessions commence - when will the student be instructed to start self-management sessions in class
- How long will students self-manage – how long will each intervention session will last – (i.e. for the length of a lesson or for part of a lesson)
- How frequently will students be expected to self-monitor their behaviour during class. Students will be taught to monitor their behaviour periodically while engaging in regular classroom activities. It is anticipated that students will self-monitor using one of the following approaches (King-Sear & Carpenter, 1997):

INTERVAL-RECORDING*	TIME-SAMPLING*	FREQUENCY
The prompting device delivers a signal to cue students to observe/think about the previous interval and note whether the target behaviour occurred, or not, at any time during the specific time period (i.e. There is the signal, have I been working appropriately during the time since I heard the last signal?)	The prompting device delivers a signal to cue students to observe what they are doing at that time, and to record the occurrence or non-occurrence of the target behaviour (i.e. There is the signal, what was I doing just then?)	The student counts the occurrences of the desirable behaviour during a set period of time (e.g. how many times the target behaviour occurs).

*In the event that interval recording or time-sampling is used during self-monitoring sessions it will need to be determined how frequently students will be cued to observe and record their own behaviour.

It is likely that an *interval or time-sampling system* will be utilised in this pilot study. With this form of self-management students may be cued to self-monitor their behaviour from every 30 seconds to every 5min or more. The length of an interval will depend on the frequency, intensity, severity and duration of their target behaviour (Bedesem & Dieker, 2013; McConnell, 1999) and various individual characteristics such as age, cognitive level and ability levels (Wilkinson, 2008). To determine the interval length the baseline data will be used to determine the average length of time the student can successfully engage in the appropriate target behaviour without teacher or other support (Busick & Neitzel, 2009). The initial interval length will be equal to or be slightly less than the average time identified. Some students may be required to self-monitor more frequently than others. For behaviours that occur frequently, you may decide to set the self-monitoring system to occur at closer intervals (McConnell, 1999).

- How will self-management sessions end? (i.e. how will students know to end? Will students be taught to end? When will students self-chart?)

6C) SELF-MANAGEMENT MATERIALS/DEVICE

Throughout this pilot study the research will be responsible for arranging all materials and equipment necessary for any training and intervention procedures.

The following materials/devices will be used in the proposed intervention package:

- **A PEBBLE Smart Watch** will act as both the *Self-monitoring prompting/cuing* device AND the *Self-Recording Device* with the **Self-Management Assistive Technology (SMAT) PEBBLE App**
- **An Apple iPad** will act as the Self-Recording Feedback device in combination with the **PEBBLE Smart Watch** and **Self-Management Assistive Technology (SMAT) Website**
- **Self-Charting Booklet or Spreadsheet**

Input will be required from the classroom teacher to determine whether the materials/ equipment (a) are suitable for the participating students and (b) remain non-intrusive to the classroom setting such that they do not interfere with competing academic tasks or activities. In the event that proposed materials/devices are deemed unsuitable discussions will be held to determine what alterations can be made to make them more appropriate.

(i.) Self-monitoring prompting/cuing feature - A PEBBLE Smart Watch (PEBBLE for short) will be worn by students during each intervention session. Each PEBBLE, loaded with a programmable app, will signal students at certain intervals with a vibration. The watch vibrate will cue students so they know to observe and record their target behaviour (self-monitor).

Through SMAT students will be able to keep track of their behaviour by observing their behaviour recordings after they have

(ii.) *Self-recording device/medium* –This intervention is trialling the use of a technology based self-management system. Self-monitoring prompting/cuing feature - A PEBBLE Smart Watch (PEBBLE for short) will be worn by students during each intervention session. Each PEBBLE, loaded with a programmable app, will signal students at certain intervals with a vibration. The watch vibrate will cue students so they know to observe and record their target behaviour (self-monitor).

(iii.) *Self-Charting Booklet* – At the end of each session students will be required to plot their % of target behaviour engaged in within the completed session. Having the students graph their own behaviour ratings will ensure that they are actively keeping track of their own behaviour change throughout the intervention period.

General Intervention Planning Considerations

When making any decision concerning aspects of this pilot study it is imperative that a number factors are considered including the following:

- *Collected baseline data* – Analysis of collected data may show behaviour patterns and give an indication as to when students would most benefit from intervention. In addition baseline data may provide information that indicates what recording approach would be best used with the student.
- *Student Characteristics* – (i.e. *individual needs, competencies, age, cognitive ability and the severity of the behaviour*) – Consideration of these factors will help to determine whether the proposed self-monitoring system, prompts/cues and device/materials are appropriate for individual student participants.
- *Classroom environment* – It must be considered whether the proposed self-monitoring system, prompts/cues and device/materials are appropriate for the classroom setting. Care must be taken to ensure that intervention processes and materials, (a) do not draw too much unwarranted attention to the student, and (b) are deemed non-intrusive.
- *Class scheduling* - It is important that self-management sessions are scheduled into the student's regular routine in a minimally disruptive manner. Seek the help of the classroom teacher to help determine when sessions can be undertaken to keep this intervention procedure minimally disruptive to regular classroom activities and learning.
- *Teacher workload* – The initial stages of this intervention will require a level of teacher involvement for intervention development and student training. As such it is important that all discussions and processes are scheduled at times suited to the teacher.
- *Research Requirements* – The intervention must also satisfy requirements necessary for the researcher to conduct a high-quality study which has been informed by evidence-based research.

(7) GAUGE STUDENTS' WILLINGNESS TO TRIAL SELF-MANAGEMENT – GAINING ASSENT

Before students can be trained in the self-management procedures students' willingness to participate in the implementation of this intervention must be determined. As this study intends for students to be highly involved in the intervention it is imperative to determine whether students are willing to engage and co-operate in the self-management strategy.

The researcher will meet with each participant prior to student training to:

- Invite each participant to participate
- Discuss the purpose of the study (briefly introducing the concept of self-management)
- Outline to students what is involved in the project (i.e. training and use of the strategy)
- Provide students with a rational for using self-management - Identify some benefits that students may experience as a result from participating in the training and using self-management (ie. It will help students to improve upon certain classroom behaviours)
- Determine students' motivation to learn self-management
- Get commitment from students to try self-management

If a student is reluctant to try self-monitoring, you may have them try the intervention for only one week after which the student can choose to stop self-monitoring.

Self-management instructional sessions should commence with students once it is determined if students are willing to participate.

STAGE 3: TRAIN

(8) TRAINING SESSIONS (INTRODUCTION OF THE TARGET BEHAVIOUR, INTRODUCTION OF THE SELF-MANAGEMENT SYSTEM, STUDENT PRACTICE)

This manual outlines the step-by-step instructional process for how to train students to use the self-management system. Successful completion of the training program must be achieved for students to participate in this study.

Proposed Training Session Structure

Ideally, training sessions will be run during class time within the general classroom setting. Suitable times and an appropriate location must be arranged with the teacher prior to training.

Duration: 3x20minute training sessions
Timeframe: Within one week across three days
Location: In classroom setting
Who: Researcher, Teacher and participating students
Detail: Small group instruction run by the teacher and the researcher for sessions 1 and 2. Independent researcher-student session for each participant for session 3. To be conducted in class when the rest of the students are engaging in independent seat work.
What: The sessions will cover the content described in the following training step-by-step guidelines. Direct instruction will be used to lead students through step-by-step instructions on how to use the self-management devices/materials. Students will be provided with opportunities to model and practice the procedures. Training will need to occur until students can use the procedure with minimal or no assistance.
Cue cards may be used to supplement or enhance verbal information through the use of pictures and/or written information

Session 1: Introduce the Intervention and Model Target Behaviour
Session 2: Introduce the Self-Management System
Session 3: Provide Practice, Assess Mastery and Transfer to Authentic Session

SESSION 1: INTRODUCE SELF-MANAGEMENT AND TARGET BEHAVIOUR

AIM: After this first session students should:

- have a vague idea of what the intervention is
- know what target behaviours are and understand their importance (rationale for intervention)
- discriminate between ideal target behaviours and problem classroom behaviours
- identify (and possibly demonstrate) examples and non-examples of target behaviours

SESSION OUTPUT: *Student Prompt for Target Behaviour*

STEP (A): INTRODUCE CONCEPT OF SELF-MANAGEMENT STRATEGIES: PROVIDE RATIONALE FOR SELF-MANAGEMENT

This step focuses on (a) introducing the self-management intervention and (b) providing a rationale for its use – focusing on the importance of the target behaviour.

Example Script (modelled off McDougall 2003)

Sometimes I notice…. *(insert behaviour that student demonstrates in class)*

I also notice that one of your goals for this terms is to……*(insert students behaviour goal)*

If it is ok with you I would like to teach you a strategy this week that will help to remind you to ….. *(insert behaviour that self-management will help student to increase).*

Before I show you how to use the strategy we first need to figure out which behaviours we want to work on and talk about why it is important to work on such behaviour.

Your teacher Mrs I and I have some ideas on what type of behaviour would be good to work on. After we put forward our ideas of behaviours you might like to work on we want to hear your ideas for which behaviours you would like to improve in class.

Importance of the Behaviour: Focus on highlighting and discussing the importance of engaging in the targeted behaviour (i.e. appropriate behaviour), and reasons as to why students should attempt to use the self-management strategy (i.e. benefits of self-management). Prior to this step brainstorm with the researcher to list some potential benefits that may be valued by students.

Remember in discussing benefits, be optimistic but realistic. Link the target behaviour to benefits that would occur for students if they were to demonstrate high levels of the target behaviour all of the time (King-Sears, 2008) (i.e. working silently when instructed would help to increase the amount of work completed). It may be helpful to indicate to the student that self-management is something that has helped other students with similar behaviour (Rankin & Reid, 1995).

Be aware that self-management benefits you and the classroom teacher identify may not be motivating or perceived as benefits to participating students (King-Sears & Bonfils, 1999). Remember that rationales for the behaviour should be specific to each student so that the benefits will motivate them (Morrison, et al., 2014). Discussions must be held with the students to help them see the value in improving their target behaviour through self-management. If students do not see the point in using self-management they may not be motivated to engage in the strategy.

Discussing the importance of behaviour?

- If students have agreed to participate ask what motivated them to try the strategy. Link this discussion to a discussion of target behaviour importance.
- If students have trouble in identifying reasons Cue Card 1 (i.e. Figure 3), may be used to facilitate discussion (King-Sears & Bonfils, 1999).
    - Cue Card 1 lists benefits of engaging in the target behaviour (previously identified by the researcher and teacher). Space is provided so that students can add personal reasons/benefits which they identify on their own. If students have difficulty in thinking of benefits they may select the benefit that is most important for them from those listed

Example Cue Card 1

It is important for students to follow the classroom rules and engage in on-task classroom behaviours because:

1. Following class rules means that everyone has more opportunity to engage in productive learning activities
2. When students are on-task consistently they have more opportunity to learn
3. Students who consistently exhibit on-task behaviours get more work done during class
4. Students who learn more and get more work done during class do better at their school work
5. Doing better at school work means that you will get better comments/grades on your reports

Each student develops 6 and 7 on their own

6. ____
7. ____

Figure 3

Cue card 1: Importance of exhibiting appropriate classroom behaviour (adapted from King-Sears & Bonfils, 1999 for example)

Importance of the Self-Management: Focus on highlighting and discussing the importance of engaging using self-management.

Example Script (modelled off McDougall 2003)

> ***Self-management is a strategy that will help to remind you to….*** *(insert behaviour that self-management will help student to increase)…* ***without the teacher having to remind you all of the time.***
>
> ***Self-management is a strategy that can help us to engage in a behaviour that we want so that we can stay focused on doing what we are supposed to be doing in class.***

STEP (B): IDENTIFY TARGET BEHAVIOUR: DEMONSTRATE EXAMPLES AND NON-EXAMPLES THROUGH BEHAVIOUR DISCRIMINATION

The focus of this step is to identify and demonstrate examples and non-examples of the target behaviour to the participating students. It must be made clear what behaviour(s) is expected of students. During this step examples and non-examples of the behaviour should be concretely and simply identified, described and shown to the students (King-Sears & Bonfils, 1999; King-Sears, 2008). This will help to ensure that the students realise what behaviours they are displaying in class, and so that they are aware of what the appropriate (or replacement) behaviours look like.

Introduce students to the ideal target behaviour(s) in simple, understandable, specific and direct language using this framework:

(b) Identify and name the target behaviour(s),
(c) Clearly describe what the behaviour(s) look or sound like,
(d) Discuss and model both examples and non-examples of the target behaviour.

Cue cards (e.g. Figure 4) may be used to supplement this step. Pictorial descriptions may be provided for some students.

Example Cue Card 2

Appropriate Classroom Behaviour (on-task)	**Inappropriate Classroom Behaviour (off-task)**
➢ Reading or looking at assigned material ➢ Working quietly, independently, and consistently on assignments	➢ Reading or looking at non-related material ➢ Disrupting self- and/or others when all students should be working quietly on assignments (e.g. making inappropriate noise, not working consistently until assignment completed).
➢ Participating in class discussions by contributing relevant (e.g. about the content) information ➢ Using objects (eg. books pencils) appropriately (eg. the way objects are intended to be used within the classroom).	➢ Calling out during class discussions without permission; ➢ Talking about irrelevant topics ➢ Using objects inappropriately; touching other people
➢ Staying in your seat	➢ Walking around classroom or leaving your seat unless a class direction or individual permission/ direction has been given to leave your seat ➢ Taking too long to follow a direction
➢ Following directions as soon as possible ➢ Doing work and limiting distractions at desk ➢ Active learning; making contributions to group and partner work even when someone else is writing or doing the work	➢ Playing/fidgeting with objects instead of doing work ➢ Passive learning; making no contribution to group or partner activities

Figure 4
Cue card containing examples and non-examples of the target behaviour (adapted from King-Sears & Bonfils, 1999 for example)

Teaching students to discriminate between target behaviour and problem behaviour may involve:

Adult Model/Role-Play: Demonstrate examples (i.e. target behaviour) and non-examples (i.e. problem behaviour) of the target behaviour to the student via *modelling* and/or *role-play*. By having students observe target and non-target behaviours they can start to identify the distinction between the behaviours (Morrison, et al., 2014).

- Model (or role-play) both target and problem behaviours numerous times in random order.
- Demonstrate/specify multiple examples and non-examples to ensure students have plenty of opportunity to discriminate between target behaviour occurrence/non-occurrence.
- Model or role-play what the examples and non-examples of the behaviour looks like in scenarios/activities that occur on a regular basis in class.
- *There is no need to 'make-up' non-examples in this step – simply draw upon the behaviours that the student demonstrates in the regular class setting.*

Adult Model/Talk-Aloud: When modelling behaviour talk-aloud to describe the behaviour at times to help clarify behaviour occurrences. You may choose to at talking aloud about the behaviours (i.e. what behaviour is being displayed, why the behaviour is being displayed) while modelling so that students can become informed as to what they should be doing and what they should be thinking in class (Morrison, et al., 2014).

Identification Practice: During modelling/role-play displays have students identify the behaviour demonstrated (i.e. Ask student whether target or problem behaviour was demonstrated).

Mastery Criterion for Training: Have students correctly identify demonstrations of both appropriate and inappropriate behaviour. Continue practice until the student identifies modelled behaviour correctly three times in a row OR obtains 80% correct responses (out of 10 responses).

Incorrect identification? Model the behaviour again and prompt the correct response. Gradually fade prompts until students can consistently and accurately identify examples and non-examples of the ideal behaviour (Busick & Neitzel, 2009).

You may use the role play scenarios provided in Table 4 to prompt students in practicing their behaviour demonstrations.

Table 4

Role-play scenarios for demonstrating target behaviour

Practice each role-play scenario and others similar to these that suit the students personal situation: **Scenario 1:** The teacher has stated that it is time to get out your _________ books to start today's ________ session. *What is an appropriate behaviour? What would be an inappropriate behaviour?* **Scenario 2:** The class is currently doing their _________ work. Your classmates are currently doing the tasks that the teacher has asked them to do? *What is an appropriate behaviour? What would be an inappropriate behaviour?* **Scenario 3:** The class is involved in a discussion about ___________. You want to participate in this discussion. *What is an appropriate behaviour? What would be an inappropriate behaviour?* **Scenario 4:** Your teacher has instructed you to____. *What is an appropriate behaviour? What would be an inappropriate behaviour?*

Modelled off King-Sears & Bonfils, 1999 pg 103

IMPORTANT: Consider differentiating target behaviours on an individual basis depending on the specific behaviour each student needs to target (King-Sears & Bonfils, 1999). Students should identify what behaviours (target and problem) reflect their own behaviours.

Note: Initially differences between examples and non-examples of target behaviour should be very obvious – as students becomes more successful in identifying behaviours, the examples and non-examples can then become more similar so students must make more difficult discriminations (Busick & Neitzel, 2009).

STEP (C): STUDENT PRACTICE OF TARGET BEHAVIOUR

This step involves having each student practice (a) identifying target and non-target behaviour and (b) demonstrating target behaviour examples and non-examples prior to the introduction of the self-management strategy. This step will help to determine whether students will be able to identify and distinguish the behaviours they need to monitor (Rankin & Reid, 1995).

Possible Approaches

- *Student Modelling/Role-Play:* Have the student model various target behaviour back to you after you have modelled. Ask the student "show me (INSERT EXAMPLE BEHAVIOUR)"
- Identification Practice: During modelling/role-play have students identify the behaviour demonstrated (i.e. Ask student what appropriate behaviour was demonstrated).

Mastery Criterion for Training: Have students correctly model occurrences of appropriate behaviour. Continue practice until the student models behaviour correctly three times in a row OR obtains 80% correct responses (out of 10).

Incorrect identification? Model the behaviour again and prompt the correct response. Gradually fade prompts until students can consistently and accurately identify examples and non-examples of the ideal behaviour If students have difficulty in modelling behaviours, the researcher or teacher may continue to ask the student to discriminate between examples and non-examples of the target behaviour through adult-led modelling and/or role-play (Bedesem & Dieker, 2014) (e.g. an adult may model what appropriate and inappropriate behaviour looks like with the student). Then give further opportunity to act out examples of the target behaviour.

SESSION 2: INTRODUCE SMAT SYSTEM

AIM: After this first session students should:

- know what the self-management system involves and be familiar with the materials/devices
- have a clear understanding of intervention terms – i.e. self-monitoring and self-charting
- have an understanding of how to use the self-management (researcher/teacher to show students how to use all device/materials and how to engage in the self-management process)
- be set up and read to undertake practice of the self-management system (next session)

STEP (D): INTRODUCE SMAT SYSTEM

In this session you will introduce students to the self-management system for the first time – this involves introducing the self-management materials/devices, explaining self-management process and describing how materials/devices are used throughout the process. Written or pictorial instructions might be useful for this step (Maag, 1999). An instructional power point will be used with students so that they may learn to use the system.

- ♦ Show students the PEBBLE watch and demonstrate its use – i.e. how to turn it on, how self-management sessions can be started by putting on the watch, setting up their iPad with the website open and starting the session by pressing a button on their watch.
- ♦ Demonstrate that the PEBBLE will prompt students every now and again (through vibrations) to remind students to self-monitor (i.e. observe and record their behaviour). Show students that when prompted by the watch they will need to press the appropriate button on the PEBBLE to indicate whether or not they were engaged in their target behaviour. If using an interval recording system students must be shown how to record their behaviour at the appropriate time (at the end of an interval when the vibrating prompt goes off) and how to do so accurately (Busick & Neitzel, 2009). Demonstrate that when a response is pressed on the watch it makes a 'check' on a website which can be viewed on their iPad. This will show students if they are engaged in their target behaviour or not throughout the session.
- ♦ An effective strategy to teach appropriate and accurate recording is for the trainer to model examples and non-examples of the target behaviour and then assist students in recording if the behaviour was an example or non-example (Busick & Neitzel, 2009).
- ♦ Show students how to end sessions and pack away their self-monitoring devices.
- ♦ Show students how to finish each session by charting their behaviour progress

- Students will be required to watch demonstrations of how to use the self-management devices and to engage in discussion surrounding the materials/devices to ensure understanding

- Students will also be desensitised to the self-management devices/materials (i.e. vibrating prompt). This is important as some students may need to become accustomed to the self-management devices/materials in the classroom setting (King-Sears & Bonfils, 1999).

Step (e): Adult Models Self-Management Strategy through think-aloud examples

This step will involve the researcher modelling how to use the self-management system and devices in its entirety– trainers will be required to *think aloud* (i.e. verbalise) the procedure and their thought processes while modelling how to undertake self-management.

The modelling demonstration will involve the researcher demonstrating a mixture of examples and non-examples of the target behaviour while using the self-management system. Intentionally mix up examples and non-examples of the target behaviour to ensure that students (a) can hear/see how to make decisions record on the self-management device appropriately (King-Sears, 2008) and (b) are accurately discriminating between desirable and non-desirable behaviours (Morrison, et al., 2014).

Each step of the procedure should be verbalised as it is completed and you should encourage the student to ask questions throughout the process.

Proposed Modelling Approach:

- Model examples/non-examples of target behaviour while stimulating classroom scenarios
- Model and verbalise the self-monitoring process for a number of intervals

  Example think aloud for appropriate behaviour:
    - **Vibration/Tone:** *There's the vibration signal. Now I ask myself?- Am I behaving appropriately?(target question) I was just sitting down quietly listening to the teacher talk, so my answer is yes, I am on-task. So I hit YES on my watch. I can see on my iPad that I was behaving appropriately. OK I will now start working again.*

  Example think aloud for on-task behaviour:
    - **Vibration/Tone:** *There's the vibration signal - Am I behaving appropriately? Well, I was just calling out to the teacher without putting my hand up… Nope that is not appropriate behaviour. Whoops, that's a NO on the PEBBLE watch. Ok – I need to behave appropriately and keep working so that I can press YES for the next vibration.*

Discrimination Accuracy Checks - Agreement (Morrison, et al., 2014)

- While the researcher is self-monitoring have the student independently self-recording (using a paper and pencil method) to ensure that they accurately self-record observed behaviour

At least 80-85% agreement will be required during this step. Agreement must be high as the next step involves the student modelling the self-management procedure for the first time. Higher agreement increases the likelihood of the student accurately using the procedure in the next step.

SESSION 3: PROVIDE PRACTICE, ASSESS MASTERY AND TRANSFER TO AUTHENTIC SETTING

AIM: After this first session students should:
- be able to use the self-management strategy independently, accurately and proficiently
- be ready to record on their own in class sessions after this session

Step (f): Guided practice opportunitites for students (under adult supervision)(Mastery and Procedural Accuracy)

Give students the opportunity to practice the self-management strategy in role-play situations. During this step students' involvement in training practice should increase as they will ideally be guided through active role-play type practice scenarios using the self-management strategy. Students will be instructed to practice the steps of the intervention – guidance will be provided by trainers where necessary.

Proposed Practice Approach (McDougall, et al., 2012):
- Direct the student to demonstrate only desired target behaviours
- Instruct the student to self-record promptly and accurately
- Instruct the student to get back on task immediately after self-recording on the PEBBLE

- Option: Have students verbalise and perform the intervention steps as they go (Maag, 1999). Ideally, students should be able to describe the intervention process in their own words while engaging in the self-monitoring process.

Immediately before the practice the trainer should remind the student to: (a) engage in only desired or appropriate classroom behaviours; (b) record using the watch quickly, immediately after it vibrates, then get right back on-task; and (c) record their behaviour honestly and accurately – that record NO when engaging in inappropriate behaviour and recording YES when engaging in appropriate target behaviour (Morrison, et al., 2014).

Once students can self-monitor target behaviour they should be encourage to undertake practice role-plays with both the desired target behaviour and undesired non-examples of the target behaviours – demonstrating both forms of behaviour while engaging in practice will help students to accurately discriminate, self-observe and record these behaviours (Wilkinson, 2008).

Test the student's acquisition of self-monitoring skills before students' use the process under real conditions – this will be done by conducting several assessment trials in role-play situations (Maag, 1999). Students should ideally practice using the self-management system until they can demonstrate independently the appropriate target behaviour while using the intervention.

During this step fidelity checks will need to be undertaken to evaluate each students' ability to use the process accurately and independently.

MASTERY/PROCEDURAL FIDELITY AND ACCURACY

Evaluating students' mastery of the self-management system is important to ensure future success and independence with the strategy in the classroom (King-Sears & Bonfils, 1999).
The follow two aspects of fidelity will be evaluated *(Morrison, et al., 2014)*:

- **Recording Accuracy** –is the student accurately recording their own behaviour
- **Procedural fidelity** – is the student using the strategy correctly as it was taught to them

These recording accuracy and procedural fidelity will be measured through the following process:

a. The student will engage in the self-monitoring process (using the ipad/watch combo)
b. At the same time the researcher will independently observe the student engaging in the self-monitoring process
c. The researcher will independently self-record student behaviour (using a paper and pencil method) to ensure the student is accurately recording their own behaviour (this will be checked through student-researcher agreement checks*)
d. The researcher will also make note as to whether the student is making use of the strategy in the correct way

* At least 80-85% agreement will be required during this step. Agreement must be high as the next step involves the student using the strategy in the classroom setting during regular classes. If agreement is low additional training may be required or training may need to be adjusted.

Mastery Checklist
Using the following checklist to determine whether the student has mastered the self-management process sufficiently after training. Students must satisfy the first four mastery indicators in order to implement the intervention system independently during class. If the student cannot master the strategy during training, then odds are that the student will not be able to independently and successfully use the system during regular class time. Ideally students should be able to independently practice the intervention steps without any guidance two or three times in a row (Rafferty, 2010).

TRAINING FIDELITY AND ACCURACY CHECKLIST		
General indicators of mastery during guided and independent practice	Yes	No
1. [SESSION 1] Can the student identify examples and non-examples of the target behaviour?[1]		
Student identifies behaviour correctly three times in a row OR obtains 80% correct responses (out of 10).		
2. [SESSION 1] Is the student able to demonstrate examples of the target behaviour (i.e. can the student distinguish and perform the behaviour themselves)? [2]		
Student models behaviour correctly three times in a row OR obtains 80% correct responses (out of 10).		
3. [SESSION 2] Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)		
Student models correct use of the self-management system for three consecutive practices		
4. [SESSION 2/3] Does the student accurately record their behaviour when using the self-management strategy? (i.e. can the student accurately record when they have or have not demonstrated the target behaviour [5]		
Student self-manages ACCURATELY for three consecutive intervals (or 80% vibrations) – i.e. accurately records behaviour.		
5. [SESSION 3] Can the student independently set up their self-management system? (i.e. put on watch, access website, start session, view prompt card, access graph)		
6. [SESSION 3] Can the student independently pack up their self-management system?		
7. [SESSION 1] Does the student identify the importance of the target behaviour?*		
8. [SESSION 1] Does the student describe the benefits of the self-management system? *		
Adapted from King-Sears & Bonfils (1999) and King-Sears (2008) *While it is ideal that the student satisfies master indicators five and six, these are not compulsory for implementing the intervention during class time. Though they are ideal for increasing student motivation to engage in the intervention process.		

Step (g): Discuss the When, What, Who, How (Intervention Housekeeping)

Discuss the following with students:

- **When will self-management be used in class**?
  - During various lessons where students work independently, in pairs or in groups
  - Only when permitted by the classroom teacher. Indicate to students that the teacher will tell them when to begin using the self-management system in class
    - Ideally students will be prompted to get their self-management systems organised after academic instruction prior to starting the task
    - The teacher will also need to remind students *when* to stop self-management at the end of the session
- **What situations self-management will be used in?**
  - In various lessons (literacy, Maths and Religion) where students are required to work independently, in pairs or in groups
  - In class when working at desks or at other learning locations
  - Not whilst on the floor receiving instruction from the teacher
- **What is required for set up?**
  - Explain to students that it is their responsibility to organise the self-management system. Students will be responsible for returning and putting their materials away.
  - Teach students to gather and set up necessary materials using prompting, modelling and reinforcing strategies.

  - Arrangements need to be made with the teacher for device storage in the classroom.
- **How it will be used?**
  - It must be made clear to students that the strategy is to be used whilst students engage in regular classroom activities
- **When (date) the intervention will start**
  - To be determined with the classroom teacher and student readiness

STEP (H): INDEPENDENT PRACTICE IN CLASSROOM SETTING (MASTERY AND PROCEDURAL ACCURACY)

Allow students to independently practice the self-management intervention strategy while engaging in target behaviour in the actual setting that the student will use the intervention in. Observe and monitor each student's first attempt at using the self-management system in a regular class session. This will be to ensure that students use the procedure accurately and consistently.

If any student makes errors in the implementation process, they may require a 'booster' session to practice specific aspects of the self-management system – e.g. students may need reminders in what constitutes as examples and non-examples of the target behaviour or they may require more practice in the self-observation/self-recording processes (Ganz, 2008; Rankin & Reid, 1995).

MASTERY/PROCEDURAL FIDELITY AND ACCURACY

Fidelity checks will again be undertaken to evaluate each students' ability to use the process accurately and independently. Both Recording Accuracy and Procedural Fidelity will be evaluated by the researcher. See step F for full details regarding accuracy/fidelity checks.

Step H Mastery Checklist

Using the following checklist to determine whether the student has mastered the self-management process sufficiently after training. Students must satisfy the first four mastery indicators in order to implement the intervention system independently during class.

TRAINING FIDELITY AND ACCURACY CHECKLIST		
Indicators of mastery during guided and independent practice	Yes	No
1. Can the student independently set up their self-management system? (i.e. put on watch, access website, start session, access graph)		
2. Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)		
Student models correct use of the self-management system for three consecutive practices		
3. Does the student accurately record their behaviour when using the self-management strategy? (i.e. can the student accurately record when they have or have not demonstrated the target behaviour [5]		
Student self-manages ACCURATELY for three consecutive intervals (or 80% vibrations) – i.e. accurately records behaviour.		
4. Can the student independently pack up their self-management system?		

FIDELITY CHECK AND MASERY CRITERION-GUIDED & INDEPENDENT PRACTICE

This checklist is to be completed at the end of any guided practice session completed in training.

GUIDED PRACTICE CHECKLIST						
Indicators of mastery during guided practice	Yes			No		
1. Can the student independently set up their self-management system? (i.e., , start session, view prompt card, access graph)						
A. put on watch						
B. get iPad out and access SMAT website						
C. open SMAT app on watch						
D. start self-management session on watch						
Student should be able to complete aspects of this step two times in a row with minimal assistance						
2. Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)						
A. Does the student look at the watch when the vibration goes off						
B. Does the student read the statement on the screen and consider their behaviour at that particular moment						
C. Does the student accurately record their behaviour when the vibration is emitted						
D. Does the student get on with their task after recording their behaviour						
E. Does the student check their iPad to see if their recording was made and to see how their behaviour is going						
Student should be able to complete aspects of this step two times in a row independently *NOTE: Student must accurately record their behaviour 80% of recordings on each practice*						
3. Can the student independently end the session, graph their performance and pack up their self-management system?						
A. Can student press pause on the watch when instructed to do so						
B. Student can open their last session on the SMAT website and observe the %yes responses for the previous session						
C. Student can record %yes responses in the appropriate graphing area on the spread sheet						
D. Student can pack up self-management devices at the end of the session						
Student models correct use of the self-management system for two consecutive practices						

This checklist is to be completed at the end of any independent practice session completed in class.

INDEPENDENT PRACTICE CHECKLIST						
Indicators of mastery during independent practice	Yes			No		
1. Can the student independently set up their self-management system? (i.e., , start session, view prompt card, access graph)						
A. put on watch						
B. get iPad out and access SMAT website						
C. open SMAT app on watch						
D. start self-management session on watch						
Student should be able to complete aspects of this step two times in a row independently						
2. Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)						
A. Does the student look at the watch when the vibration goes off						
B. Does the student accurately record their behaviour when the vibration is emitted						
C. Does the student get on with their task after recording their behaviour						
D. Does the student check their iPad to see if their recording was made and to see how their behaviour is going						
Student should be able to complete aspects of this step two times in a row independently *NOTE: Student must accurately record their behaviour 80% of recordings on each practice*						
3. Can the student independently end the session, graph their performance and pack up their self-management system?						
A. Can student press pause on the watch when instructed to do so						
B. Student can open their last session on the SMAT website and observe the %yes responses for the previous session						
C. Student can record %yes responses in the appropriate graphing area on the spread sheet						
D. Student can pack up self-management devices at the end of the session						
Student models correct use of the self-management system for two consecutive practices						

STAGE 4: IMPLEMENT AND OBSERVE

(9) IMPLEMENTATION IN REAL-SETTING

Once students have been trained in the self-management process they will then be instructed to use the intervention independently in the classroom setting. The teacher will inform students each time they are required to engage in a self-management sessions in class. Prior to each session students should be reminded of their target behaviours (Menzies, et al., 2009). This will involve prompting the student to check their visual prompt card.

Treatment fidelity

When the student begins to use the self-management system the teacher and/or researcher will initially monitor student use of the system to ensure that students are using the procedure accurately and consistently (Ganz, 2008; Rankin & Reid, 1995). The researcher will conduct frequent checks initially to ensure student accuracy in the self-management system; checks will become less frequent as the intervention progresses to ensure that students continue to use the self-management accurately in class sessions.

If any student makes errors in the implementation process, the student may require further mini 'booster' session to practice specific aspects of the self-management system.

Intervention Data

While the self-management intervention is in effect the researcher will continue to collect behavioural data in the same way that baseline data was collected. This data will be used to track/monitor student progress throughout the study by comparing the students' target behaviour before the intervention was implemented to student behaviour while undertaking self-management. Ongoing data collection will be used to determine the effectiveness of the self-management intervention – effectiveness of self-management systems is considered in terms of whether student behaviour changes occurs after during intervention use.

Behavioural data collected throughout the intervention will be used to make informed instructional decisions and to determine whether adjustments must be made to the intervention to increase likelihood of positive behaviour change (Rafferty, 2010). The delivered intervention will be adjusted as required based on the comparison of baseline data and intervention phase data. In this study adjustments could involve adjusting how often the student is cued to self-monitor (i.e. shorter or longer intervals), or adding goal-setting and self-evaluation components (Bedsem & Dieker, 2013).

(10) INTERVENTION FADING AND MAINTENANCE

The ultimate goal of this self-management intervention is to help the student to maintain the desired behaviour independently. It is hoped that throughout this pilot study students will learn to manage their behaviour without the self-management intervention. The point of self-management is to help students to internalise management processes while maintaining appropriate levels of the target behaviour (Rafferty, 2010). Students can learn to internalise management behaviours by gradually fading the intensity of intervention use (Rafferty, 2010).

Once a student has demonstrated maintained behavioural improvements levels during the intervention period over a number of sessions, the intensity of the intervention may be gradually faded/reduced through the following processes (Menzies, et al., 2009):

Firstly, the intervention can be faded by lengthening the time between self-monitoring prompt intervals (for example, the student may be cued to self-monitor every 5 mins rather than every 2mins). Secondly, intervention may be faded by reducing the number of self-management sessions a student engages in during the school week (for example, the student may use the system for fewer sessions during any one day, or they may be asked to use self-management every second day rather than every day). These steps will help to reduce students' reliance on external cuing (Wilkinson, 2008). Alternatively, if additional self-management components have been added to the intervention they may be slowly removed from the system (i.e. goal setting and self-evaluation).

During this phase of the study behavioural data will continue to be collected by the researcher to determine whether the target behaviour maintains at acceptable levels during the fading process. If behaviour levels become unsatisfactory, aspects of the intervention may be reinstated as the student may not be ready to self-monitor without intervention. Conversely, if behaviour levels maintain, the student may be provided with the opportunity to self-monitor in an additional setting or during a different time of the day to see if this outcome generalises.

Creating Independence

Having students' self-manage behaviours independently is the ultimate goal of the intervention pilot. To enable independence the following components should be utilised throughout the training and intervention processes.

1. *Increase the time spend self-managing behaviours*
    - You might start with short sessions while training – you will gradually want increase the length of the sessions when it comes to the intervention sessions.
    - In terms of interval recording (i.e. with the device) you will eventually increase the amount of time that passes before the student is required to record their behaviour (fading) (i.e. you might start with a 30second interval, progress to a 45 second interval, 1min interval and 3 min interval etc).
2. *Fade student's reliance on prompts*
    - As the student learns to self-mange behaviours you will also need to make prompts (cues to self-manage) more and more subtle until they are faded completely. The amount of prompting necessary for various students will vary in regard to type and amount.
    - Make sure the student is successful at the steps before moving to the next step.

Appendix i

Section 1: Commonly Observed Behaviour

In selecting and defining student behaviour (both problem and desired target) for this intervention consider the following behaviours. The table below contains a list of commonly observed problem and appropriate behaviours (and associated definitions) - these are the types of behaviours that the intervention may ideally target.

Behaviours listed have been adopted from the following sources:

Behaviour Observation Systems

- *Behavioural Observation of Students in Schools (BOSS) User's Guide (Shapiro, 2013)*
- *Behaviour Snap (Mittleman & Ghan, 2011)*

Behaviour Rating Scales

- *School Behaviours Rating Scale Manual (Gardon, 2009)*

Articles

- *Alter, et al., 2011*
- *Angus, et al., 2009*
- *Sullivan, et al., 2009*

Table A.1 Commonly Observed Behaviours

Resource	Behaviours	Definitions/Examples
		Behaviour Observation Systems
Behavioural Observation of Students in Schools (BOSS) User's Guide (Shapiro, 2013)	Active Engaged Time (On-task)	Student is actively attending to assigned work. Examples: Writing, reading aloud, and looking at task related resources (i.e. dictionary). May also involve raising a hand, discussing assigned work/material with teacher or peer.
	Passive Engaged Time (On-task)	Student is passively attending to assigned work. Examples: Listening to lesson, looking at academic worksheets, reading silently, looking at blackboard during teacher instruction or listening to peers during discussions.
	Off-Task Motor	Student engaging in instances of motor activity **not** directly associated with an assigned academic task. Examples: Out-of seat behaviour (buttocks not in contact with seat), aimlessly flipping book pages; manipulating objects not related to the academic task (e.g. throwing paper, twirling pencil, folding paper); physically touching another student when not related to academic task; bending or reaching, such as picking up a pencil on the floor, drawing or writing not related to an assigned academic activity, turning around in seat – orientated away from the classroom instruction, fidgeting in seat (i.e. engaging in repetitive motor movements for at least 3 consecutive seconds) while not on task NOTE: Student not considered off-task if passing materials to a student as instructed by the teacher or swinging feet or fidgeting WHILE working on assigned material
	Off-task verbal	Students engaging in any audible verbalisations that are not permitted and/or are not related to an assigned academic task. Examples: Making any audible sound (i.e. whistling, humming, forced burping etc), talking to another student about issues unrelated to an assigned academic task, taking to another student about an assigned academic task when such talk is prohibited by the teacher; making unauthorised comments or remarks; calling out answers to academic problems when the teacher has not specifically asked for an answer or permitted such behaviour NOTE: Student is not considered off-task if laughing at a joke told by the teacher or calling out the answer to a problem when the teacher has permitted such behaviour during instruction

	Off-task passive	Student is passively not attending to an assigned academic activity for a period of at least three consecutive seconds. Examples: Sitting quietly in an unassigned activity, looking around the room, staring out the window, and passively listening to other students talk about issues unrelated to the assigned academic activity NOTE: Student is not considered off-task if passively listening to other students talk about the assigned work in a cooperative learning group
Behaviour Snap (Mittleman & Ghan, 2011)	On-task	Examples: *Engaging in lesson* (listening to discussion, interacting with teacher, taking notes), *peer interaction* (cooperating with peer, talking appropriately with peer), *seatwork, transition* (moving around room appropriately, gathering/putting away materials, waiting appropriately)
	Off-task	Examples: *Inappropriate movement* (fidgeting, walking/running around room, using materials inappropriately, moving in seat, leaving classroom), *inattention* (staring/daydreaming/looking around, doodling), *inappropriate vocalisation* (laughing inappropriately, teasing/taunting peer, making disruptive noises, arguing with teacher or peer, calling out answers, calling out off-topic, chatting with peer(s)), *avoidance behaviours* (sleeping/head down, transition activity, getting drink, wandering room, fiddling in desk, using bathroom, visiting nurse), *repetitive behaviours* (talking/humming/singing to self, tapping pencil/fingers, tapping/swinging/bouncing feet, pacing, rocking, flapping or other stereotyped mannerisms, spinning an object) NOTE: This system also makes note of *physical aggression* (hitting, kicking, biting, pushing, throwing objects, destroying materials) and self-injurious behaviour (hair pulling, head banging, biting, hitting, eating non-food items). These behaviours are deemed inappropriate for this intervention as they need more immediate intervention to stop potentially harmful behaviour.
	Behaviour Rating Scales	
School Behaviours Rating Scale Manual (Gardon, 2009)	General Classroom Behaviour	Behaviours on following classroom rules, being prepared to learn and work habits. Consider the following behaviours when identifying problem behaviour areas. Does the student… - follow classroom rules, - stay in their seat, - behave appropriately for casual teachers/other staff, - concentrate well in class; - ignore inappropriate peer behaviour; - stop doing something when asked, - look after their own work, - move when asked, bring necessary equipment/materials to school, - appear to be listening carefully, - behave when not closely supervised, - put hand up to speak in class, - follow instructions from class teacher - quietly not comply when asked to do something - need to be asked to do things more than once
	Attempting Tasks Presented	Behaviours that demonstrate ability to be on-task. Consider behaviour related to finishing set tasks and persevering with difficult tasks. Also consider whether the student has difficulty staying on-task during structured activities and unstructured tasks or groups
	Articles	
Scott, et al., 2011	Active Engagement	Target student engaged with the instructional content Examples: Choral response, raising-of-hand, responding to teacher instruction, writing, reading, or otherwise actively completing an assigned task (e.g. typing on computer, manipulating assigned materials).
	Passive Engagement	Student passively attending to instruction either by orientation to teacher, performing peer or materials (i.e. tracking with eyes) but not required to do anything other than listen or observe. Examples: sitting quietly at desk and facing the teacher who is instructing or sitting quietly with collaborative work group but not actively speaking, writing, or working on an activity

	Off-Task	Student not engage in active or passive engagement but engaged in an activity that was incompatible with any assigned task/activity. Student not actively engaged in work nor looking at the teacher or assigned task, and may not be disrupting the class. Examples: Out of seat without permission but not bothering anyone else; looking away from teacher and instructional materials and directing attention to something else.
	Student Disruption	Behaviours incompatible with learning. Student displaying neither active or passive engagement, and displaying behaviour that did or potentially could have disrupted the lesson (i.e. wandering out of seat, noises, bothering peer etc).
Angus, et al., 2009	Disruptive	Examples: Calls out to the teacher or other students; seeks attention; provokes other students
	Inattentive	Examples: Easily distracted; looks for distractions; does not appear to concentrate
	Non-compliant	Examples: Refuses to follow class rules; questions instructions (challenges teacher); talks back and is argumentative
Sullivan, et al., 2014	Disengaged	Examples: Being late for class, avoiding doing school work, disengaging from classroom activities
	Low-level disruptive behaviour	Examples: Behaviour that disrupt the lesson flow; talking out of turn (calls out to teacher and other students); making distracting noises intentionally, interfering with property, moving around the room unnecessarily; using laptop or iPad inappropriately, making inappropriate remarks, and mucking around/being rowdy

Section 2: Selecting and Defining Behaviour for Self-Management

Adapted from King-Sears & Carpenter (1997)

GUIDELINE 1: Select *Functional Behaviours* with *Meaningful Social Value*

- Behaviour should be important to the student's current and future classroom participation
- Behaviour that occurs across various activities throughout the school day provide more opportunities for generalisation (they also have the potential to impact a student's behaviour across other settings)

GUIDELINE 2: Select behaviours important to students

- Behaviour that the teacher may value may not always be valued by students
- Ask students what behaviour they would like to change. Student involvement in selecting target behaviours may help increase student commitment to learn self-management and greater success

GUIDELINE 3: Select Behaviour with Performance Opportunities

Table 3

Guidelines for Selecting Behaviors for Self-Management

Select behaviors that:

- are functional and have meaningful social value.
- are important to the student.
- have frequent or consistent performance opportunities.
- are manageable in relation to the students' characteristics and situational demands.
- can be defined, counted, evaluated, *and* described clearly.

Table 3: Extracted directed from King-Sears & Carpenter, 1997

- *Selected behaviours should have frequent performance opportunities*. There should be multiple opportunities for the student to perform the selected target behaviour within a session or across a range of activities throughout the school day (i.e. raising hand to speak).
- Selected behaviours may require increased frequency or decreased frequency

GUIDELINE 4: Select Behaviours Manageable for Student

- Ensure behaviours are manageable in relation to students' characteristics and situational demands
- Factors to consider when selecting behaviour:
  - Total number of behaviours targeted for self-management (limiting intervention to one or two behaviours may result in greater success - especially if implementation agents is inexperienced with self-management)
  - Behaviour intensity
  - Is the student capable of performing the targeted behaviour (physically and cognitively)
  - Does the student have pre-requisite skills to perform the targeted behaviour
  - Does the behaviour typically occur in the classroom in the presence of the teacher
- Students may have better success if the targeted behaviour is one they feel they are capable of changing and for which they can see changes in a relatively short amount of time

GUIDELINE 5: Select Behaviours You Can Define, Count, Evaluate AND Describe Clearly

- Describe behaviour in terms which allow students to understand what it looks, sounds and feels like
- Describe behaviour in simple and concrete terms
- Provide examples of what the behaviour does and does not look like; this will help students to understand what they should be doing and what they should not be doing
- Behaviour must be observable so that changes can be evaluated
- Behaviours may be continuous (ie. On-task) or they may be discrete (i.e. number of times hand is raised). Behaviours may be specific (i.e. raise hand) or general (i.e. sets of appropriate behaviours)

Section 3: Guidelines for Selecting and Defining Behaviour for Self-Management

When defining the problem and target behaviour(s) it is important to consider the following guidelines.

- *Make definitions* ***specific*** **–** Definitions should be worded in specific terms such that both adults and students can accurately determine whether the behaviour has occurred or not occurred. Language should be easy understandable for both adults and students. Students will need to be provided with clear descriptions of the target behaviour during intervention training.

Example: Avoid selecting behaviours such as "being good" or "being on-task". Aim to define behaviour in specific terms such as, "listening to the teacher", "sitting in seat", "reading work" or "writing answers to problems".

- Define behaviour(s) using **observable** terms– Definitions should focus on overt and observable aspects of behaviour. This will ensure that students can accurately observe their behaviour and identify when the behaviour is present (or absent).

Example: A student may not be able to observe whether they are being "disruptive by means of talking out of turn", however he or she may be able to observe "the number of time they raise their hand to ask a question" rather than shouting out

- Ensure that the target behaviour is **appropriate** and is a good match for the setting, situation and task in which self-management will be used- It may be necessary to select and define different target behaviours within the context of a particular environment and/or activity (For example, appropriate behaviour for independent maths practice may be different from appropriate behaviour for group reading lessons).

Example 1: It may be appropriate for a student to self-monitor "talking out" behaviour during independent silent work time or teacher instruction time. However, it would not be appropriate to self-monitor this behaviour during small-group discussion when students are expected to engage in discussion.

Example 2: You may want your student to increase on-task behaviour for instance, however on-task behaviour for maths practice may differ to on-task behaviour for reading practice.

- *Maths practice may involve: sitting in assigned seat, working on problems, studying examples etc*
- *Reading lessons may involve: listening to teacher, reading a book, writing answers on worksheets etc*

Ideally, this intervention will incorporate behaviour definitions which have not been defined too narrowly (i.e. specific to certain lessons/ situations, as above) or too broadly (e.g. on-task means doing all your work). Attempt to create definitions which can apply to various activities (For example, definition which may apply across reading and maths may involve: *listening to teacher instructions asking the teacher for help by putting one's hand up, following teachers instructions on the given task, completing the assigned work etc).*

- Targeted behaviours must be a **personal match** for the student – The target behaviour must match the student's cognitive and developmental level. If students are to self-monitor their behaviour effectively they must be able to monitor their thought processes adequately enough to identify the occurrence of the behaviour and to understand the connection between the behaviour and the monitoring procedures (Rankin & Reid, 1995) – if they do not have the ability to make this connection change in behaviour is unlikely.

Example: It may be appropriate to expect a student typically developing student to remain seated still throughout a 20 minute reading session, but you may not expect this from a student with ADHD. Thus you would need to re-consider the target behaviour definition.

IMPORTANT NOTE: Ideally students should be enabled to select their own target behaviour (this may help to increase motivation and have students more involved in the intervention). At the start of the intervention preparations adults will select and define a target behaviour. When it comes to student training the adults may gauge whether students have the capacity to define their own target behaviour. At this stage you may guide students in identifying and defining their own target behaviour (*Note: Behaviours identified by adults and students may not always be the same – this is ok as long as the student selects a related behaviour that will help to improve upon the selected problem behaviour)*

Guidelines have been adapted from **Maag (1999); Rankin & Reid (1995); The IRIS Centre (n.d.b)**

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MONASH University

Monash University Human Research Ethics Committee (MUHREC)
Research Office

Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

Project Number:	**CF14/3515 - 2014001848**
Project Title:	**Promoting appropriate student behaviour: Self-management in regular primary school classrooms**
Chief Investigator:	**Dr Angelika Anderson**
Approved:	**From: 25 February 2015 to 25 February 2020**

Terms of approval - ***Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.***

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

[redacted]

Professor Nip Thomson
Chair, MUHREC

cc: Prof Dennis Moore; Ms Margheita Busacca

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Appendix E.2 - School Explanatory Statement and Permission Letter (School Principal)

MONASH University

EXPLANATORY STATEMENT

For Schools

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson (Chief Investigator) Faculty of Education [redacted]	**Professor Dennis Moore** (Co-investigator) Faculty of Education [redacted]	**Margherita Busacca** (Student Investigator) [redacted]	**Amanda Fernandez** (Student Investigator) [redacted]

Your school is invited to take part in a research project being conducted by Margherita Busacca under the joint supervision of Dr Angelika Anderson and Professor Dennis Moore in the Faculty of Education at Monash University. Margherita will be completing this project as part of completing the Master of Psychology (educational and developmental)/PhD degree. Amanda Fernandez will be assisting Margherita in various aspects of this project to fulfil the requirements of the Graduate Diploma in Professional Psychology. Please take the time to read this Explanatory Statement in full before deciding whether or not you would like to give permission for this research to take place in your school. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the contact details listed above.

What does the research involve?

The aim of this study is to develop and pilot a student self-management intervention package which can be easily implemented by teachers in regular primary school classrooms. We are interested in finding out if self-management interventions can be successfully used by students to improve appropriate classroom behaviour and whether the package is suitable for use by teachers in regular classroom settings. The intervention package to be trialled within this project will be developed in collaboration with a classroom teacher to suit both their needs and the needs of the students selected to be in the self-management intervention group.

This research project is seeking the participation of 3-6 primary school students in a regular classroom who engage in high-frequency problematic/difficult (i.e. disruptive or inappropriate) behaviour during class time. The students we seek must also have a classroom teacher willing to assist them in reducing the occurrence of problem behaviour and improving appropriate classroom behaviours through behavioural intervention. While the study is open to all students, we would ideally like to like to recruit students with special needs **and/or** those who are in younger grade levels (i.e. Grade 1 and/or 2) to form the self-management *intervention* group as limited research has been conducted with these populations in regular classrooms. Ideally students in the intervention group will be in same class and have the same teacher, however this is not a strict requirement. We will also be looking to recruit 3-6 comparison students with satisfactory levels of appropriate behaviour from the same class. These students will be passive participants and are not required to do anything in the study. Their behaviour will simply be observed to provide a benchmark for targeted behaviours. Appropriate written consent will be sought from all participants prior to this project commencing.

Student Involvement *– Intervention Group* (all participation to occur during regular school hours)

1. By participating in 2 or 3 training sessions (each lasting 30 or 20mins respectively) students will be taught strategies which they will use during class to self-manage their behaviour. It is likely that this will include students observing their own behaviour, discriminating between appropriate/inappropriate behaviour and recording the presence/absence of the targeted appropriate behaviour at designated times when cued by a subtle prompting device. Students will also learn to set appropriate behavioural goals, evaluate their own behaviour against their goals and monitor progress over time by graphing their recorded self-observations.

2. Once trained, students will be instructed on when to use the self-management processes in class during school hours whilst engaged in regular classroom activities. This intervention is intended to be unobtrusive and minimally disruptive to teaching/learning processes.

3. For the duration of this project a researcher (at times two) will be present in the participating classroom to undertake observations of the students to monitor their behaviour. During the initial stages an exploratory interactive analysis of environmental factors that influence particular behaviours will also be undertaken to determine the purpose (or function) of student behaviour (formally referred to as a Functional Analysis). Only consenting students will be the focus of these observations and analyses. Parents/ guardians of non-targeted students in the selected class will be informed of the researcher's presence. It is expected that self-management sessions will occur at least three days weekly and will not exceed 20-45mins. The researchers anticipate that the project will not exceed the length of two school terms. The number of sessions per week and the project duration will be negotiated with the teacher/school.

4. At the completion of the study students will be asked to engage in a brief (10-15min) interview session during class time with the researcher to provide feedback on the intervention. In this session students will complete a short feedback questionnaire, assisted by the researcher where needed.

Teacher Involvement

1. The teacher will be asked to nominate up to 6 students to participate for each the intervention and comparison group, assist in inviting them to participate, and in obtaining consent for students (information sheets and consent forms to be given to parents/ guardians will be provided).

2. In the initial stages the teacher will be asked to meet with the student researcher twice, each time for no longer than 60 minutes at a time convenient for the teacher, to provide professional information on themselves (i.e. teaching experience, qualifications), to complete a profile on intervention group students (this will include disclosure of any diagnoses that impact on school behaviour), and to fill out a brief questionnaire on each intervention group student evaluating student behaviour (a follow-up discussion/interview may follow if additional information be required). The teacher and researcher will work collaboratively to identify/define specific student behaviours to be targeted for intervention (i.e. what behaviour needs to be increased), and to develop the details of the self-management intervention package.

3. The teacher will be asked to discuss the project with the consenting intervention group students and to train them in the self-management intervention processes with the student investigator. Training is not expected to exceed 1 hour of instruction and will occur during school time at times which suit the teacher's classroom schedule (this time may be split into multiple sessions i.e. 3x20min or 2x30min sessions).

4. The teacher will be asked to schedule student-led self-management sessions during class times where the intervention group students will be instructed to engage in the taught strategy. Whilst it is expected that minimal teacher involvement will be required during the student led sessions, the teacher may be required to provide low-levels of assistance on occasion.

5. At the completion of the study, the teacher will be asked to complete one feed-back questionnaire and a brief questionnaire on each student evaluating student behaviour. The teacher will also engage in a short feed-back interview. This should take no longer than 30mins.

Parent/Guardian Involvement

Parents/guardians of students nominated by the classroom teacher for intervention will be required to read a project explanatory statement (similar to this one). Should they wish to allow their child to participate in the proposed research parents/guardians will be required for read and sign a consent form. Those that allow their child to participate may be required to engage in a brief interview with the student researcher to provide some background information on their child (no longer than 20 minutes).

Participating in the project and withdrawing from the research

Involvement in this study is voluntary; there is no obligation to accept this invitation. If you do accept this invitation you may withdraw your school from the project at any time without explanation. You will also have the right to ask that any data collected to that point be destroyed. If you decide to accept our invitation to be involved in this research you will be asked to sign the permission letter and return it to the researchers. It would also be helpful if you could notify teachers working at your school of this research and invite them to volunteer in the study (a recruitment flyer will be provided).

Possible benefits and risks to participants

The project holds the potential to benefit the wider education community through the development of a self-management package which can be used by teachers to help students learn to actively manage their own behaviour in regular classrooms. Direct benefits for students include gaining greater responsibility for their behaviour, and increased appropriate classroom behaviours which may enable students to experience greater educational opportunities. Students may also develop skills which will help them to become more independent in the classroom. The participating teacher/s may experience benefits through reduced classroom behaviour management demands, increased time for academic instruction, and positive behaviour change in their classroom, which will also potentially be of benefit to the school as a whole.

There is no major foreseeable risk for participants in this study. Students involved in this project will not miss class, and there will be minimal disruption to their normal classroom activities as the project will be adapted to suit the class routine/schedule. Participating students may miss small portions of academic activity (due to training). The teacher/s may feel inconvenienced by the time needed for initial planning sessions and all participants may be feel inconvenienced by the training sessions and brief follow-up interviews/questionnaires.

Confidentiality

Personal information will be confidential at all times. Every effort will be made to maintain confidentiality in any reports, presentations or subsequent publications resulting from this study. Where any data is reported, neither the participants nor school will be identifiable. Alternative fake names will be used to protect the confidentiality of all participants.

Results

Results will be presented within a PhD thesis and a Graduate Diploma research project. They may also be published in the form of a research report and/ or journal article. Additionally a summary report will be prepared and made available to the school and interested parents. In any case neither the individual participants nor the school will be identifiable in reported results.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted]

[redacted] [redacted]

Fax: +61 3 9905 3831

Questions or Concerns

If you have any questions or concerns as a result of reading this information sheet, you are encouraged to address these with the student researcher, Margherita Busacca. You may also contact Margherita with inquiries about the research at any time throughout this study. If she is unable to address your questions or concerns to your satisfaction she will address these matters with the supervising investigators.

Thank you, **Angelika Anderson, Dennis Moore, Margherita Busacca and Amanda Fernandez**

PERMISSION LETTER

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

November 24th 2014

[redacted]

Dr. Angelika Anderson
Krongold Centre, Building
5
Faculty of Education
Clayton Campus
Monash University
Wellington Road Vic 3800

Dear Dr Anderson,

Thank you for your request to recruit participants from our school for the above-named research.

I have read and understood the Explanatory Statement regarding the research project "Promoting appropriate student behaviour: Self-management in regular primary school classrooms" **and hereby give permission for this research to be conducted.**

Yours sincerely,

NOTE: Header and signature cropped to ensure school privacy and confidentiality is maintained

Appendix E.3- Teacher Explanatory Statement and Consent Form

MONASH University

EXPLANATORY STATEMENT

For Teacher

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson	**Professor Dennis Moore**	**Margherita Busacca**	**Amanda Fernandez**
(Chief Investigator) Faculty of Education [redacted]	(Co-investigator) Faculty of Education [redacted]	(Student Investigator) [redacted]	(Student Investigator) [redacted]

You have been invited to take part in a research project being conducted by Margherita Busacca under the joint supervision of Dr Angelika Anderson and Professor Dennis Moore in the Faculty of Education at Monash University. Margherita will be completing this project as part of completing the Master of Psychology (educational and developmental)/PhD degree. Amanda Fernandez will be assisting Margherita in various aspects of this project to fulfil the requirements of the Graduate Diploma of Professional Psychology. Please take the time to read this Explanatory Statement in full before deciding whether or not you would like to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the contact details listed above.

What does the research involve?

The aim of this study is to develop and pilot a student self-management intervention package which can be easily implemented by teachers in regular primary school classrooms. We are interested in finding out if self-management interventions can be successfully used by students to improve appropriate classroom behaviour, and whether the package is suitable for use by teachers in regular classroom settings. The intervention package to be trialled within this project will be developed in collaboration with a classroom teacher to suit both their needs and the needs of the students selected to be in the self-management intervention group.

This research project is seeking the participation of 3-6 primary school students in a regular classroom who engage in high-frequency problematic/difficult (i.e. disruptive or inappropriate) behaviour during class time. The students we seek must also have a classroom teacher willing to assist them in reducing the occurrence of problem behaviour and improving appropriate classroom behaviours through behavioural intervention. While the study is open to all students, we would ideally like to like to recruit students with special needs **and/or** those who are in younger grade levels (i.e. Grade 1 and/or 2) to form the self-management *intervention* group as limited research has been conducted with these populations in regular classrooms. Ideally students in the intervention group will be in same class and have the same teacher, however this is not a strict requirement. We will also be looking to recruit 3-6 comparison students with satisfactory levels of appropriate behaviour from the same class. These students will be passive participants and are not required to do anything in the study. Their behaviour will simply be observed to provide a benchmark for targeted behaviours. Appropriate written consent will be sought from all participants prior to this project commencing.

The following points outline what this project will entail for you as the classroom teacher if you choose to participate.

1. You will be asked to nominate up to 6 students to participate for each the intervention and comparison groups, assist in inviting them to participate, and in obtaining consent (information sheets and consent forms to be given to parents/ guardians will be provided).

2. In the initial stages you will asked to meet with the student researcher twice, each time for no longer than 60 minutes (this can be negotiated based on your schedule) to provide professional information on yourself (i.e. teaching experience, qualifications), to complete a profile on intervention group students (this will include disclosure of any diagnoses that impact on school behaviour), and to fill out a brief questionnaire on each intervention group student evaluating student

behaviour (a follow-up discussion/interview may follow if additional information be required). You will work collaboratively with the researcher to identify/define specific student behaviours to be targeted for intervention (i.e. what behaviour needs to be increased), to develop the details of the self-management intervention package.

3. You will be asked to discuss the project with the consenting intervention group students and to train them in the self-management intervention processes with the student investigator. Training is not expected to exceed 1 hour of instruction and will occur during school time at times convenient to you (this time may be split into multiple sessions i.e. 3x20min or 2x30min sessions).

4. You will be asked to schedule student-led self-management sessions during class times where the intervention group students will be instructed to engage in the taught strategy. Whilst it is expected minimal teacher involvement will be required during the student led sessions, you may need to provide low-levels of assistance on occasion.

5. At the completion of the study, you will be asked to complete one feed-back questionnaire and a brief questionnaire on each student evaluating student behaviour. You will also engage in a short feed-back interview. This should take no longer than 30mins.

This intervention is intended to be unobtrusive and minimally disruptive to teaching/learning processes. It is expected that self-management sessions will occur at least three days a week and will not exceed 20-45mins. The researchers anticipate that the project will not exceed the length of two school terms. The number of sessions per week and the project duration will be negotiated with yourself and/or your school principal. For the duration of this project a researcher (at times two) will be present in your classroom for 30-60minutes each time to undertake observations of the students to monitor their behaviour. During the initial stages an exploratory interactive analysis of environmental factors that influence particular behaviours will also need to be undertaken by the researchers to determine the purpose (or function) of student behaviour (formally referred to as a Functional Analysis). Only consenting students will be the focus of these observations and analyses. You will be provided with a notice to give to parents/ guardians of non-participating students to inform them of the research and researcher's presence in your classroom. All arrangements will be made with you prior to undertaking any observations or analyses in your classroom.

Consenting to participate in the project and withdrawing from the research

Involvement in this study is voluntary and you are under no obligation to give consent to participate. If you do provide consent, you may withdraw any time without explanation. You will also have the right to ask that any data collected to that point be destroyed. If you wish to participate in this study you will be asked to sign a consent form and to return it to the researchers.

Possible benefits and risks to participants

The project holds the potential to benefit the wider education community through the development of a self-management package which can be used by teachers to help students manage their own behaviour in regular classrooms. Direct benefits for students include gaining greater responsibility for their behaviour, and increased appropriate classroom behaviours which may enable students to experience greater educational opportunities. Students may also develop skills which will help them to become more independent in the classroom. As the classroom teacher, you may experience benefits through reduced classroom behaviour management demands, increased time for academic instruction, and positive behaviour change in their classroom.

There is no major foreseeable risk for participating teachers. You may feel inconvenienced by the time needed for initial planning sessions, training sessions and the follow-up questionnaires. Perceived inconveniences will be minimised by scheduling all processes at times which suit you and your class schedule. It is anticipated that there will be minimal disruption to students' normal classroom activities as we will work together to adapt the intervention to fit within your class routine. Participating students may miss small portions of academic activity (due to training), however the times at which this will occur will be decided by yourself to ensure there is minimal disruption to learning (i.e. training may occur during allocated free time). If any concerns are raised or if any adverse outcome should arise during the course of this you are encouraged to inform a member of the research team immediately. If necessary the student researcher will assist in obtaining further assistance if required. Alternatively, you may directly contact any of the counselling and psychological services provided.

Confidentiality

Personal information will be confidential at all times. Every effort will be made to maintain confidentiality in any reports, presentations or subsequent publications resulting from this study. Where any data is reported, neither the participants nor school will be identifiable. Alternative fake names will be used to protect the confidentiality of all participants.

Storage of data

Data collected will be stored in accordance with Monash University Regulations, for a minimum of 5 years or until no longer required. All electronic data will be kept on a password protected University computer which can only be accessed by the researchers. All other data will be kept on University premises in a locked cabinet accessible only by the researchers, in a locked room. At the end of the storage period all data will be destroyed by shredding or through the deletion of the electronic data files.

Results

The results will be presented within a PhD thesis and a Graduate Diploma research project. They may also be published in the form of a research report and/or journal article. In addition a summary report will be prepared and made available to the school and any interested parents. In any case neither the individual participants nor the school will be identifiable in reported results.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
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Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted] [redacted] Fax: +61 3 9905 3831

Questions or Concerns

If you have any questions or concerns as a result of reading this information sheet, you are encouraged to address these with the student researcher, Margherita Busacca. You may also contact Margherita with inquiries about the research at any time throughout this study. If she is unable to address your questions or concerns to your satisfaction she will address these matters with the supervising investigators.

Thank you, **Angelika Anderson, Dennis Moore, Margherita Busacca and Amanda Fernandez**

MONASH University

CONSENT FORM
For Teacher

Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson (Chief Investigator) Faculty of Education [redacted]	**Professor Dennis Moore** (Co-investigator) Faculty of Education [redacted]	**Margherita Busacca** (Student Investigator) [redacted]	**Amanda Fernandez** (Student Investigator) [redacted]

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
• Participating in the identification of between 3-6 appropriate students to participate in the intervention group for this project and the contacting of parents for consent to participate	☐	☐
• Participating in the identification of between 3-6 appropriate students to participate in the comparison group for this project and the contacting of parents for consent to participate	☐	☐
• Completing a brief profile on intervention group students, filling out a short questionnaire evaluating student behaviour and engaging in a brief interview with the student investigator to provide further information if required (upon consent from students' parents)	☐	☐
• Participating in the structuring of the intervention	☐	☐
• Training intervention group students in how to use the self-management intervention with the student investigator	☐	☐
• Allowing researchers to observe the class and undertake brief functional analyses on the target students at agreed times	☐	☐
• Completing post-intervention questionnaires and interview	☐	☐

I understand that I my participation is voluntary and I can withdraw my consent at any time during this project. I understand that I should contact the researchers listed above if I have any questions, queries or concerns regarding this project.

Name of Teacher Participant

Teacher Participant Signature Date

Appendix E.4 – Study Overview (Principal and Teacher)

SELF-MANAGEMENT INTERVENTION STUDY OVERVIEW

Monash University

PhD Research Project 2015

Margherita Busacca
Provisional Psychologist
Master of Psychology (Educational/Developmental)/PhD Candidate
[redacted]

Study Aim

- **To investigate the effectiveness of a primarily student-driven, technology-based self-management intervention package in promoting appropriate student classroom behaviours in a regular classroom setting.**
- **To investigate the appropriateness of the trialed intervention approach for regular classroom settings.**

What is Self-Management?

The personal application of behaviour change techniques or actions to bring about a desired change in one's own behaviour (Cooper, et al., 2007; Shapiro & Cole, 1994).

Self-Management Interventions in Education

Education-based self-management interventions broadly involve teaching students a range of procedures/strategies which students can then use in bringing about positive changes to their own behaviour in education contexts.

Self-management intervention packages vary in structure and degree of student involvement (i.e. some may contain more adult involvement compared to others). Typically, self-management interventions include combinations of one or more of the strategies presented in Figure 1.

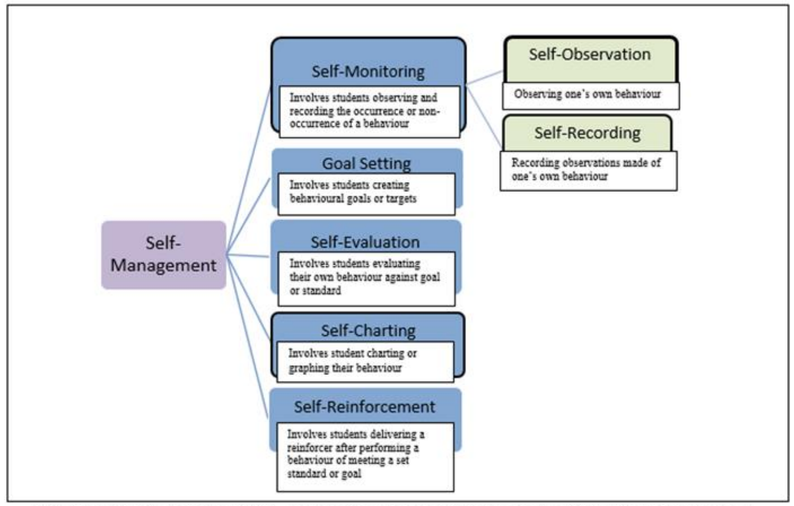

FIGURE 1: Adopted from Rafferty (2010) – incorporating information from Cooper, et al., (2007); King-Sears & Carpenter (1997); Maag (1999)

The Current Self-Management Package

Presented below is an outline of the self-management package being trialled in the current study.

Self-Management Package

Adult-Managed = Managed by researcher/teacher
Joint-Managed = Managed by Adult and Student
Student-Managed = Managed solely by student

Target Behaviour Selection
Selection of behaviour to be self-managed
Adult-Managed

Target Behaviour Definition
Definition of behaviour to be self-managed
Adult- Managed

Self-Monitoring Prompt
Use of a prompting device to engage in self-monitoring during regular classroom activities
Student-Managed

Self-Observation*
Observing one's own behaviour when prompted to determine whether or not one is (or has) engaged in their target behaviour
Student-Managed

Self-Recording*
Recording observations made of one's own behaviour
Student-Managed

Self-Charting
Graphing or charting one's behaviour over time
Student-Managed

Material Management
Management of materials required for self-management
Joint-Managed

* Combined self-recording and self-observing form **Self-Monitoring**

FIGURE 2: Current self-management package

This study will involve students using a novel technology-based system to engage in a self-management intervention system comprised of self-monitoring and self-charting strategies

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Anticipated Benefits

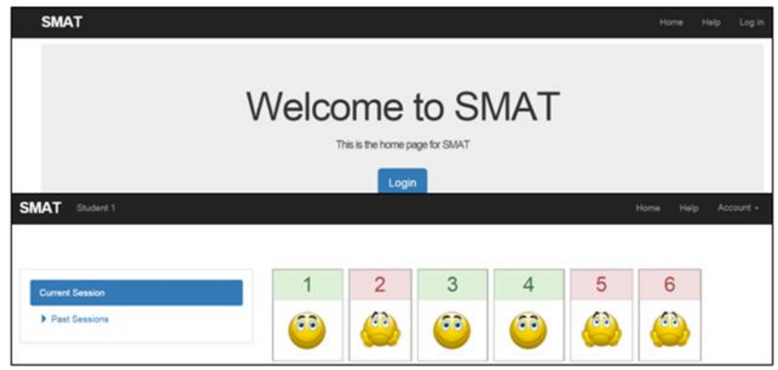
- Development a primarily student-managed technology-based behaviour management strategy (holds potential to benefit the wider education community)
- Students gain greater responsibility for their own behaviour in class
- Increased appropriate behaviours; positive behaviour change in classroom environment
- Greater opportunity for students to experience educational opportunities
- Reduced demands on classroom teacher
- Teacher gains increased time for academic instruction

Self-Management Assistive Technology (SMAT)

SMAT refers to the technology-based self-management system which is going to trialled throughout this study.

SMAT incorporates a PEBBLE watch (see below) which will act as a *self-monitoring prompt* and *self-monitoring recording device*. This means that in self-management sessions students will be prompted by a tactile vibration emitted by the watch that will cue them to self-monitor (i.e. self-observer their behaviour and record the occurrence or non-occurrence of the behaviour). After the vibration students will then record their behaviour on the watch with a YES or a NO response.

The PEBBLE watch will be connected with a specially designed SMAT website (smat.rocks) (see image below for prototype).



The SMAT website will ideally be viewed by students throughout each self-management session on their school iPad. This website will provide student with immediate live feedback of their self-recordings so that they may be able to keep track of their behaviour performance throughout class.

Providing students with an awareness of their behaviour performance may help in bringing about positive behaviour change.

Study Details

Setting	Participants	Intervention Agents	Required Materials	Anticipated Timeline
Regular Classroom Environment	3-6 primary school students (must meet the student criteria below)* 3-6 comparison peers	Classroom Teacher Researcher	An iPad per student A self-management smartwatch device (provided))	Two school terms (Terms 2-3 2015)

Target Participant Student Criteria

Participant must….

- participate in a general education classroom
- be in any primary year level above Prep
- be typically developing OR have an educational, behavioural or developmental diagnosis (i.e. learning disability, ADHD, ASD, etc)
- be exhibiting problematic classroom behaviour at a high-frequency which disrupts the classroom environment and/or interferes with academic tasks
- demonstrate the problem behaviour at a high-frequency across at least three different subjects
- be observed by the researcher in the classroom setting as exhibiting the reported problem behaviours at a high frequency
- have daily access to an iPad
- have a high attendance rate (i.e. 85-90% attendance during Term 1)
- have consent to participate from a parent/guardian for participating in this study
- be willing to engage in self-monitoring of behaviour in a classroom (student assent to participation is required)

Comparison Participant Student Criteria

Participant must….

- be in the same class and same year level as the target participants
- have the same schedule as the target participant
- demonstrating appropriate/desirable levels of classroom behaviour according to the teacher (across the subjects in which the target student demonstrates problem classroom behaviour)
- have a high attendance rate (i.e. 85-90% attendance during Term 1)
- have consent to participate from a parent/guardian for participating in this study

NOTE: *Target participants will be the main focus of this intervention study as they will be using SMAT to manage their behaviour. Observation data will be collected on these students throughout the whole study. Comparison peers will be observed on occasion to collect normative class behaviour data. This will enable the researchers to determine whether behaviour change in target students improves to the expected or desired classroom level.*

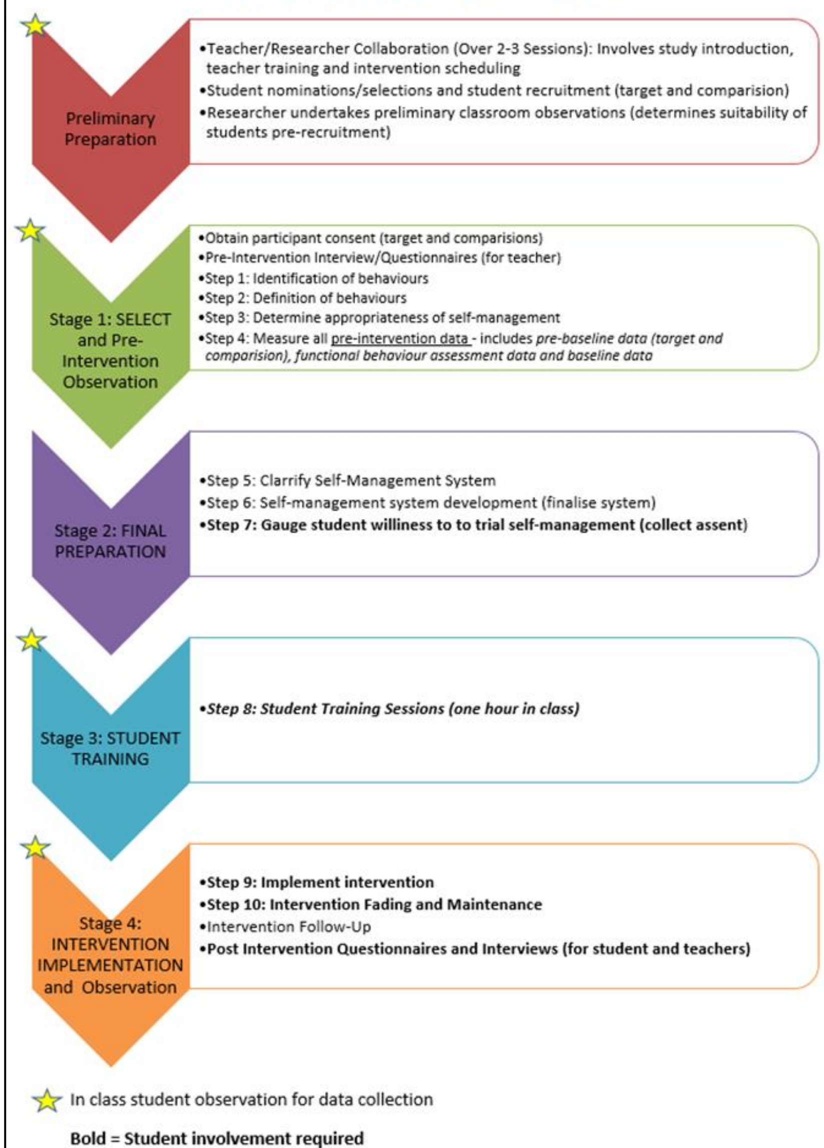
Inappropriate/Problematic Behaviour

Identify the type of behaviour this study is looking at…

Low-Level Disruptive Behaviour (i.e. Behaviours that disrupt the flow of the lesson - talking out of turn, inappropriate interruptions, making distracting noises intentionally, interfering with or destruction of property, moving around the room unnecessarily, making inappropriate remarks, and mucking around/being rowdy).

Disengaged/Off-Task Behaviour (*i.e.* Behaviours where the student does not attend to current task/activity – may be passive or active disengagement/off-task behaviour – avoidance of school work, distraction, lack of concentration)

STUDY STAGES and PROCESSES



TEACHER RESPONSIBILIITIES

- Collaboration with researcher to organise study initial phases (approx. 2 hours out of class time)
  - Student identification and recruitment
  - Session scheduling with researcher
- Completion of student profile questionnaires and behavioural measures (pre and post intervention) (approx. 1 hour out of class time)
- Completion of functional behaviour interview (approx. 1 hour)
- Student training with researcher (approx. 1 hour in class time)
- Instructing students when to use self-management in class
- Provision of feedback to researcher (questionnaire/interview) (approx. 30 min out of class time)

NOTE: Most teacher involvement will occur during the initial stages of the trial (i.e. collaborating with researcher, student recruitment delivering of student training, organising observation sessions with the researcher).

TARGET STUDENT RESPONSIBILIITIES

- Meeting with researcher to provide assent (approx. 15mins class time)
- Student training session (approx. 1 hour in class time)
- Use intervention during regular classroom scheduling (no additional time as intervention to be used during regular activities)
- Provision of feedback to researcher (questionnaire/interview) (approx. 20min in class time)

RESEARCHER RESPONSIBILIITIES

- To organise all study materials (if access is required to school materials this will be discussed with teacher
- To collect behaviour observation data across all study phases*
- To make all study arrangements with the teacher at a time which suits
- Student training with teacher
- To inform teacher and other relevant school staff of study progress and findings

*CLASSROOM OBSERVATIONS: This study involves the researchers undertaking extensive classroom observation across a number of weeks. The teacher will not be involved in observation processes. The primary researcher will be present during the observation sessions. At times a second research will need to collect observation data to ensure the reliability of obtained data. Every effort will be made to ensure that the observers are non-disruptive to the classroom environment. All processes surrounding observations will be arranged with the teacher to suit their classroom. Observation data will not be collected until appropriate consent has been collected for all target and comparison students

The following table provides details outlining all participant involvement and observation processes

PROSPECTIVE TIMELINE

Italicised = Teacher Involvement Required

Term/Month	Week	Stage	Task
TERM 2			
	20th-24th	**Preliminary Prep**	*Teacher/Researcher Collaboration (Session 1)*
	27th-1st	**Preliminary Prep**	*Teacher/Researcher Collaboration (Meeting with Principal) -Prepare for student recruitment*
May	4th-8th	**Preliminary Prep**	*Classroom observation to prepare for student recruitment - Commence student recruitment*
	11th-15th	**Preliminary Prep/Stage 1**	*Teacher/Researcher Collaboration(Session 2) - Follow up on recruitment*
	18th-22nd	**Preliminary Prep/Stage 1**	*Prepare for Pre-Intervention Data Collection (Collect Teacher FBA Measures)*
	25th-29th	***Stage 1***	*Pre-Intervention Data Collection (Comparison Data/FBA)*
June	1st-5th	***Stage 1***	Prepare/Commence Baseline Data Collection
	8th-12th	***Stage 1***	Baseline
	15th-19th	***Stage 1***	Baseline
	22nd-26th	***Stage 1***	Baseline
HOLIDAYS			
July	*29th-3rd*	***Stage 2?***	~
	6th-10th	***Stage 2?***	*Teacher/Researcher finalise system and prep for training*
CAMP			
	13th-17th	*Stage 2*	*Teacher/Researcher finalise system and prep for training*
TERM 3			
	20th-24th	***Stage 1***	Baseline
	27th-31st	***Stage 3***	*Commence Intervention Student Training*
August	3rd-7th	***Stage 4***	Intervention
	10th-14th	***Stage 4***	Intervention
	17th-21st	***Stage 4***	Intervention
	24th-28th	***Stage 4***	Intervention
Sept	31st-4th	***Stage 4***	Fading of Intervention
	7th-11th	***Stage 4***	Fading of Intervention
	14th-18th	***Stage 4***	*Intervention Removal - Collection of Post Intervention Questionnaire Data*
HOLIDAYS			
	21st-25th		~
October	28th-2nd		~
TERM 4			
	5th-9th		
	12th-16th	***Stage 4***	Follow-Up Data Collection
	19th-23rd		
	26th-30th		
November	2nd-6th		
	9th-13th		
	16th-20th		
	23rd-27th		
	30th-4th		
	7th-11th		
	14th-18th		
END OF YEAR			

Unlikely to continue with intervention into terms 4 – however if there are roadblocks along the way we may need to consider this

STUDENT RECRUITMENT

Proposed Process

1. ***TEACHER NOMINATE 3-6 TARGET AND COMPARISON STUDENTS WHO MAY BE APPRORIATE FOR STUDY***
   - Consider the student selection criteria on Page 5
2. ***ARRANGE RESEARCHER CLASSROOM OBSERVATION***
   - Ideally the researcher will conduct non-intrusive observation of nominated students to determine whether their behaviour may be suitably addressed through self-management. All observation will occur at times which are suited to your class schedule – classroom observations may occur across 2-5 days.
3. ***SELECTION DISCUSSION***
   - Researcher-teacher discussion to reach a final decision
4. ***OBTAINING CONSENT***
   - As indicated in the explanatory statement teacher assistance is needed in obtaining consent from the parents/guardians of selected students. This will involve the teacher inviting parents/guardians to have their child participate in the current study. Teacher will be required to provide students' parents/guardians with an explanatory statement and a consent form – of which they will return to the researcher. **Teacher should encourage parents/guardians to contact the researcher if they have any questions/concerns.**
5. ***OBTAINING STUDENT ASSENT***
   - Once parent/guardian assent has been obtained the researcher will need to obtain assent from the participating students (if this is developmentally appropriate). This process will involve a short meeting between the students and the researcher during class time so that the researcher may obtain assent from the student.

Explanatory Statements and Consent Forms

Prior to any student participant taking part in this study informed consent must be obtained from the students' parents/guardians. As such the researcher has provided the teacher with three packages in order to do this.

PACKAGE 1: Target Students
Contains:
- Explanatory Statement
- Content Form
- Return Addressed Envelope
- Counselling Service/Support Information Sheet

PACKAGE 2: Comparison Students
Contains:
- Explanatory Statement
- Content Form
- Return Addressed Envelope
- Counselling Service/Support Information Sheet

PACKAGE 3: Class Students (non-participants)
Contains:
- Notice informing students' parents/guardians that the research project will be taking place

Participation Involvement and Responsibilities

	Collaboration Sessions	Student Assent Session	Pre-Intervention Questionnaire and Interview	Pre-Baseline Data Collection Sessions and Functional Behaviour Assessment (FBA)	Baseline Data Collection Sessions	Student Training Sessions	Intervention Sessions	Post Intervention Questionnaires and Interviews
Purpose	~Researcher introduce study ~Student nomination and recruitment ~Intervention adjustments ~Session scheduling	~Inform students of study ~Gauge student willingness to participate	~To determine teacher's view of target student behaviour before intervention ~To collect target student background ~To undertake FBA interview so that behaviour purpose can be identified	~To collect preliminary measure of comparison student behaviour (normative data) ~To collect preliminary measure of target student behaviour ~To determine the purpose of the target students' identified problem behaviour (FBA)	~Collect measure of target student behaviour before intervention#	~Train students in self-management system (in regular classroom scheduling)	~To collect measure of target student behaviour while they use the self-management system in the classroom#	~To collect student and teacher feedback on the intervention ~To determine teacher's view of target student behaviour post intervention
Expected No. of Sessions	2	1	1	To be determined (min. 5 sessions per student per subject)	To be determined (min. 5 sessions per student per subject)	3	To be determined (min. 5 sessions per student per subject)	1
Anticipated Session Length	1 hour each	10-15mins	To be determined	Anticipated 15-30min	Anticipated 15-30min	20minutes each	Anticipated 15-30mins	To be determined
Participant Involvement	Teacher Researcher	All Student Participants Researcher	Researcher Teacher For each target participant the teacher will complete: (a) a behaviour rating scale, (b) a student information questionnaire, and (c) an functional behaviour interview with the research	Researcher (secondary observer) - Researchers will collect observational behaviour data *(students engage in regular class))*	Same as Pre-Baseline	Researcher Teacher Target Students	Researcher will collect observation data Target Students will use intervention as they engage in regular class (Potentially Teacher - if extra training is required)	Teacher (for each target participant the teacher will need to complete a behaviour rating scale
Stage in the Study	Preliminary Preparation	Final Preparation	Stage 1	Stage 1: Pre-Baseline Phase	Stage 1: Baseline Phase	Stage 3: End of Baseline Phase	Stage 4:Intervention Phase	Stage 4
Anticipated Timeframe	Within one week of each other	In the same week as the collaboration sessions	Within a week	Across 1-2 weeks	Across 3-5 weeks	Within one week at the end of Baseline	Across 3-5 weeks	Within a week

All sessions and tasks are to be completed at times deemed suitable by the teacher – Times must be negotiated and agreed upon by the teacher and researcher
#During the Baseline and Intervention Sessions the researcher will conduct observations of the student participants to gain a direct measure of their behaviour in class. At times a second researcher will be present to conduct observations to ensure that behaviour observations are reliably obtained

Appendix E5.a- Target Participant Explanatory Statement, Consent Form and Principal's Letter

EXPLANATORY STATEMENT

For Parents of Nominated Target Students (Intervention Group)

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson (Chief Investigator) Faculty of Education [redacted]	**Professor Dennis Moore** (Co-investigator) Faculty of Education [redacted]	**Margherita Busacca** (Student Investigator) [redacted]	**Amanda Fernandez** (Student Investigator) [redacted]

Your child has been invited to take part in a research project being conducted by Margherita Busacca under the joint supervision of Dr Angelika Anderson and Professor Dennis Moore in the Faculty of Education at Monash University. Margherita will be completing this project as part of completing the Master of Psychology (educational and developmental)/PhD degree. Amanda Fernandez will be assisting Margherita in various aspects of this project to fulfil the requirements of the Graduate Diploma of Professional Psychology. Please take the time to read this Explanatory Statement in full before deciding whether or not you would like to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the contact details listed above.

What does the research involve?

The aim of this study is to develop and pilot a student self-management intervention package which can be easily implemented by teachers in regular primary school classrooms. We are interested in finding out if self-management interventions can be successfully used by students to improve appropriate classroom behaviour, and whether the package is suitable for use by teachers in regular classroom settings.

This research project is seeking the participation of a small number of primary school students who engage in high-frequency difficult (i.e. disruptive or inappropriate) behaviour during class time. The students we seek must also have a classroom teacher willing to assist them in reducing the occurrence of difficult behaviour and improving appropriate classroom behaviours through behavioural intervention. We aim to recruit 3-6 students who participate in a regular classroom setting.

As part of this study your child will participate in a self-management intervention during class time. The following points outline what your child will experience if you allow them to participate in this study.

1. Your child will participate in 2 or 3 training sessions (each lasting 30 or 20mins respectively) with their teacher and the student investigator where they will be taught strategies which they will use during class to self-manage their behaviour. It is likely that this will include students observing their own behaviour, discriminating between appropriate and inappropriate behaviour and recording the presence/absence of the targeted appropriate behaviour at designated times when cued by a subtle prompting device. Students will also be taught to set appropriate behavioural goals, evaluate their own behaviour against their personal goals and monitor their progress over time by graphing their recorded self-observations.

2. Once trained students will be instructed on when to use the self-management processes in class during school hours whilst engaged in regular classroom activities. This intervention is intended to be unobtrusive and minimally disruptive to teaching/learning processes.

3. For the duration of this project a researcher (at times two) will be present in the participating classroom to undertake observations the participating students (including your child) to monitor their behaviour. During the initial stages an exploratory interactive analysis of environmental factors that influence particular behaviours will also be undertaken to determine the purpose (or function) of student behaviour (formally referred to as a Functional Analysis). Observations and analyses will be minimally disruptive to the regular teaching/learning processes in class. It is expected that self-

management sessions will occur at least three days weekly and will not exceed longer than 20-45mins. The researchers anticipate that the project will not exceed the length of two school terms. The number of sessions per week and the project duration will be negotiated with your child's teacher/school.

4. At the completion of the study your child will be asked to engage in a brief (10-15min) interview session during class time with the researcher to provide feedback on the intervention. In this session your child will complete a short feedback questionnaire, assisted by the researcher where needed.

Parent/Guardian Involvement

Should you allow your child to participate in the proposed research you may be required to engage in a brief interview with the student researcher to provide some background information on your child. This interview will be completed in the early stages of the study and is not expected to take longer than 20 minutes. The interview will be scheduled at a time and location to suit you (alternatively it may be completed via phone).

Why your child has been chosen to be part of this research?

Your child's teacher was asked to identify a group of students who may possibly benefit from the proposed self-management intervention aimed at increasing appropriate classroom behaviours. Your child was one of these nominated children. The targeted behaviour will depend on the needs of your child and the recommendations of the classroom teacher.

Consenting to participate in the project and withdrawing from the research

Involvement in this study is voluntary and you are under no obligation to give consent for your child to participate. If you do provide consent, you may withdraw any time without explanation. You will also have the right to ask that any data collected to that point be destroyed. You have been provided with a consent form which you are asked to sign if you are happy for your child to participate in this project. By signing this form you also consent to your child's teacher disclosing relevant information about your child (such as age, classroom behaviour, and diagnosis/medical information if relevant to your child's education or behaviour). If your child has a diagnosis which impacts their classroom behaviour (i.e. Autism Spectrum Disorder, Attention Deficit Hyperactivity Disorder, etc) the teacher may potentially disclose sensitive information about approaches being used to manage the diagnosis at school (if relevant to your child's behaviour). This information may include medical or service related information (i.e. use of medication or intervention programs). If you would like for your child to participate in this study please sign this form and to return it to your child's classroom teacher. Students will be involved on a voluntary basis; if your child no longer wishes to participate at any stage of this research they will be allowed to stop.

Possible benefits and risks to participants

The project holds the potential to benefit the wider education community through the development of a self-management package which can be used by teachers to help students learn to actively manage their own behaviour in regular classrooms. Direct benefits for students include gaining greater responsibility for their behaviour, and increased appropriate classroom behaviours which may enable students to experience greater educational opportunities. Students may also develop skills which will help them to become more independent in the classroom. The participating teacher/s may experience benefits through reduced classroom behaviour management demands, increased time for academic instruction, and positive behaviour change in their classroom.

There is no major foreseeable risk for participating students. Students involved in this project will not miss class, and there will be minimal disruption to their normal classroom activities as the project will be adapted to suit class scheduling. Participating students may miss small portions of academic activity (due to training). The times at which this will occur will be negotiated with the classroom teacher to ensure there is minimal disruption to learning (i.e. training may occur during allocated free time). Students may be feel inconvenienced by the training sessions and brief follow-up interview; these inconveniences will be minimised by scheduling all processes at times to suit your child's class schedule. In some instances students may feel some discomfort if they do not achieve personal goals; risk will minimised by teaching and assisting students on how to set/re-evaluate their goals. If any concerns are raised or if any adverse outcome should arise during the course of this study you encouraged to inform a member of the research team immediately. If necessary the student researcher will assist in obtaining further assistance if required. Alternatively, you may directly contact any of the counselling and psychological services provided.

Confidentiality

Personal information will be confidential at all times. Every effort will be made to maintain confidentiality in any reports, presentations or subsequent publications resulting from this study. Where any data is reported, neither the participants nor school will be identifiable. Alternative fake names will be used to protect the confidentiality of all participants.

Storage of data

Data collected will be stored in accordance with Monash University Regulations, for a minimum of 5 years or until no longer required. All electronic data will be kept on a password protected University computer which can only be accessed by the researchers. All other data will be kept on University premises in a locked cabinet accessible only by the researchers, in a locked room. At the end of the storage period all data will be destroyed by shredding or through the deletion of the electronic data files.

Results

The results will be presented within a PhD thesis and a Graduate Diploma research project. They may also be published in the form of a research report and/or journal article. In addition a summary report will be prepared and made available to the school and any interested parents. In any case neither the individual participants nor the school will be identifiable in reported results. You will be notified as to when the summary report is available for your viewing, should you wish to read it.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted]
Fax: +61 3 9905 3831

Questions or Concerns

If you have any questions or concerns as a result of reading this information sheet, you are encouraged to address these with the student researcher, Margherita Busacca. You may also contact Margherita with inquiries about the research at any time throughout this study. If she is unable to address your questions or concerns to your satisfaction she will address these matters with the supervising investigators.

Thank you, **Angelika Anderson, Dennis Moore, Margherita Busacca and Amanda Fernandez**

Appendix E5.b- Comparison Peer Explanatory Statement, Consent Form and Principal's Letter

MONASH University

EXPLANATORY STATEMENT

For Parents of Nominated Comparison Peers (Social Validity Group)

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson	Professor Dennis Moore	Margherita Busacca	Amanda Fernandez
(Chief Investigator)	(Co-investigator)	(Student Investigator)	(Student Investigator)
Faculty of Education	Faculty of Education	[redacted]	[redacted]
[redacted]	[redacted]		

Your child has been invited to take part in a research project being conducted by Margherita Busacca under the joint supervision of Dr Angelika Anderson and Professor Dennis Moore in the Faculty of Education at Monash University. Margherita will be completing this project as part of completing the Master of Psychology (educational and developmental)/PhD degree. Amanda Fernandez will be assisting Margherita in various aspects of this project to fulfil the requirements of the Graduate Diploma of Professional Psychology. Please take the time to read this Explanatory Statement in full before deciding whether or not you would like to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the contact details listed above.

What does the research involve?

The aim of this study is to develop and pilot a student self-management intervention package which can be easily implemented by teachers in regular primary school classrooms. We are interested in finding out if self-management interventions can be successfully used by students to improve appropriate classroom behaviour, and whether the package is suitable for use by teachers in regular classroom settings.

This study is looking to recruit 3-6 students who present with satisfactory levels of appropriate behaviour. These students will be passive participants and are not required to engage in any study processes. The behaviour of these students will simply be observed to provide a benchmark for targeted behaviours.

Why your child has been chosen to be part of this research?

Your child's teacher was asked to identify a group of students who engage in satisfactory levels of appropriate behaviour in class. Your child was one of these nominated children.

Consenting to participate in the project and withdrawing from the research

Involvement in this study is voluntary and you are under no obligation to give consent for your child to participate. If you do provide consent, you may withdraw any time without explanation. You will also have the right to ask that any data collected to that point be destroyed. You have been provided with a consent form which you are asked to sign if you are happy for your child to participate in this project. By signing this form you also consent to your child's teacher disclosing relevant information about your child (such as age, classroom behaviour, and diagnosis if relevant). If you consent to your child's participation in this study please sign this form and to return it to your child's classroom teacher. Students will be involved on a voluntary basis; if your child no longer wishes to participate at any stage of this research they will be allowed to stop.

Possible benefits and risks to participants

The project holds the potential to benefit the wider education community through the development of a self-management package which can be used by teachers to help students learn to actively manage their own behaviour in regular classrooms. Direct benefits for students include gaining greater responsibility for their behaviour, and increased appropriate classroom behaviours which may enable students to experience greater educational opportunities. Students may also develop skills which will help them to become more independent in the classroom. The participating teacher/s may experience benefits through reduced classroom behaviour management demands, increased time for academic instruction, and positive behaviour change in their classroom.

There is no major foreseeable risk for participating students. Students involved in this project will not miss class, and there will be minimal disruption to their normal classroom activities as the project will be adapted to suit class scheduling. If any concerns are raised during the course of this study you encouraged to inform a member of the research team immediately. If necessary the student researcher will assist in obtaining further assistance if required. Alternatively, you may directly contact any of the counselling and psychological services provided.

Confidentiality

Personal information will be confidential at all times. Every effort will be made to maintain confidentiality in any reports, presentations or subsequent publications resulting from this study. Where any data is reported, neither the participants nor school will be identifiable. Alternative fake names will be used to protect the confidentiality of all participants.

Storage of data

Data collected will be stored in accordance with Monash University Regulations, for a minimum of 5 years or until no longer required. All electronic data will be kept on a password protected University computer which can only be accessed by the researchers. All other data will be kept on University premises in a locked cabinet accessible only by the researchers, in a locked room. At the end of the storage period all data will be destroyed by shredding or through the deletion of the electronic data files.

Results

The results will be presented within a PhD thesis and a Graduate Diploma research project. They may also be published in the form of a research report and/or journal article. In addition a summary report will be prepared and made available to the school and any interested parents. In any case neither the individual participants nor the school will be identifiable in reported results. You will be notified as to when the summary report is available for your viewing, should you wish to read it.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted] [redacted] Fax: +61 3 9905 3831

Questions or Concerns

If you have any questions or concerns as a result of reading this information sheet, you are encouraged to address these with the student researcher, Margherita Busacca. You may also contact Margherita with inquiries about the research at any time throughout this study. If she is unable to address your questions or concerns to your satisfaction she will address these matters with the supervising investigators.

Thank you, **Angelika Anderson, Dennis Moore, Margherita Busacca and Amanda Fernandez**

MONASH University

CONSENT FORM
For Parents of Nominated Comparison Students

Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson (Chief Investigator) Faculty of Education [redacted]	**Professor Dennis Moore** (Co-investigator) Faculty of Education [redacted]	**Margherita Busacca** (Student Investigator) [redacted]	**Amanda Fernandez** (Student Investigator) [redacted]

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
• My child being observed by researchers in the classroom	☐	☐

I understand that I can withdraw my consent at any time during this project. I understand that if my child does not wish to participate they will be allowed to withdraw from this research. I understand that I should contact the researchers listed above if I have any questions, queries or concerns regarding this project.

Name of Participant

Parent/Guardian Signature Date

PRINCIPAL'S LETTER

For Parents of Nominated Comparison Peers
Printed on School Letter Head

Dear Parent or Guardian

RE: Monash University Research Project - Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Your child has been invited to participate in a research project being conducted by Monash University in Mrs TEACHER's class this year. This project is being conducted by Margherita Busacca under the supervision of her supervisors Dr Angelika Anderson and Professor Dennis Moore. Margherita is completing her Master of Psychology (Educational and Developmental)/PhD degree and has my permission to conduct her research project within SCHOOL NAME.

This research project aims to investigate the effectiveness of a student *self-management intervention* in promoting appropriate student behaviour in the classroom. This project will involve trailing a self-management strategy with a group of students in your child's class over the next two terms to determine whether self-management can help improve students' classroom behaviour.

In conducting this research the researchers need to conduct observations on a number of students who present with satisfactory levels of appropriate classroom behaviour. This group of students will be considered *passive participants* – that is passive participant students will engage in their regular classroom activities throughout the whole study and will not be required to engage in any additional study procedures. Collection of observation data on passive student participants is required to obtain a benchmark for appropriate behaviour the classroom. With your consent, the researchers would like to observe your child to obtain a comparison benchmark for the study.

I would like to encourage you to read the attached explanatory statement provided by the Monash research team. The explanatory statement provides detailed information about the research project – this information details what the research project will involve for your child, consenting to the research, withdrawing from the research, benefits/risks to participants, confidentiality, how study data will be stored, what will happen with the results, and how you can address any questions, queries or complaints.

After reading the explanatory statement I invite you to complete the provided consent form if you are happy for your child to participate. If you do consent to your child's participation in this research study please send the completed consent form to the researchers in the provided envelope. If you have any questions/concerns about this research project please contact Margherita (contact details are on the attached forms) or your child's teacher, TEACHER.

Kind Regards

Principal

NOTE: Identifying detail removed to ensure school privacy and confidentiality is maintained

Appendix E5.c- Non-participating Peer Explanatory Statement and Principal's Letter

MONASH University

NOTICE TO PARENTS OF UPCOMING RESEARCH

For parents/guardians of non-participating students

Project: Promoting appropriate student behaviour: Self-management in regular primary school classrooms

Dr. Angelika Anderson (Chief Investigator) Faculty of Education [redacted]	**Professor Dennis Moore** (Co-investigator) Faculty of Education [redacted]	**Margherita Busacca** (Student Investigator) [redacted]	**Amanda Fernandez** (Student Investigator) [redacted]

Dear Parent/Guardian,

I am writing in regards to a study in which your child's class will be participating in 2015.

What does the research involve?
The aim of this study is to develop and pilot a student self-management intervention package which can be easily implemented by teachers in regular primary school classrooms. We are interested in finding out if self-management interventions can be successfully used by students to improve appropriate classroom behaviour, and whether the package is suitable for use by teachers in regular classroom settings.

What does this mean for your child?
A small group of students in your child's classroom will be participating in this study. This does not include your child. Your child will experience a researcher coming into their classroom in order to observe the behaviours of other students participating in the research. If you have any concerns or questions regarding the presence of the researcher in your child's class at any time, please contact your child's teacher and let them know. We would be happy to discuss any concerns you might have and to answer questions.

Possible benefits
The project holds the potential to benefit the wider education community and your child's class through the development of a self-management package which can be used by teachers to educate students in how to actively manage their own behaviour in regular classrooms. The teacher, may experience benefits through reduced classroom behaviour management demands, increased time for academic instruction, and positive behaviour change in their classroom.

Risks to your child
There is no foreseeable risk in this study for any children in the participating classroom. There will be minimal disruption to your child's classroom experience and education.

Confidentiality
Personal information will be kept confidential at all times. Students and the participating school will not be identified in any reports, presentations or subsequent publications resulting from this study. No data will be collected or reported on your child.

Results
The results will be presented within a PhD thesis and a Graduate Diploma research project. They may also be published in the form of a research report and/or journal article. In addition a summary report will be prepared and made available to the school and any interested parents. In any case neither the individual participants nor the school will be identifiable in reported results. You will be notified by your school as to when the summary report is available for your viewing, should you wish to read it.

Complaints
Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted] [redacted] Fax: +61 3 9905 3831

Thank you,

Angelika Anderson, Dennis Moore, Margherita Busacca and Amanda Fernandez

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PRINCIPAL'S LETTER

For Parents of Non-Participating Peers
Printed on School Letter Head

Dear Parent or Guardian

RE: Monash University Research Project - Promoting appropriate student behaviour: Self-management in regular primary school classrooms

I am writing to inform you about a research study that will be taking place within your child's class this year. The study is being conducted by Margherita Busacca under the supervision of her supervisors Dr Angelika Anderson and Professor Dennis Moore. Margherita is completing her Master of Psychology (Educational and Developmental)/PhD degree and has my permission to conduct her research project within SCHOOL NAME.

This research project aims to investigate the effectiveness of a student *self-management intervention* in promoting appropriate student behaviour in the classroom. This project will involve trailing a self-management strategy with a group of students in your child's class over the next two terms to determine whether self-management can help improve students' classroom behaviour.

While your child will not be participating in this study I would like to encourage you to read the attached explanatory statement provided by the Monash research team. The explanatory statement provides detailed information about the research project – this statement details what the research project will mean for your child, benefits/risks to students, confidentiality, what will happen with the results, and how you can address any questions, queries or complaints.

If you have any questions or concerns after reading the provided explanatory statement I invite you to contact Margherita (contact details are on the attached form) or your child's teacher, TEACHER.

Kind Regards,

Principal

NOTE: Identifying detail removed to ensure school privacy and confidentiality is maintained

Appendix E5.d- Target Students Assent Letter

MONASH University

Research Project Information for Students

You are invited to take part in a research project in your class. This sheet tells you information about this project and what is involved. If you do not understand anything just ask!

Who am I?

My name is Margherita Busacca and I am a research student from Monash University.

Self-Management

We are trying to find out about how children can improve the way they act/behave in class by learning how to watch and take note of their own behaviour - this is called self-management. By using self-management strategies we can learn to keep an eye on the way we act and focus on changing the way we behave in class.

Why be involved?

We are asking you and some other students to help in this project because we don't know very much about self-management. If you participate you will help to teach me important ways to help children like you in the future. What we learn may help other children to improve their behaviour in class.

Being involved in this project might help you to work better, learn better, and improve your behaviour in class. Learning self-management is not very difficult and might also help you to get along better with your teacher and friends.

What is involved?

If you participate in this project your teacher and I will teach you a self-management strategy to use in class. This will involve:

- Choosing a behaviour to keep track of (one you might want to work on improving)
- Learning how to observe/watch your behaviour and to take note of your behaviour using a (insert material/ device i.e. paper/pen or ipad).

What do I have to do?

When you can use the self-management strategy all by yourself you will use it during class to keep track of your behaviour. Your teacher will tell you when to use self-management. At the end of this project you will answer some questions to tell what you liked and what you did not like about using self-management.

What else will happen?

Over the next few weeks/two terms I will be watching you and the class to take note on how everything is going.

Who will know about this project?

Any information collected about you will be kept locked up safely. There might be a lot of people who read about this project. When they do they won't know about you because I won't use your name when I write about the things that I learnt from this project. If you want to know what you helped me learn, you can ask your mum or dad to find out the results when this project is finished.

Who can I talk to about this project?

You can talk to your teacher, parents/guardians or me any questions. If you have any questions you can ask at any time.

Being involved

Your parents/guardians have given you permission to take part in this project if you would like to. Even though your parents said "yes" you can choose not to be in this project. Take your time to think about being involved. Remember, being in this study is up to you and no one will be upset or mad if you don't want to take part. You can say yes now and change your mind later on if you like - all you have to do it tell your teacher, parents/guardians or me that you want to stop.

Thank you for reading this information sheet!

<u>Student assent to participate in self-management study</u>

This study information sheet has been read to me, ______________(student name) and I had a chance to ask questions about this project. I understand that this project is about self-management and would like to join the self-management group. I understand that my parents/guardians have given permission (said it is okay) for me to take part in this project run at school in my classroom.

I agree to:	Yes	No
• Join in the self-management group who will be trained by the teacher and researcher	☐	☐
• Let my teacher talk to the researcher about my behaviour in class	☐	☐
• Be observed by the researcher	☐	☐
• Answer some questions about what I think of self-management after the study ends	☐	☐

I am taking part in this project because I want to. I have been told that I that I can quit this project any time I like and that no one will be angry with me if I change my mind. I know that if I have any questions I should ask my teacher, parents or the researcher. I can ask questions about this study at any time.

(If you sign this paper, it means you have read / have been told about our study and you want to be in it. If you don't want to be in the study, don't sign the paper)

Student Name ____________________ Student Signature ____________________

Person Obtaining Assent ____________________ Signature ____________________

Date ____________________

Appendix E.6- Behaviour Observation Forms

OBSERVATION SHEET

Daily Sess No.____

____________________GROUP OF STUDENTS

Date: __________ Start Time: ______ End Time: ______ Interval: ______________________ Subject:____________ Lesson Type:_________________

OFF-TASK = X / ON-TASK = - DISRUPTIVE = X / Non-Disruptive= - (Out of classroom = O; No observation (i.e. could not see student) = •)

TARGET BEHAV.

Student #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ON-TASK/ OFF-TASK																														
NON-DISRUPT/ DISRUPTIVE																														
Re-Direction and Notes																														

OT= __= %

DB= __= %

Student #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ON-TASK/ OFF-TASK																														
NON-DISRUPT/ DISRUPTIVE																														
Re-Direction and Notes																														

OT= __= %

DB= __= %

Student #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ON-TASK/ OFF-TASK																														
NON-DISRUPT/ DISRUPTIVE																														
Re-Direction and Notes																														

OT= __= %

DB= __= %

Student #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ON-TASK/ OFF-TASK																														
NON-DISRUPT/ DISRUPTIVE																														
Re-Direction and Notes																														

OT= __= %

DB= __= %

__________OVERALL SESSION NUMBER ___________TARGET BEHAVIOUR ENTERED ___________IOA DATA ENTERED

SESSION DETAILS

☐ SUBJECT

- Maths Religion Literacy/Enquiry

Other____

☐ TYPE OF SESSION

- Individual work Partner work Group work (how many students)

Other____

- Seated at own desks Working around the room at other desks

Other____

- Ipad No iPad

Activity Description ____

____

NOTES (i.e. Student sick, major disruptions, change of activity, other students in class, etc):

____

____

____

____

CODING KEY

☐ TO = Talking Out

☐ TS = Talking to other Student

☐ Wo = Wondering

☐ Wa = Walking/Running

☐ S = Standing

☐ 3s= 3 Seconds of passive off-task

☐ NTR = Not task related

☐ TR = Task related

☐ POT = Passive off task

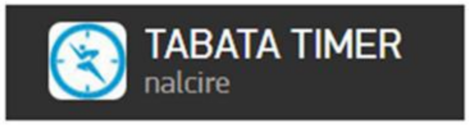
☐

T = Teacher attention, re-direction, instruction

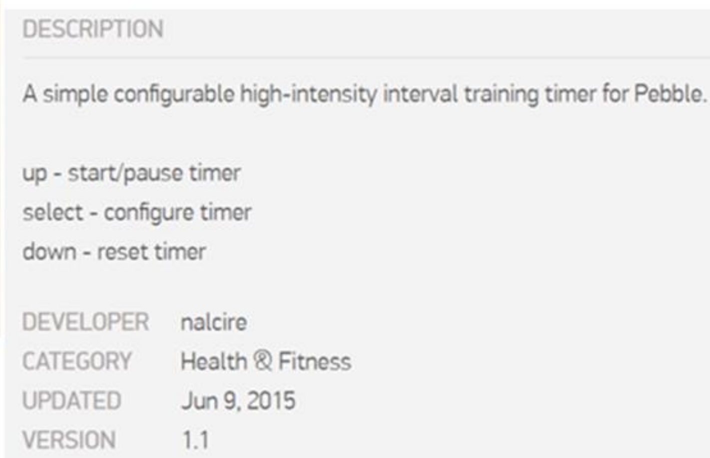
Circle if the teacher interaction is directed at the individual student or the individual's group

Do not circle if it is a general teacher interaction with the class

Appendix E.7- Pebble Smartwatch Interval-App (Observer Cue)



App installed on observer's Pebble Classic. Programmed to emit vibrations 10-s/5-s (work/rest)



DESCRIPTION

A simple configurable high-intensity interval training timer for Pebble.

up - start/pause timer
select - configure timer
down - reset timer

DEVELOPER	nalcire
CATEGORY	Health & Fitness
UPDATED	Jun 9, 2015
VERSION	1.1

App as viewed on Pebble Home menu (above left) and as viewed when activated (right). App description obtained from link below (above)

App Link
https://apps.getpebble.com/en_US/application/532611eadac14132e900003f?section=watchapps

Appendix E.8- Teacher History Questionnaire (THQ)

Participant Profile Form - Teacher Information

To be completed by teacher participating in the self-management intervention pilot study

The purpose of this questionnaire is to collect information about the following:

(a) Your teaching experience (i.e. your current teaching tole/position, past teaching experience, and qualifications)
(b) Information about the class your are teaching at {insert school name} primary school 2015
(c) Behaviour management strategies which you have implemented within your current class.

In addition to the listed questions, please feel free to provide any additional information that you believe may be relevant for the purpose of this study (a section for extra comments is provided at the end of this document).

Please note: You may choose not to answer some questions if you wish. All information is to be provided at your discretion. Simply leave blank any questions if you do not wish to provide a response. You may contact the researcher listed below to discuss any questions that you are uncomfortable with.

All information provided will remain confidential to the research team at Monash.

Your responses may form part of a PhD thesis, research report, journal article, and/or summary report which will be provided to the school. All identifying information about you will be omitted from any reporting of data resulting from this study. If you have any objections to the following information being used in any of those formats please inform the researcher.

If you have any questions or concerns about this questionnaire please contact the researcher (you may contact Margherita Busacca on 0400867957 or by email at margherita.busacca@monash.edu)

Thank you for taking the time to fill in this questionnaire

Completion Instructions

Most answers require you to mark a square like this ☐, or to write a short answer in the space provided. Some questions allow you to mark more than one box. When this is the case, clear instructions are given. You can 'mark' your choice by ticking the box, crossing the box or colouring in the box.

Questionnaire Completion

These two questions relate to the completion of this questionnaire

1. **Please indicate who has completed this questionnaire**
   ____

2. **Please indicate the data that you completed this questionnaire (day/month/year):**
   ______/______/__________

Professional Information

The following questions relate your professional teaching experience

1. Qualifications (i.e. Completed education – include special education qualifications if relevant)	______________________
2. Total years teaching experience	__________ years
3. Current teaching position/role	
4. How many years have you held your position at this school?	
5. a) What grade level/s are you currently teaching? b) How many years' experience do you have with this student level?	a)__________ b)__________
6. What grade level/s have you taught in the past?	

Class Structure and Environment

The following questions relate to the class you are teaching in 2015

7. How many students are in your current class?	
8. Do you have multiple grades in your class (i.e. Grades 3 and 4).	Grade levels__________ Number of students per level __________
9. Student age range	
10. Gender breakdown	Number of males:__________Number of females:__________
11. Do you have any students with special needs or diagnosed disabilities within your class? If so please indicate the number of students and what types of needs or disabilities they have	☐ No ☐ Yes (Provide detail below)
12. Do you have any students receiving additional or supplementary supports/ assistance in your class? (Can be academic, behavioural, social or other related)	☐ No ☐ Yes (Provide detail below)
13. Do you have any additional education professionals present in your classroom during the school week? (will any additional professionals be joining your class this year?) (i.e. learning aid, student teachers etc)	☐ No ☐ Yes (Provide detail below)
14. Do you have any additional people present in your classroom during the school week? (or will any additional people be joining your	☐ No ☐ Yes (Provide detail below)

class this year?) (i.e. parent helpers)	______________________________ ______________________________
15. Will it be possible for you to provide the research team with a description of your class schedule/routine (if you have one in place) at the time that this study will be taking place?	☐ No ☐ Yes (If yes a researcher will address this question with you)
Classroom Management Strategies and Student Behaviour	
16. Do you have any classroom rules in place within your class? If so how do you enforce these with students? (additional space provided at end of questionnaire if needed)	☐ No ☐ Yes (Provide detail below) ______________________________
17. Do you have any classroom management strategies in place in your classroom? (i.e. token economies, group contingencies, reinforcement systems etc) (If so please detail what these strategies are - additional space provided at end of questionnaire if needed)	☐ No ☐ Yes (Provide detail below) ______________________________
18. Do you have any students who are particularly difficult to manage in terms of behaviour (i.e. in terms of high frequency disruptive, problematic or inappropriate behaviour)	☐ No ☐ Yes (If yes can you give an indication as to how many students present with disruptive behaviour) ______________________________ *These students that you have in mind may be those which will be nominated for intervention in the self-management study. Please keep these students in mind when discussing student who may benefit from intervention with the researcher*

Additional Detail

If you need to provide additional detail for any of the questions above please do so below. Simply do so by writing down the number of the question followed by the necessary additional detail.

Appendix E.9- Student History Questionnaire (SHQ)

Student Participant History Questionnaire (Profile Form) – Teacher Version

To be completed by teacher participating in the self-management intervention pilot study

The purpose of this questionnaire is to collect information about students participating in the self-management intervention pilot study being conducted in {INSERT SCHOOL NAME} primary school in 2015. This will act as an intake questionnaire to elicit information about each student participant relevant to the self-management intervention. Please complete this form about the student you have nominated to participate in this study. Information collected through this questionnaire concerns the following:

(a) Student demographic information (including some medical history)
(b) Student behavioural concerns
(c) Behaviour management strategies

In addition to the listed questions, please feel free to provide any additional information that you believe may be relevant for the purpose of this study (a section for extra comments is provided at the end of this document).

Please note: This form is to be completed only after informed consent has been obtained from the student's parent/guardian by the researchers. You may choose not to answer some questions if you wish. All information is to be provided at your discretion. Simply leave blank any questions if you do not wish to provide a response. You may contact the researcher listed below to discuss any questions that you are uncomfortable with.

All information provided will remain confidential to the research team at Monash.

Your responses may form part of a PhD thesis, research report, journal article, and/or summary report which will be provided to the school. All identifying information about this student will be omitted from any reporting of data resulting from this study. If you have any objections to the following information being used in any of those formats please inform the researcher.

If you have any questions or concerns about this questionnaire please contact the researcher (you may contact Margherita Busacca on 0400867957 or by email at margherita.busacca@monash.edu)

Thank you for taking the time to fill in this questionnaire

Completion Instructions

Most answers require you to mark a square like this ☐, or to write a short answer in the space provided. Some questions allow you to mark more than one box. When this is the case, clear instructions are given. You can 'mark' your choice by ticking the box, crossing the box or colouring in the box.

Questionnaire Completion

These two questions relate to the completion of this questionnaire

1. **Please indicate who has completed this questionnaire**
   ____

2. **Please indicate the data that you completed this questionnaire (day/month/year):**
   _____/______/__________

Student Demographic Information

The following question relate to the student you are nominating for participation in the self-management pilot study due to high-frequency disruptive, inappropriate or problematic behaviour

1. Student's name	
2. Student's Gender	☐ Male ☐ Female
3. Student's age (Date of Birth)	Age:______ DOB(day/month/year):______/______/_______
4. Student's Grade	

Medical/Psychological Information

The following questions relate to this student's medical history in terms of diagnosed conditions

5. Does this student have any formal diagnoses/ conditions?	☐ No ☐ Yes (Provide detail below) ☐ Autism Spectrum Disorder (ASD) ☐ Attention Deficit Hyperactive Disorder (ADHD) ☐ Developmental delay ☐ Intellectual disability ☐ Cognitive Impairment ☐ Diagnosed Learning Disability ☐ Learning Problems ☐ Emotional disorder/condition Specify, ________________________ ☐ Depression ☐ Anxiety ☐ Behavioural disorders/conditions Specify, ________________________ ☐ Other ________________________ ________________________ ________________________
6. Does this student have any medial or physical conditions that may affect his or her behaviour in class? (i.e. asthma, allergies, seizures, hearing difficulties, sight difficulties)?	☐ No ☐ Yes (Provide detail below i.e. what condition and how it impacts behaviour) ________________________ ________________________ ________________________
7. (If relevant) is this student receiving any medication to manage the aforementioned diagnosis/conditions at school? If any do you believe these medications affect his or her behaviour?	☐ Unsure ☐ No ☐ Yes (Provide detail below if known) Medication: Dosage: Purpose: Times Take: Taken at school: ☐ No ☐ Yes

	Other Information:______________________________ ____ ☐ *Not relevant* (no diagnosis/condition to be medicated)
8. If you indicated that this child has a condition/ diagnosis are you in a position where you can provide information on the evaluation/assessments which were undertaken to obtain this diagnosis?	☐ *Not relevant* (no diagnosis/condition) ☐ No ☐ Yes If yes, are you (or another member of staff) able to provide information concerning the (a) the type of assessments, (b) the type of measures/tests administered, (c) who conducted the assessment, (d) when it was conducted and € what the general findings/recommendations were? (i.e. is this information on file) ☐ No ☐ Yes (a researcher will follow up this question at some point)
9. If this student does not have any diagnosed conditions, is he/she considered to be *at-risk* for any condition that you know of?	☐ No ☐ Yes (Provide detail below i.e. what condition) ____ ____ ____ ____
10. Please provide any other relevant information or psychological history that you believe is relevant to this student's involvement in this intervention pilot study	____ ____ ____ ____
Education/School Information **The following questions relate to this student's education and school involvement**	
11. *Mainstream/Regular Education*: Please detail this student's history of school placement in regular/mainstream education settings if known (please indicate unknown where relevant)	a. School grades completed in regular education (☐ unknown) ____ b. Grades retained/repeated: (☐ unknown) ☐ No ☐ Yes (what grade/s?) ____ c. Attended Previous Schools: (☐ unknown) ☐ Yes (Provide detail) ☐ No Name of School: Start Date: End Date: School Grades Undertaken: Reason for Discontinuing:
12. Special Education: Has this student experienced placement in any special education setting (i.e. resource classroom, psychoeducational centre, self-contained classroom etc)?	(☐ unknown) ☐ No ☐ Yes (Provide detail; describe where the placement occurred, how placement occurred and how long your child was in special education) ____ ____ ____

	____ ____ ____
13. Assessment relating to student's school performance and/or behaviour. Has this student undergone any psychological, psycho-educational, behavioural, intelligence, or achievement testing/assessment/ evaluation	☐ Yes (Provide detail) ☐ No (☐ unknown) Type of Assessment: Assessment Measures/Tests Administered: Who provided the assessment: When was the assessment undertaken: What were the general findings and recommendations? Was this assessment undertaken as a result of a school-based referral? ____ a. Does the school have these assessment reports on file ☐ Yes ☐ No If yes, are the researchers able to obtain copies of these reports if necessary? [If you select yes a researcher may contact you for further information] ☐ Yes ☐ No
14. A. Is this student *currently* receiving any supplemental or special education services in their regular classroom (i.e. integration aides, or special education services)? B. (If relevant) What is the pattern of staffing support that this child receives at school (e.g. 1:1, 2:1)? Do you believe that the number of staff or social interactions with this student affects the problem behaviour? (i.e. does student do better with more individualised attention?)	A. ☐ Yes ☐ No If yes please detail what services this child is *currently* receiving, what the service involves *and* the reason for them (Please select a box below if this student receives the listed services) ☐ Individualised Education Plan (IEP) ☐ Behaviour Intervention Plan ☐ Other____________________ ____ ____ ____ ____ B. ______________________________________ ____ ____
15. Has this student received any supplemental or special education services in their regular classroom *in the past* (i.e. integration aides, or special education services)?	☐ Yes ☐ No (☐ unsure) If yes please detail what services this student has received *and* the reason for them (Please select a box below if this student has received the listed services) ☐ Individualised Education Plan (IEP) ☐ Behaviour Intervention Plan ☐ Other____________________

	Please indicate the dates this student received special education services in the past
16. Does this student participate within the regular school classroom at all times?	☐ Yes ☐ No (If no please elaborate, i.e. is there times when this student is withdrawn from the regular school classroom to engage in alternative education programs or instruction elsewhere?)
17. Does this student have a consistent record of regular school attendance?	☐ Yes ☐ No (If no please detail why school attendance is inconsistent)

Student Behavioural Concerns

These questions relate to the behavioural concerns you currently have about this student

18. What are your main concerns about this student's behaviour? List each behaviour concern below. Then in your words can you *define* the problem behaviours that prompted your nomination of this student? (i.e. What they look like or how they are performed?)
(Example. Talking out of turn, work avoidance, inappropriate vocalisations, inattention, hyperactivity/over-active, uncooperative, not following the task or instruction, disruptive behaviours, hindering or interfering with other students' work, non-compliance, disobedience, out of seat behaviour, physical aggression, noisiness).

Give detail on and examples of the problematic/disruptive/inappropriate /challenging behaviour/s this child demonstrates (try to indicate the frequency and duration if possible)

Undesirable behaviours that you would like __________ (Student name) to do less often of not at all.
Example
Behaviour: Yelling
Definition: Uses obscenities and inappropriate language

1. Behaviour: ____
   Definition: ____
2. Behaviour: ____
   Definition: ____
3. Behaviour: ____
   Definition: ____
4. Behaviour: ____
   Definition: ____
5. Behaviour: ____
   Definition: ____

If needed there is additional space at the end of this questionnaire

19. For each behaviour of concern, listed above can you list the frequency (how often it occurs per day, week, or month), duration (how long it lasts when it occurs), and intensity (how disruptive the behaviours are when they occur)

FREQUENCY	DURATION	INTENSITY
5-6 times/week	5-10 seconds	Loud and easily audible

20. How long have each of the listed behaviours been a problem for in your classroom?	1. 2. 3. 4. 5.
21. Which of the behaviours listed in item 18 are likely to occur together in some way? Do they occur about the same time? In some kind of predictable sequence or "chain"? In response to the sme type of situation?	Example; Yelling and wandering around the room
22. Are there any other behaviours that concern you at this time?	☐ Yes (please detail) ☐ No
23. Were these behaviours (or others) a concern for this student's teacher last year?	☐ Yes (please detail) ☐ No (☐ unsure)

24. What classroom behaviour does this student need to work on to improve the problem behaviours? What behaviour/s would you like for this student to demonstrate? What is your expectation for good conduct in your classroom? What is acceptable?

Desirable behaviours that you would like __________ (student name) to do more often (or behaviours you would like him/her to start doing)

1. ____
2. ____
3. ____
4. ____
5. ____

If needed there is additional space at the end of this questionnaire

Details on Behavioural Concerns	
25. When are these behaviour of highest concern for you? When are they most and least likely to happen? (i.e. In the morning/afternoon? Before or after certain events? During a specific class? - maths instruction)	Highest Concern: ____ Most likely: ____ Least likely: ____
26. With whom are the behaviours most and least likely to happen? (i.e. different staff? Peers?)	Most likely: ____ Least likely: ____
27. When the student engages in the listed problem behaviours what usually happens immediately before the behaviour occurs?	____
28. What activities are most and least likely to produce the behaviours?	Most likely: ____ Least likely: ____
29. A. What things can you do (or do you do) to improve the likelihood that a teaching session or other activity will go well with this student? B. What things do you avoid that might interfere with or disrupt a teaching session or activity with this student?	A. ____ B. ____

30. For each behaviour listed in item 19, try to identify the specific consequences or outcomes that occur to the student when the behaviour occurs in different situations

Behaviour	Situation	What does the student get?	What do you think the student is avoiding?
Example: Yelling out	Group work; seat work, situations with little teacher attention	Attention (from peers and teacher)	
Example: Walking around the room	Seat work	Attention (from peers and teacher)	Doing the assigned task
1.			
2.			
3.			
4.			

31. A. How do you react when the student demonstrates the listed behaviours? (i.e. do you tell the student off, send them to time out or to the principal's office?) B. How does the student respond to your reaction?	____
32. Do you currently have any behavioural behaviour management strategies in place to manage this students behaviours? (i.e. rewards, group contingencies etc)	☐ Yes (please detail) ☐ No ____ Have these been successful? If so detail? ____
33. (If any) What other strategies or interventions have you previously attempted in the past? (What has been successful/unsuccessful?)	____
34. What do you know about the history of these undesirable behaviours? (i.e. past programs/interventions used in attempts to decrease problem behaviour outside of school? In other settings? Effects of any such programs?)	____

Impact of Behaviour	
If you have listed multiple behaviours for question 17 please specify specific impacts of each behaviour if known.	
35. Does the student's behaviour impact on school work and/or academic achievement? If so, how?	☐ Yes (please detail) ☐ No ____
36. Does the student's behaviour impact negatively on the teacher-student relationship?	☐ Yes (please detail) ☐ No ____
37. Does the student's behaviour impact negatively on their peer relationship?	☐ Yes (please detail) ☐ No ____

38. Does the student's behaviour impact negatively on this students school participation?	☐ Yes (please detail) ☐ No
Additional Information	
39. Are you aware of whether this student is engaged in any therapies or intervention programs outside of school?	☐ Yes (please detail) ☐ No
40. Does his student have any additional physical, medical, or health issues/conditions? (i.e. hearing, visual or language impairments) Discuss. Is it possible these are related to the identified challenging behaviour?	☐ Yes (please detail) ☐ No
41. Does this student seem to enjoy coming to school? Do they enjoy participating in class activities?	☐ Yes (please detail) ☐ No
42. How is this student performing in an academic sense? (i.e. is this student's work below, on par, or above the grade level?)	☐ Yes (please detail) ☐ No
43. Are you aware of any changes or events which may be related to the student's behaviour? (i.e. changing school, changing class, bullying, changes at home such as moving house, family difficulties, birth of a sibling, parental separation).	☐ Yes (please detail) ☐ No

Additional Information

If you wish please use this space to provide any additional information for the questions you have just answered. Also use this space if you wish to provide any additional information that you view to be relevant to this student's behaviour.

Appendix E.10- Student Self-Graphing Sheet

HOW AM I GOING? % on-task appropriate

SUPERSTAR!

Getting There!

You can do better...

100%											
90%											
80%											
70%											
60%											
50%											
40%											
30%											
20%											
10%											
DAY											
% YES											
Subject											

Appendix E.11- SMAT Process Prompt Sheets

TEACHER PROMPT SHEET

Self-Management

1. **Deliver**… Academic Instruction (tell class to start activity)

2. **Prompt**…students to gather self-management devices and set up


(watch on wrist and SMAT website open on iPad)

3. **Check**… students are clear on their tasks and what behaviour is expected.

4. **Signal**… students to begin self-management right away (start watch) just before starting the task

5. **Remind**… students to self-record ACCURATELY when the watch vibrates and to get straight back to work after the recording

---

PACK UP

- Five min before end of session prompt students to…
  - *End self-management session (press pause on watch)*
  - *Graph their performance*

STUDENT PROMPT SHEET – Starting-Up

Self-Management

Getting Started

SET UP
STEP
1. BE CLEAR ON THE ACTIVITY INSTRUCTIONS AND BEHVIOUR EXPECTATIONS
2. Get your watch from box, put on and OPEN SMAT
3. Login to the SMAT Website on your iPad– place iPad on your work spot out of the way where you can see it
4. Push START on the watch when instructed
5. START YOUR TASK
When the watch buzzes record your behaviour - **YES if you are on-task** - **NO if you are off-task**
REMEMBER… **Record your behaviour QUICKLY, QUIETLY and then get back to work!**


STUDENT PROMPT SHEET – Self-Management

Self-Management Steps

STEPS
Watch Vibrates
1. Ask yourself… ***AM I ON-TASK? AM I BEHAVING APPROPRIATELY?***
2. OBSERVE your behaviour Are you on-task? Is it what the teacher asked you to do?
3. RECORD your behaviour *IMMEDIATELY* - ***YES*** *if you are on-task and behaving appropriately* - ***NO*** *if you are off-task or behaving inappropriately*
IF YOU RECORD NO REMIND YOURSELF TO GET BACK ON TASK
4. Get straight back to work after recording your behaviour
5. **CHECK smat.rocks on your iPad to see how you are going throughout the lesson**
REPEAT AFTER EACH VIBRATION

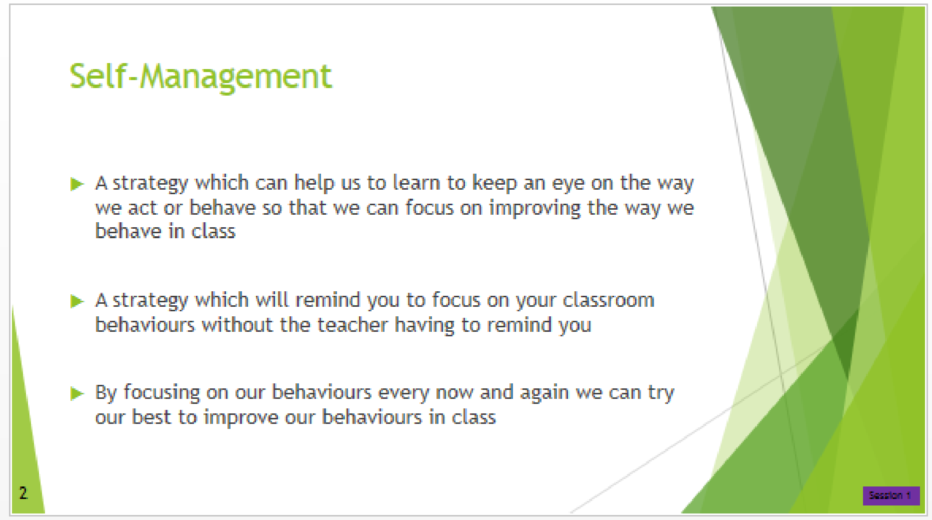
STUDENT PROMPT SHEET – Finishing Up

Self-Management Finishing Up

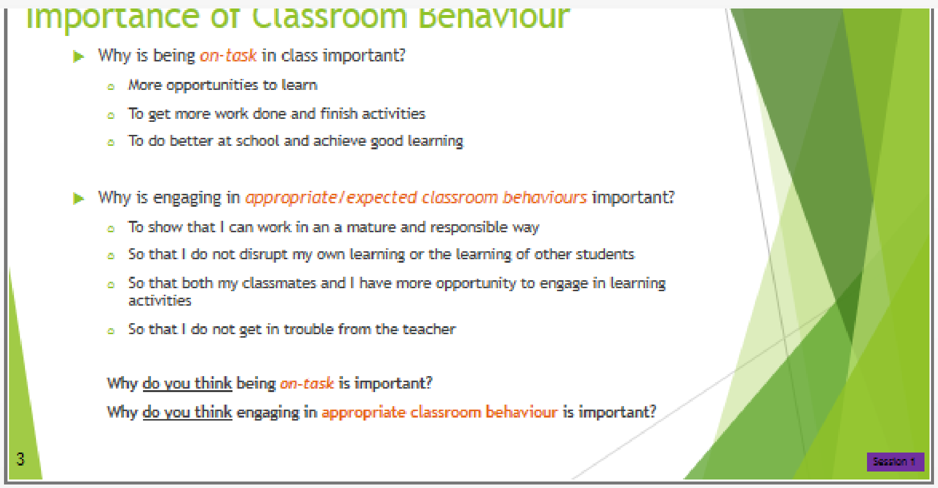
FINISH/PACK-UP
STEP
1. Press pause on your watch when instructed
2. Graph session behaviour performance on graph
3. Open the most recent session on the SMAT website
4. Find the **% yes** (note down your % of yes response)
5. Get out your graphing sheet
6. Record % of yes in the appropriate graphing area (ASK FOR HELP IF YOU GET STUCK)
7. Pack up the self-management devices - Put iPad away - Put watch back in box - Put graph away

Appendix E.12- Student Training PowerPoint Slides

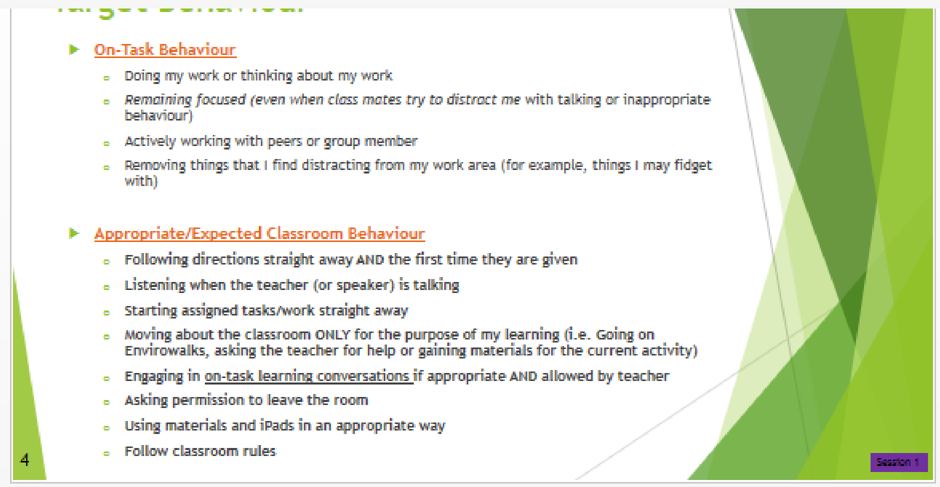
1



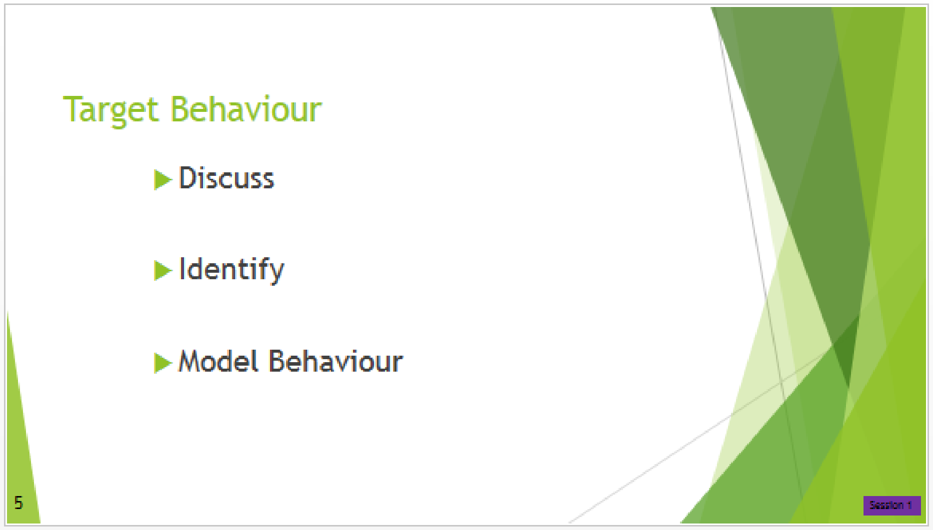
2



3



4


Target Behaviour
Discuss
Identify
Model Behaviour
5
Session 1

5


Behaviour Reminder
Starting my work straight away
Doing my work or thinking about my work
Raising my hand to ask or respond to a question
Listening when the teacher (or speaker) is talking
Follow directions the first time they are given
Walking or standing around (except if on Envirowalk)
Looking around the room or playing with things instead of working
Talking to friends – Off-Task Conversations (Learning conversations with teacher permission)
What behaviours do you want to work on improving?
6
Session 1

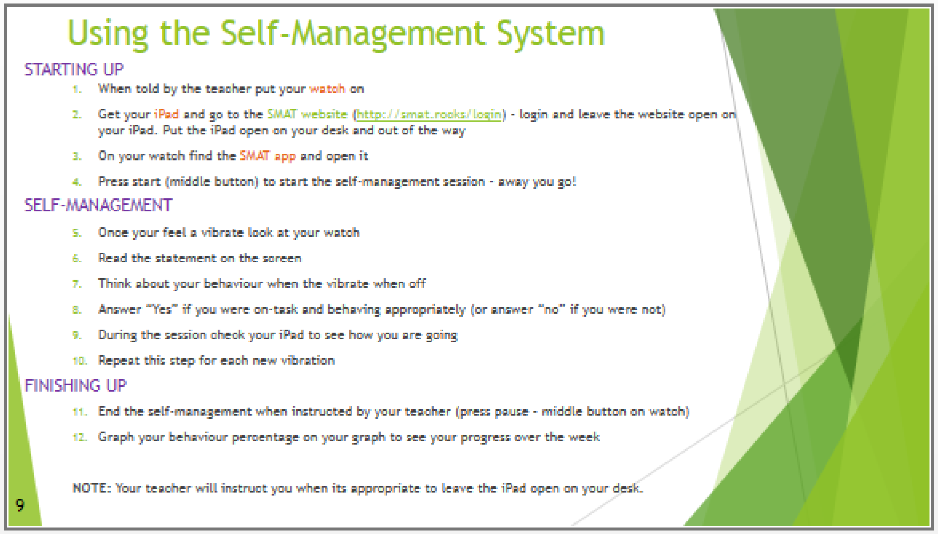
6


What will I need?
Pebble Watch
iPad
SMAT login page (http://smat.rocks/login)
Weekly Behaviour Chart
7
Session 2

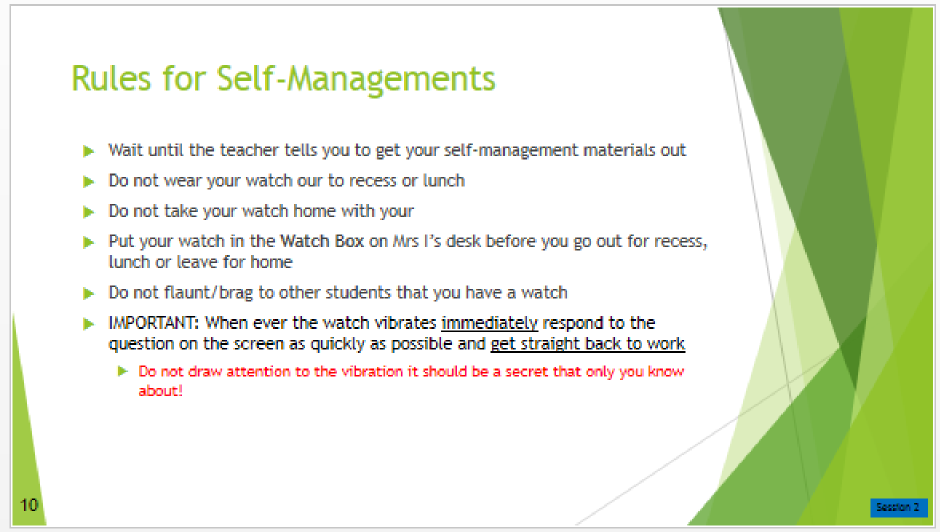
7


Steps to Self-Management
Watch Vibrate
At each vibrate ask yourself
"am I on-task? am I behaving appropriately?"
Observe
Observe your behaviour
"what am I doing right now? Is it in line with my target behaviours? It is in line with what is expected for this task"
Record
Record your behaviour
respond "yes" or "no" to the question on the watch
Keep Track
Keep track of how you are going throughout the lesson
8
Session 2

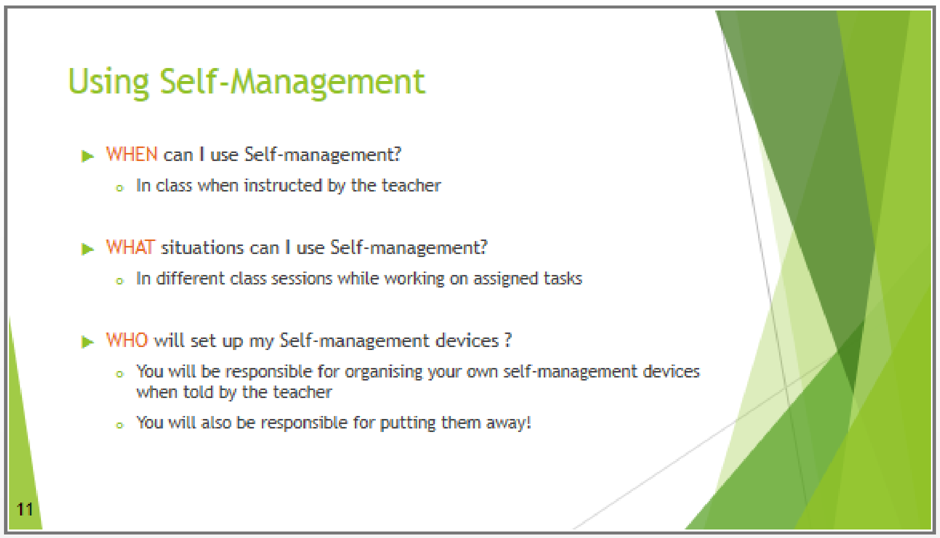
8


Using the Self-Management System
STARTING UP
1. When told by the teacher put your watch on
2. Get your iPad and go to the SMAT website (http://smat.rocks/login) - login and leave the website open on your iPad. Put the iPad open on your desk and out of the way
3. On your watch find the SMAT app and open it
4. Press start (middle button) to start the self-management session - away you go!
SELF-MANAGEMENT
5. Once your feel a vibrate look at your watch
6. Read the statement on the screen
7. Think about your behaviour when the vibrate when off
8. Answer "Yes" if you were on-task and behaving appropriately (or answer "no" if you were not)
9. During the session check your iPad to see how you are going
10. Repeat this step for each new vibration
FINISHING UP
11. End the self-management when instructed by your teacher (press pause - middle button on watch)
12. Graph your behaviour percentage on your graph to see your progress over the week
NOTE: Your teacher will instruct you when its appropriate to leave the iPad open on your desk.
9

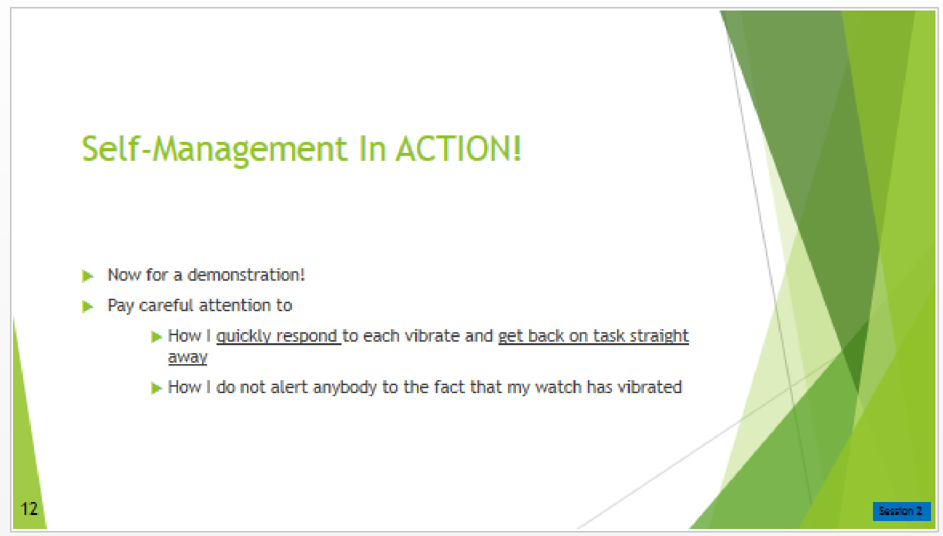
9


Rules for Self-Managements
Wait until the teacher tells you to get your self-management materials out
Do not wear your watch our to recess or lunch
Do not take your watch home with your
Put your watch in the Watch Box on Mrs I's desk before you go out for recess, lunch or leave for home
Do not flaunt/brag to other students that you have a watch
IMPORTANT: When ever the watch vibrates immediately respond to the question on the screen as quickly as possible and get straight back to work
Do not draw attention to the vibration it should be a secret that only you know about!
10
Session 2

10


Using Self-Management
WHEN can I use Self-management?
In class when instructed by the teacher
WHAT situations can I use Self-management?
In different class sessions while working on assigned tasks
WHO will set up my Self-management devices ?
You will be responsible for organising your own self-management devices when told by the teacher
You will also be responsible for putting them away!
11

11


Self-Management In ACTION!
Now for a demonstration!
Pay careful attention to
How I quickly respond to each vibrate and get back on task straight away
How I do not alert anybody to the fact that my watch has vibrated
12
Session 2

12

Appendix E.13a- SMAT Student Training Checklist

TRAINING CHECKLIST

Status Coding Key

☑ = Implemented in Full; ✓ = Partially Implemented; ☒ = Not Implemented; N/A = Not Applicable

Training Step	Status	NOTE
SESSION 1 – INTRODUCE BEHAVIOUR **AIM:** After this first session students should: - have a vague idea of what the intervention is - know what target behaviours are and understand their importance (rationale for intervention) - discriminate between ideal target behaviours and problem classroom behaviours - identify (and possibly demonstrate) examples and non-examples of target behaviours		
Step (a): BRIEFLY INTRODUCE THE INTERVENTION: PROVIDE RATIONALE FOR SELF-MANAGEMENT AND IMPROVING TARGET BEHAVIOUR	__/__/2015	
▪ Introduce self-management [SLIDE 2]		
▪ DISCUSS Importance of on-task and appropriate behaviour. Provide examples of why the target behaviour is important. [SLIDE 3]		Talk about on-task and appropriate/expected classroom behaviours in general terms here – behaviours will be explored in greater detail in Step (b)
▪ Ask the students why it is important to demonstrate these behaviours? Have the student brainstorm 2-4 additional reasons for why the target behaviour is important [SLIDE 3]		
Step (b)*: CLARIFICATION OF TARGET BEHAVIOUR AND BEHAVIOUR DISCRIMINATION	__/__/2015	
▪ (i) Identify and name the target behaviour [SLIDE 4]		
▪ (ii) Describe what the behaviours look like [SLIDE 4]		
▪ (iii) Discuss examples and non-examples of the target behaviour [SLIDE 4]		See Slide 4 and engage in discussion of examples and non-examples of all of the behaviours listed on the slide
▪ (iii) Model behaviour - Adult role play/demonstrate examples and non-examples of the target behaviour		See prepare role plays and discuss with teacher
▪ (iv) Student Behaviour Identification Practice (i.e. **Discrimination Training)**: Have students correctly identify/label behaviour demonstrations		Praise and reinforce accurate behaviour identifications; provide corrective feedback for incorrect identification. Provide prompts if students are unable to identify behaviours or are having difficulty
Discrimination Training Mastery Criterion **MASTERY:** Have students discriminate between examples of target and non-target behaviour until they correctly do so **three times in a row <u>unprompted</u> (or min 80% correct)** Check whether students meet mastery criteria checklist (Item 1		
Step (c): CREATE: TARGET BEHAVIOUR PROMPT: STUDENT PRACTICE OF THE TARGET BEHAVIOUR	__/__/2015	***NOTE: if necessary***
• Introduce and explain what TBP is to students [SLIDE 6]		To be described in terms of a 'behaviour reminder' to students
• Show students the prepared template and discuss the behaviours listed on the template		Ensure students have clear understanding of the behaviours on the card
• Assist students in identifying additional Target Behaviours to display on their TBP		
• Explain that students are to complete their TBP by inserting pictures of themselves acting out (modelling) each of the behaviours		Students to work together (with adult assistance) in modelling behaviours, taking photos with their iPads and inserting pics into the document
• Have student complete the TBP		Assist students in creating the TBP (take photos, model behaviour and format).
▪ Further Student Role-Play (after creating the TBP): Have student model target behaviour		Prompt students to demonstrate target behaviour upon request Have student identify and label the behaviour they demonstrate. Praise and reinforce correct demonstrations of target behaviour; provide corrective feedback for incorrect demonstrations Provide prompts if students are unable to demonstrate target behaviour
Student Role Play Mastery Criterion **MASTERY:** Have students demonstrate examples of target and non-target behaviour until they correctly do so **three times in a row <u>unprompted</u> (or min 80% correct)** Check whether students meet mastery criteria checklist (Item 2)		

SESSION 2 – INTRODUCE THE SELF-MANAGEMENT SYSTEM

AIM: After this first session students should:

- know what the self-management system involves and be familiar with the materials/devices
- have a clear understanding of intervention terms – i.e. self-monitoring and self-charting
- have an understanding of how to use the self-management (researcher/teacher to show students how to use all device/materials and how to engage in the self-management process)
- be set up and read to undertake practice of the self-management system (next session)

Step (d): INTRODUCE THE SELF-MANAGEMENT SYSTEM	__/__/2015	
▪ Introduce and explain the purpose of each self-management element - Prompt (watch) - Record (watch) - Session Monitor Tool (website/iPad) - Daily/Weekly Monitor Tool (graph sheet) [SLIDE 7]		
▪ Explain how the watch and iPad combo is used in the self-management procedure - Vibration Prompt - Recording on Watch - View iPad to Monitor - Charting progress on spread to Monitor progress over week [SLIDE 8]		
▪ Allow students to 'play' with the watch/iPad combo		
Step (e): MODEL (THINK-ALOUD) THE SELF-MANAGEMENT STRATEGY	__/__/2015	
▪ Model the entire self-management procedure - Access SMAT on PEBBLE - Find SMATwebsite on iPad - Start SMAT sessions on PEBBLE - Recording after vibrations - Observing recordings on SMAT website - Finishing SMAT sessions - Viewing session data - Recording on graph sheet [SLIDE 9]		Model examples of target behaviour whilst showing students how to self-observe/self-record accurately at the appropriate time Check whether students have any questions
▪ Explain watch and iPad rules [SLIDE 10]		

SESSION 3 – PROVIDE PRACTICE

AIM: After this first session students should:

- be able to use the self-management strategy independently, accurately and proficiently
- be ready to record on their own in class sessions after this session

Step (f): PROVIDE GUIDED PRACTICE OPPORTUNITIES FOR STUDENTS (in training)	__/__/2015	
▪ Have students practice the entire self-management procedure *Practice until judgement determines that the student will be able to use relatively independently in class.*		It is expected that students will require a guided practice this first time – provide assistance or prompting where required if necessary. If student can use strategy independently allow to do so.
▪ Give students feedback on how they are going with the strategy		reinforce all accurate recordings at the appropriate times and provide corrective feedback if necessary
Mastery/Procedural Accuracy ▪ ***Procedural Fidelity Mastery Criterion*** ▪ ***Recording Accuracy Mastery Criterion*** Check whether students meet mastery criteria on checklist (Item 3, 4, 5, 6)		
Step (g): Discuss the When, What, Who, and How* (INTERVENTION HOUSEKEEPING)	__/__/2015	
▪ Inform students of the following - When self-management will be used in class? - What situations self-management will be used in? - What is required for set up? - How will it be used? - When (date) the intervention will start [SLIDE 11]		Make sure that students are clear on all of these points
▪ Teach learners to independently gather the necessary materials/devices for the intervention		
Step (h): Independent practice in the actual classroom setting	__/__/____	
▪ Allow students to practice the entire self-management procedure in the target setting		
▪ Give students feedback on how they are going with the strategy (corrective feedback if necessary)		Prompt students if required to self-record accurately at the appropriate time.
Mastery/Procedural Accuracy ▪ ***Procedural Fidelity Mastery Criterion*** ▪ ***Recording Accuracy Mastery Criterion*** Check whether students meet mastery criteria on **Training Fidelity and Accuracy Checklist** **Have student practice using for a minimum of one 15min session with:** - **Complete procedural independence (items 1, 2, 4)** - **At least 80% recording accuracy (or three consecutive intervals) (Item 3)**		

*Steps to occur simultaneously

Appendix E.13b- Guided and Independent Practice Checklist

FIDELITY CHECK AND MASERY CRITERION-GUIDED & INDEPENDENT PRACTICE

This checklist is to be completed at the completion of any guided practice session completed in training.

GUIDED PRACTICE CHECKLIST						
Indicators of mastery during guided practice	Yes			No		
1. Can the student independently set up their self-management system? (i.e., , start session, view prompt card, access graph)	T	J	P	T	J	P
A. put on watch						
B. get iPad out and access SMAT website						
C. open SMAT app on watch						
D. start self-management session on watch						
Student should be able to complete aspects of this step two times in a row with minimal assistance						
2. Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)	T	J	P	T	J	P
A. Does the student look at the watch when the vibration goes off						
B. Does the student read the statement on the screen and consider their behaviour at that particular moment						
C. Does the student accurately record their behaviour when the vibration is emitted						
D. Does the student get on with their task after recording their behaviour						
E. Does the student check their iPad to see if their recording was made and to see how their behaviour is going						
Student should be able to complete aspects of this step two times in a row independently *NOTE: Student must accurately record their behaviour 80% of recordings on each practice*						
3. Can the student independently end the session, graph their performance and pack up their self-management system?	T	J	P	T	J	P
A. Can student press pause on the watch when instructed to do so						
B. Student can open their last session on the SMAT website and observe the %yes responses for the previous session						
C. Student can record %yes responses in the appropriate graphing area on the spread sheet						
D. Student can pack up self-management devices at the end of the session						
Student models correct use of the self-management system for two consecutive practices						

This checklist is to be completed at the completion of any independent practice session completed in class.

INDEPENDENT PRACTICE CHECKLIST						
Indicators of mastery during independent practice	Yes			No		
1. Can the student independently set up their self-management system? (i.e., , start session, view prompt card, access graph)	T	J	P	T	J	P
A. put on watch						
B. get iPad out and access SMAT website						
C. open SMAT app on watch						
D. start self-management session on watch						
Student should be able to complete aspects of this step two times in a row independently						
2. Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)	T	J	P	T	J	P
A. Does the student look at the watch when the vibration goes off						
B. Does the student accurately record their behaviour when the vibration is emitted						
C. Does the student get on with their task after recording their behaviour						
D. Does the student check their iPad to see if their recording was made and to see how their behaviour is going						
Student should be able to complete aspects of this step two times in a row independently *NOTE: Student must accurately record their behaviour 80% of recordings on each practice*						
3. Can the student independently end the session, graph their performance and pack up their self-management system?	T	J	P	T	J	P
A. Can student press pause on the watch when instructed to do so						
B. Student can open their last session on the SMAT website and observe the %yes responses for the previous session						
C. Student can record %yes responses in the appropriate graphing area on the spread sheet						
D. Student can pack up self-management devices at the end of the session						
Student models correct use of the self-management system for two consecutive practices						

Appendix E.13c- SMAT Post-Training Student Mastery Checklist

POST-TRAINING SESSION FIDELITY AND ACCURACY CHECKLIST

This checklist is to be completed at the completion of each training session to evaluate students' general capability of utilising the self-management

POST-TRAINING SESSION TRAINING FIDELITY AND ACCURACY CHECKLIST						
General indicators of mastery during guided and independent practice	Yes			No		
1. [SESSION 1] Can the student identify examples and non-examples of the target behaviour?	T	J	P	T	J	P
Student identifies behaviour correctly three times in a row OR obtains 80% correct responses (out of 10).						
2. [SESSION 1] Is the student able to demonstrate examples of the target behaviour (i.e. can the student distinguish and perform the behaviour themselves)?	T	J	P	T	J	P
Student models behaviour correctly three times in a row OR obtains 80% correct responses (out of 10).						
3. [SESSION 2] Does the student use the self-management device/materials correctly?) (i.e. Can the student demonstrate use of the self-management materials/device while performing the target behaviour during practice opportunities?)	T	J	P	T	J	P
Student models correct use of the self-management system for two consecutive practices						
4. [SESSION 2/3] Does the student accurately record their behaviour when using the self-management strategy? (i.e. can the student accurately record when they have or have not demonstrated the target behaviour	T	J	P	T	J	P
Student self-manages ACCURATELY for three consecutive intervals (or 80% vibrations) – i.e. accurately records behaviour (for two consecutive practices)						
5. [SESSION 3] Can the student independently set up their self-management system? (i.e. put on watch, access website, start session, view prompt card, access graph)	T	J	P	T	J	P
6. [SESSION 3] Can the student independently pack up their self-management system?	T	J	P	T	J	P
7. [SESSION 1] Does the student identify the importance of the target behaviour?*	T	J	P	T	J	P
8. [SESSION 1] Does the student describe the benefits of the self-management system? *	T	J	P	T	J	P
*While it is ideal that the student satisfies master indicators five and six, these are not compulsory for implementing the intervention during class time. Though they are ideal for increasing student motivation to engage in the intervention process.						

Appendix E.14.a- Adult Intervention Fidelity Checklist

Daily Sess No.____

Date: __________ **Start Time:** ______ **End Time:** ______ **Total Session Time:** ______________

Observer:_______________ Implementer:________________ Condition: _________________

IMPLEMENTATION – TEACHER SET-UP								
Step	DAY	T		J		P		Note
1. INSTRUCT: Academic instruction delivery	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
2. COMMENCE ACTIVITY: instruct class (or students) to commence activity/task	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
3. SET-UP MATERIALS: Prompt students to independently gather materials for SMAT and to set up	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
4. START SMAT: Signal students to begin using the SMAT system and to start their task	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
Notes								

IMPLEMENTATION – TEACHER END OF SESSION								
Step	DAY	T		J		P		Note
5. END SMAT: Prompt students to end the SMAT session by pushing pause on their watch	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
6. GRAPH: Instruct students to graph their performance	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
7. FINISH SESSION: tell students to put their materials away in the appropriate location	Mon	Y	N	Y	N	Y	N	
	Tue	Y	N	Y	N	Y	N	
	Wed	Y	N	Y	N	Y	N	
Notes								

Adult Fidelity Checklist Items

Step
Starting-Up
1. INSTRUCT: deliver academic instruction
2. COMMENCE ACTIVITY: instruct class (or students) to commence activity
3. SET-UP MATERIALS: prompt students to independently gather materials for SMAT and to set-up
4. START SMAT: signal students to begin using the SMAT system and to start their task
Finishing-Up
5. END SMAT: prompt students to end the SMAT session by pushing pause on their watch
6. GRAPH: instruct students to graph their performance
7. FINISH SESSION: tell students to put their materials away in the appropriate spots

Appendix E.14b- Student Intervention Fidelity Checklist

Daily Sess No.____

Date: _________ **Start Time:** _____ **End Time:** _____ **Total Session Time:** ____________Observer:____________ Implementer:____________ Condition: _______________

IMPLEMENTATION – STUDENT SET-UP AND START														
Step	DAY	T				J				P				Note
1. Listen: student present for academic instruction	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
2. OBTAIN WATCH: student obtained watch from box when instructed by the teacher and put it on	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
3. SET-UP MATERIALS: (A) logged into SMAT website on iPad and (B)* set up at workspace (out of the way) *optional	Mon	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
	Tue	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
	Wed	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
4. OPEN SMAT: student opened the SMAT app on the watch	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
5. START: student pushed start on watch to start SMAT session PP (start on SMAT website observed?): Y N	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				
	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				

IMPLEMENTATION – STUDENT END OF SESSION														
Step	DAY	P				A				S				Note
6. PAUSE: student pushed pause to end session when instructed	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				
PP (pause on SMAT website observed?): Y N	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
		PP: Y N				PP: Y N				PP: Y N				
7. GRAPH: student graphed performance (when instructed)	Mon	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		
	Tue	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		
PP (graph): Y N	Wed	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	☑ +	✓ +	☒	NA	
Graph Timing (GT)		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		PP: Y N		GT: 1 2		
GRAPHING STEPS	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	A
A. OPEN completed session on the SMAT website		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	B
		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	C
B. OBSERVE % of yes responses	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	A
		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	B
		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	C
C. RECORD % of yes responses in appropriate graphing area	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	A
		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	B
		☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	C
8. PACK UP after session (watch in box; iPad and graph sheet away)	Mon	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Tue	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	
	Wed	☑ +		☒	NA	☑ +		☒	NA	☑ +		☒	NA	

Status Coding Key

☑ = Implemented in Full (independently); ✓ = Partially Implemented; ☒ = Not Implemented; N/A = Not Applicable
+ Adult assistance required – circle + if a student required adult assistance in completing a step

ITEM 3
☑ = (A) log into SMAT on iPad and (B) set up on desk; ✓ = if (A) OR (B) occurred (specify)

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iPad/smat.rocks Use																		
Step	**DAY**	P					A					S					Note	
Student Use of iPad During Session	Mon	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	A	
	Tue	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	B	
	Wed	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	C	

1= WHOLE SESSION [Uses iPad/smat.rocks whole session] (i.e. technology set up on desk the whole time - checks occasionally throughout the session)
2= PARTIAL SESSION [Uses iPad for part of the session only] (i.e. may have started using the iPad; used it during the middle or used it at the end)
3= CHECK-IN (>1) [Checked into smat.rocks more than once to see recordings – did not leave technology open]
4= CHECK-IN-ONCE [Checked into smat.rocks ONCE to see recordings – did not leave technology open]
5= NO USE [Did not use smat.rocks once throughout the session – only used at the end when graphing]

Student Fidelity Checklist Items

Step
Starting-Up
1. LISTEN: student present for academic instruction
2. OBTAIN WATCH: student obtained Pebble Smartwatch from SMAT area and put it on
3. SET-UP MATERIALS: (a) logged into SMAT web-app on iPad, and (b) set-up iPad at workspace*(if student elected to use ipad)
4. OPEN SMAT: opened the SMAT watch-app on the PEBBLE Smartwatch
5. START: pushed *start* on watch to start SMAT session (PP)
Finishing-Up
6. PAUSE SMAT: pushed *pause* on watch to end session when instructed (PP)
7. GRAPH: graphed behaviour performance (PP) (GT) (a) OPEN completed session on the SMAT web-app (b) OBSERVE % of yes responses (c) RECORD % of yes responses in appropriate graphing areas
8. PACK-UP: packed up materials (i.e. Smartwatch, iPad and graph sheet)
iPad Use in SMAT Sessions
Student use of the SMAT web-app on their iPads in SMAT sessions - Whole session (1): student used the SMAT web-app/iPad the whole session - Partial session (2): student used the SMAT web-app/iPad for part of the session - Checked-in more than one occasion (3): student checked-into the SMAT web-app/iPad on occasion, no continuous use - Checked-in once (4): student checked-into the SMAT web-app/iPad on only one occasion - Did not use the whole session (5): student did not check-into the SMAT web-app/iPad at all during the session, only used at the end for graphing purposes

PP = permanent product (steps in which the student produced a permanent product)
GT = graph timing (graphing either occurred straight after a SMAT session or was delayed, thus it was necessary to document when graphing occurred)

Appendix E.15a- Adult Social Validity Scales and Interview Questions

Pre-Intervention Acceptability Rating Scale

Behaviour Intervention Rating Scale and Intervention Rating Scale-20 (Combined)– Adapted for pre-intervention social validity rating

The completion of this questionnaire will allow the researchers to gain an insight to your perception of the intervention acceptability and perceived effectiveness of the proposed intervention. You have been informed of the behavioural self-management intervention which is to be piloted with students in your class in an attempt to improve their on-task and appropriate classroom behaviours. Please evaluate the self-management intervention package by circling the number which best describes your agreement or disagreement with each statement. Please answer each question while reflecting on the described intervention.

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	This intervention would be an acceptable intervention for the students' classroom problem behaviour	1	2	3	4	5	6
2.	Most teachers would find this intervention appropriate for students' problem behaviours in addition to those addressed in this study	1	2	3	4	5	6
3.	The intervention should prove effective in changing the students' problem behaviour	1	2	3	4	5	6
4.	I would suggest/recommend the use of this intervention to other teachers	1	2	3	4	5	6
5.	The students' behaviour problems are severe enough to warrant use of this intervention	1	2	3	4	5	6
6.	Most teachers would find this intervention suitable for the behaviour problem targeted in this study	1	2	3	4	5	6
7.	I would be willing to use this form of intervention in the classroom	1	2	3	4	5	6
8.	The intervention would not result in negative side-effects for the students	1	2	3	4	5	6
9.	The intervention would be appropriate for a variety of students	1	2	3	4	5	6
10.	The intervention is consistent with those I have used in my classrooms previously	1	2	3	4	5	6
11.	The intervention is a fair way to handle students' problem behaviour	1	2	3	4	5	6
12.	The intervention is reasonable for the behaviour problem targeted	1	2	3	4	5	6
13.	I like the procedures used in the intervention	1	2	3	4	5	6
14.	This intervention seems to be a good way to handle the students' behaviour problems	1	2	3	4	5	6
15.	Overall, the intervention seems like it will be beneficial for the students	1	2	3	4	5	6
16.	The intervention will quickly improve the students' behaviour	1	2	3	4	5	6
17.	The intervention will produce lasting improvements in the students' behaviour	1	2	3	4	5	6
18.	The intervention will improve students' behaviour to a point that it would not noticeably deviate from other classmates' behaviour	1	2	3	4	5	6
19.	Soon after using the intervention, I will notice a positive change in the problem behaviour	1	2	3	4	5	6
20.	I anticipate that the students' behaviour will remain at an improved level even after the intervention is discontinued	1	2	3	4	5	6
21.	Using the intervention should not only improve the child's behaviour in the classroom, but also in other settings (e.g. other classrooms, at home)	1	2	3	4	5	6
22.	When comparing the students' with well-behaved peers before and after use of intervention, the students' and peers' behaviour would be more alike after using the intervention	1	2	3	4	5	6
23.	The intervention should produce enough improvement in the students' behaviour so the behaviour is no longer a problem in the classroom	1	2	3	4	5	6
24.	Other behaviours related to the problem behaviour are also likely to be improved by the intervention	1	2	3	4	5	6

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
25.	Teachers are likely to use this intervention because it requires few technical skills	*1*	*2*	*3*	*4*	*5*	*6*
26.	Teachers are likely to use this intervention because it requires little training to implement effectively	*1*	*2*	*3*	*4*	*5*	*6*
27.	Most teachers would find this intervention appropriate for the behaviour problems described (i.e. those targeted)	*1*	*2*	*3*	*4*	*5*	*6*
28.	Most teachers would find this intervention appropriate for the behaviour problems in addition to the ones described	*1*	*2*	*3*	*4*	*5*	*6*
29.	This intervention would be appropriate for use before making a referral	**1**	**2**	**3**	**4**	**5**	**6**
30.	This intervention would not difficult to implement in a classroom full of other students (i.e. 30 students)	**1**	**2**	**3**	**4**	**5**	**6**
31.	This intervention is practical in the amount of time required for contact with parents	*1*	*2*	*3*	*4*	*5*	*6*
32.	This intervention is practical in the amount of time required for contact with school staff	**1**	**2**	**3**	**4**	**5**	**6**
33.	This intervention is practical in the amount of time required for record-keeping	**1**	**2**	**3**	**4**	**5**	**6**
34.	This intervention is practical in the amount of out-of-school time required for implementation	**1**	**2**	**3**	**4**	**5**	**6**
35.	This intervention would not be disruptive to other students	*1*	*2*	*3*	*4*	*5*	*6*
36.	It would not be difficult to use this intervention and still meet the needs of other children in a classroom	**1**	**2**	**3**	**4**	**5**	**6**
37.	This intervention would not result in risk to a child	**1**	**2**	**3**	**4**	**5**	**6**
38.	This intervention would not be considered a "last resort"	**1**	**2**	**3**	**4**	**5**	**6**

Additional space is also provided should you like to provide any extra comment.

Comments:____

Post-Intervention Teacher Feedback Questionnaire

Behaviour Intervention Rating Scale and Intervention Rating Scale-20 (Combined) – Adapted for post intervention social validity rating

Please evaluate the appropriateness and usefulness of the self-management intervention package used in your classroom by circling the number which best describes your agreement or disagreement with each statement. Please answer each question in while reflecting on the intervention overall. Each question with an asterisk (*) has a space on the following pages where you can answer the question in relation to each intervention group participant.

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	This intervention was an acceptable intervention for the students' classroom problem behaviour	1	2	3	4	5	6
2.	Most teachers would find this intervention appropriate for students' problem behaviours in addition to those addressed in this study	1	2	3	4	5	6
3.	The intervention was effective in improving the students' target behaviour*	1	2	3	4	5	6
4.	I would suggest/recommend the use of this intervention to other teachers	1	2	3	4	5	6
5.	The students' behaviour problems were severe enough to warrant use of this intervention*	1	2	3	4	5	6
6.	Most teachers would find this intervention suitable for the behaviour(s) targeted in this study	1	2	3	4	5	6
7.	I would be willing to use this form of intervention in the classroom in the future	1	2	3	4	5	6
8.	The intervention process did not result in negative side-effects for the students*	1	2	3	4	5	6
9.	The intervention would be appropriate for a variety of students	1	2	3	4	5	6
10.	The intervention is consistent with those I have used in my classroom previously	1	2	3	4	5	6
11.	The intervention is a fair way to handle students' problem behaviour	1	2	3	4	5	6
12.	The intervention is reasonable for the behaviour problem targeted	1	2	3	4	5	6
13.	I like the procedures used in the intervention	1	2	3	4	5	6
14.	This intervention was a good way to handle the students' behaviour problems	1	2	3	4	5	6
15.	Overall, the intervention was beneficial for the students*	1	2	3	4	5	6
16.	The intervention quickly improved the students' behaviour*	1	2	3	4	5	6
17.	The intervention produced a lasting improvement in the students' behaviour after it was gradually faded *	1	2	3	4	5	6
18.	The intervention improved the students' behaviour to a point that it did not noticeably deviate from other classmates' behaviour*	1	2	3	4	5	6
19.	Soon after using the intervention, I noticed a positive change in the problem behaviour*	1	2	3	4	5	6
20.	I anticipate that the students' behaviour will remain at an improved level even after the intervention is discontinued*	1	2	3	4	5	6
21.	Using the intervention should not only improve the child's behaviour in the classroom, but also in other settings (e.g. other classrooms, at home)	1	2	3	4	5	6
22.	When comparing the students' with well-behaved peers before and after use of intervention, the students' and peers' behaviour is more alike after using the intervention*	1	2	3	4	5	6

23.	The intervention produced enough improvement in the students' behaviour so the behaviour is no longer a problem in the classroom*	1	2	3	4	5
24.	I noticed improvements in other behaviours related to the problem behaviour when this intervention was used*	1	2	3	4	5

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
25.	Teachers are likely to use this intervention because it requires few technical skills	1	2	3	4	5	6
26.	Teachers are likely to use this intervention because it requires little training to implement effectively	1	2	3	4	5	6
27.	Most teachers would find this intervention appropriate for the behaviour problems described (i.e. those targeted)	1	2	3	4	5	6
28.	Most teachers would find this intervention appropriate for the behaviour problems in addition to the ones described	1	2	3	4	5	6
29.	This intervention would be appropriate for use before making a referral	1	2	3	4	5	6
30.	This intervention would not difficult to implement in a classroom full of other students (i.e. 30 students)	1	2	3	4	5	6
31.	This intervention is practical in the amount of time required for contact with parents	1	2	3	4	5	6
32.	This intervention is practical in the amount of time required for contact with school staff	1	2	3	4	5	6
33.	This intervention is practical in the amount of time required for record-keeping	1	2	3	4	5	6
34.	This intervention is practical in the amount of out-of-school time required for implementation	1	2	3	4	5	6
35.	This intervention would not be disruptive to other students	1	2	3	4	5	6
36.	It would not be difficult to use this intervention and still meet the needs of other children in a classroom	1	2	3	4	5	6
37.	This intervention would not result in risk to a child	1	2	3	4	5	6
38.	This intervention would not be considered a "last resort"	1	2	3	4	5	6

Additional space is also provided should you like to provide any extra comment.

Comments :

Post-Intervention Teacher Interview Questions (Social Validity Measure)

The following questions will be used by the researcher to guide the teacher interview

1. Tell me your impressions of the self-management intervention? What did you think of it?

Comments:

____

____

____

2. Would you recommend this intervention to other teachers? Why or why not?

Comments:

____

____

____

3. Do you think that the intervention could be implemented by teachers/school staff without the assistance of a trained professional?
   Yes ☐ No ☐ Maybe ☐

Comments:

____

4. Did you feel that this intervention was significantly disruptive to the course of the students' day?
   Yes ☐ No ☐ Maybe ☐

Comments:

____

5. Did the benefits outweigh the disruption?
   Yes ☐ No ☐ Maybe ☐

Comments:

____

6. Was there anything during this intervention that you felt was counter-productive?

Comments:

____

____

____

7. Did the intervention fit in with your classroom routine?
   Yes ☐ No ☐ Other ☐
8. Did you find the intervention overly disruptive or hard to accommodate?
   Yes ☐ No ☐ Other ☐

Comments:

____

____

____

9. How practical do you feel an intervention like this is for a mainstream schools?

Comments:

____

____

____

10. What barriers did you encounter in trying to use this intervention? Will they prevent the use of self-management interventions in schools? What are they?

Comments:

____

____

Do you think this is an appropriate intervention to use for any primary school child regardless of grade level or diagnosis (e.g. ADHD, ASD, etc.)?

Comments:

____

____

11. If you noticed any other consequences of the intervention beside any effects on the targeted behaviours what were they?

Comments:

____

____

12. Do you have any other comments on the process or outcome of this intervention? (How could the intervention process be improved?)

Comments:

____

____

ADDITIONAL QUESTIONS

a. To what extent do you think the intervention changed students behaviours (i.e. improvements)? List some examples of behaviour change that you noticed throughout the intervention phase.

Comments:

____

____

b. Responses in the questionnaire indicated that you think the intervention is slightly difficult to implement in a classroom full with other students (Item 30). What aspects in particular do you perceive to be problematic/challenging?

Comments:

____

____

c. In the pre-intervention questionnaire you indicated that you “slightly agree” (4) that the intervention would be acceptable for implementation. In the post-intervention questionnaire you indicated that you “strongly agree: that the intervention is acceptable. What caused you to change this rating?

Comments:

____

____

d. Pre-intervention you indicated that the intervention did not seem very practical (3) in terms of the amount of time required for contact with school stage. This rating changed post intervention (5) indicating that you thought the intervention was somewhat practical in terms of time (Item 32). What caused you to change this rating?

Comments:

____

____

Appendix E.15b- Student Social Validity Scales and Interview Questions

Post-Intervention Student Feedback Form and Follow-up questions for older students

Student feedback will be obtained using two methods. The first method involves a brief feedback form (provided below). The second method will involve the researcher asking the student a number of follow-up questions to obtain additional information. NOTE: Assistance may be provided to the student when filling out the feedback form if required – i.e. student does not understand the task, or cannot read the questions.
This form will be used with students for which it is deemed developmentally appropriate for (i.e. Grade 4 or older)

Post-Intervention Student Feedback Form (Older *Children*)

On this sheet there are a bunch of questions about the self-management intervention that you used in class over the past few weeks. To answer these questions first read the question and then circle the picture which matches your answer – (1) Yes a lot, (2) Yes, (3) Maybe, Sometimes or A little bit, (4) No not really, (5) No not at all, or (6) Not Sure.

Here are a couple of questions to help you practice.

Practice question 1: "Do you like watching TV?"

Yes, a lot!	Yes	Sometimes	No, not really	No, not at all	Not Sure

Practice question 2: "Do you like eating broccoli?"

Yes, a lot!	Yes	Sometimes	No, not really	No, not at all	Not Sure

If you need help with a question please ask the researcher at any time.

Your Name

____

Your Teacher's Name

____

Your Grade

____

Name of the researcher helping you complete this sheet

Margherita Busacca

1. I liked using self-management in class

Yes, a lot!	Yes	Maybe (or a little bit)	No, not really	No, not at all	Not Sure

2. I liked my teacher and the researcher teaching me how to use self-management in class

Yes, a lot!	Yes	Maybe (or a little bit)	No, not really	No, not at all	Not Sure

3. I found self-management easy to use in class

Yes, a lot!	Yes	Sometimes	No, not really	No, not at all	Not Sure

4. I liked the self-management strategies I learnt during in this study

Yes, a lot!	Yes	Sometimes	No, not really	No, not at all	Not Sure

5. The self-management strategy I used would be good to use with other students

Yes, a lot!	Yes	Maybe or Sometimes	No, not really	No, not at all	Not Sure

6. Using self-management helped me to join in class activities better

Yes, a lot!	Yes	Maybe (or a little bit)	No, not really	No, not at all	Not Sure

7. Using self-management to keep track of my behaviour helped me to do better at school

Yes, a lot!	Yes	Maybe (or a little bit)	No, not really	No, not at all	Not Sure

8. I think that using self-management helped me to improve my behaviour in class

Yes, a lot!	Yes	Sometimes	No, not really	No, not at all	Not Sure

Thanks for finishing this sheet.

Margherita will now as you a few more questions about self-management.

Follow-up Questions (Older and Younger Children)

The following questions will be used to guide a brief discussion with each student about the intervention to obtain additional information and feedback. The researcher will ask each student these follow-up questions (or variations of these questions depending on the student's level of development – some questions may be omitted for students in younger year levels) Student will not be required to read or write anything during this aspect of information collection.

1. Do you know why you were asked to use self-management this year?
Comments: ______

2. What did you think about the self-management strategy?
Comments: ______

3. Did you like the self-management strategy?
Comments: ______

4. What did you like the most about self-management? What did you like the least?
Comments: ______

5. Do you think that using self-management was helpful in class? (Discuss – why/why not)
Comments: ______

6. Did learn anything while using self-management? (Discuss)
Comments: ______

7. What do you think other kids would think about the self-management strategy?
Comments: ______

8. Were you able to work better in class when using the self-management?
Comments: ______

9. Would you want continue using the self-management strategy? (Discuss-Why or why not?)
Comments: ______

10. Is there anything else about the self-management strategy that you would like to tell me?
Comments: ______

Appendix E.16- School Behaviour Rating Scale Item Scores

School Behaviour Rating Scale Item Examination – Pre- and Post-Intervention

Subscale Items	Troy		Joey		Pete	
	Pre	Post	Pre	Post	Pre	Post
General classroom behaviour						
1. Follows classroom rules	Never (2)	Sometimes (4)	Sometimes (4)	Sometimes (5)	Sometimes (5)	Very Often (7)
3. When asked to do something will quietly not comply	Very Often (2)	Sometimes (4)	Sometimes (3)	Sometimes (5)	Sometimes (4)	Never (7)
7. Is able to concentrate well in class	Never (1)	Sometimes (3)	Sometimes (4)	Very Often (6)	Sometimes (3)	Very Often (6)
11. Stops doing something when asked	Sometimes (4)	Sometimes (4)	Sometimes (5)	Very Often (6)	Sometimes (5)	Very Often (6)
15. Appears to listen carefully to staff	Never (1)	Never (2)	Never (2)	Sometimes (5)	Sometimes (3)	Sometimes (5)
19. Needs to be asked to do things only once	Never (2)	Never (2)	Sometimes (4)	Sometimes (4)	Sometimes (4)	Very Often (6)
22. Puts hand up to speak in class	Sometimes (3)	Never (2)	Sometimes (4)	Sometimes (3)	Sometimes (4)	Very Often (6)
23. Follows instruction of class teacher	Never (2)	Sometimes (3)	Sometimes (4)	Sometimes (5)	Sometimes (4)	Very Often (7)
26. Stays in seat in class	Never (1)	Sometimes (3)	Sometimes (5)	Sometimes (4)	Sometimes (5)	Very Often (6)
28. Behaves appropriately for casual teachers	Never (1)	Never (2)	Never (1)	Never (2)	Sometimes (5)	Very Often (6)
32. Is easily distracted by others in class	Very Often (1)	Sometimes (3)	Very Often (2)	Sometimes (3)	Very Often (1)	Sometimes (4)
37. Ignores inappropriate peer behaviour	Never (1)	Never (2)	Sometimes (3)	Sometimes (4)	Sometimes (3)	Very Often (6)
40. Looks after own work	Never (2)	Sometimes (4)	Sometimes (3)	Very Often (6)	Sometimes (5)	Very Often (7)
44. Brings necessary materials/equipment to school	Sometimes (5)	Sometimes (4)	Very Often (6)	Very Often (6)	Very Often (7)	Very Often (7)
46. Behaves when not closely supervised	Never (1)	Sometimes (3)	Never (2)	Sometimes (5)	Sometimes (4)	Very Often (6)
51. Behaves appropriately during assemblies	Sometimes (3)	Sometimes (4)	Very Often (6)	Very Often (6)	Very Often (6)	Very Often (7)
Attempting tasks presented						
2. Has difficulty staying on-task during structured activities	Very Often (1)	Very Often (2)	Very Often (2)	Sometimes (5)	Very Often (2)	Never (6)
30. Has difficulty staying on-task during unstructured activities or groups	Very Often (1)	Very Often (2)	Very Often (1)	Sometimes (4)	Very Often (1)	Sometimes (5)
33. Finishes set tasks	Never (2)	Sometimes (4)	Sometimes (3)	Very Often (7)	Sometimes (5)	Very Often (6)
38. Perseveres with tasks he/she finds difficulty	Never (1)	Sometimes (3)	Sometimes (3)	Sometimes (4)	Sometimes (4)	Very Often (6)

Note. Pre = Pre-Intervention rating, Post = Post-Intervention rating

Appendix E.17- Micronorm Comparisons

Table A.

On-Task Behaviour Micronorm Comparison -Baseline and Intervention Conditions

	Baseline (%)	Intervention (%)		Change (%)
Troy				
Literacy (M)	31.13	55.77		
MN Difference	-37.13	-12.49		+24.64
Maths (M)	27.66	50.43		
MN Difference	-52.00	-33.37		+18.63
Religion (M)	40.86	57.42		
MN Difference	-40.73	-24.17		+16.56
Joey				
Literacy (M)	51.67	77.18		
MN Difference	-16.59	+8.92		+25.51
Maths (M)	65.17	NA		
MN Difference	-14.49	NA		NA
Religion (M)	58.79	56.53		
MN Difference	-22.80	-25.06		-2.26
Pete				
Literacy (M)	36.31	65.06		
MN Difference	-55.77	-12.49		+24.64
Maths (M)	45.77	67.85		
MN Difference	-52.00	-29.23		+24.17
Religion (M)	42.68	67.27		
MN Difference	-40.73	-24.17		+16.56

Note. MN Difference = the difference between the baseline or intervention average and the Micronorm, '-' average less than Micronorm; '+'average greater than Micronorm. Change = signifies the percentage change between the baseline MN difference and intervention MN difference, '+'signifies improvement and '-' signifies a decline

Table B

Disruptive Behaviour Micronorm Comparison -Baseline and Intervention Conditions

	Baseline (%)	Intervention (%)		Change (%)
Troy				
Literacy (M)	63.40	33.05		
MN Difference	+41.91	+11.56		-30.35
Maths (M)	67.81	50.43		
MN Difference	+56.95	+25.34		-31.61
Religion (M)	56.45	34.81		
MN Difference	+43.32	+21.68		-21.64
Joey				
Literacy (M)	43.17	17.03		
MN Difference	+21.68	+4.46		-26.14
Maths (M)	29.92	NA		
MN Difference	+19.06	NA		NA
Religion (M)	34.23	24.61		
MN Difference	+21.10	+11.48		-9.62
Pete				
Literacy (M)	53.84	25.79		
MN Difference	+32.35	+4.30		-28.05
Maths (M)	49.98	31.68		
MN Difference	+39.12	+20.82		-18.30
Religion (M)	46.31	22.57		
MN Difference	+33.18	+9.44		-23.74

Note. MN Difference = the difference between the baseline or intervention average and the Micronorm, '-' average less than Micronorm; '+'average greater than Micronorm. Change = signifies the percentage change between the baseline MN difference and intervention MN difference, '+'signifies improvement and '-' signifies a decline