How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others?

Thesis submitted for the degree of

Doctorate in Clinical Psychology

at The University of Leicester

by

Craig Ashley Griffiths

Department of Clinical Psychology

The University of Leicester

2018

Declaration

I confirm that this research report is my original work. It has been submitted in the partial fulfilment for the degree of Doctorate in Clinical Psychology and no part of it has been submitted for any other degree or academic qualification.

This work has been checked for completeness prior to submission.

……

Craig Griffiths

Thesis abstract

Literature Review:

This portion of the thesis presents a systematic review and quantitative synthesis (including meta-analysis) of research pertaining to the behaviour of people diagnosed with CHARGE Syndrome. Results suggest that people with CHARGE are likely to present with issues associated with slower motor and adaptive skills development, intellectual disability, language modality, and eating behaviour. Elevated prevalence rates were also found for behaviours associated with a range of psychiatric diagnostic categories. Wide variability was observed in the individual presentation of people with CHARGE, reflecting the heterogeneity of physical manifestations. It is concluded that care should be taken in attributing individual behavioural traits to potential contributory factors.

Research Report:

The second part of the thesis describes an original research report investigating how the facial appearance of people with a range of genetic neurodevelopmental disorders (GNS) and autism spectrum disorder diagnosis (ASD) may affect *prima facie* personality trait judgments made by observers. Participants were shown merged face images representing GNS groups at age 12 and ASD diagnosed children at age 9, making trait ratings whilst an eye-tracker recorded viewing behaviour. Results suggested significant differences between trait judgments made between each face compared with a typically developing, age-matched control image. Eye-tracker results suggested differences in how GNS faces were processed with greater attention paid to areas of marked facial difference. Observations relevant to the clinical and social treatment of people with GNSs are discussed, as are implications for future research into face-based trait judgments.

Critical Appraisal:

A reflexive account is offered about the process of conducting the projects presented within this report, with particular attention to the clinical intent of the report and how that developed over time. Some reflection is offered on how this has changed the trainee's understanding and contributed to their development as a clinician.

Acknowledgments

I would like to thank those people associated with the DClinPsy course who have helped me along the path towards completing this work. In particular, to Alice Welham for supervising these projects, peer and SURG reviewers, Richard Kirkden for sharing the battles with the equipment, and the 2015 cohort who have shared this journey.

It seems important to acknowledge Megan Hollett, Shauna Benton and Jasmine Sanders for their pilot in their undergraduate projects, and to Professor Peter Hammond for providing materials. This report would not be in the shape that it is without these significant contributions.

I'd also like to thank my family for all their support. A special mention goes to my gramp, who instilled in me the value of education, and to my brothers for always being there for a friendly conversation about the stuff that really matters.

I am most grateful to my loving wife Holly, who has responded to my complaining, busyness, and irritability with patience, care, and empathy.

I'd thank the cats too, but they were only interested in getting in my way while I was trying to work.

Word counts

Thesis abstract	**305**
Literature Review	
Abstract	**249**
Main text	**6,896**
References	**2,546**
Research Report	
Abstract	**304**
Main text	**10,116**
References	**2,295**
Critical Appraisal	
Main text	**2,831**
References	**100**
Total word count for all abstracts and main texts (excluding tables, figures and references)	**20,701**
Total word count for mandatory appendices (not included in final word count and excluding figures and tables)	**9,051**
Total word count for non-mandatory appendices (excluding figures and tables)	**3,901**
Final word count for the thesis (excluding references and mandatory appendices)	**24,602**

Table of Contents

List of Tables

Part A: Literature Review

Part B: Empirical Report

Appendices

List of Figures

Part A: Literature Review

The behavioural phenotype of CHARGE Syndrome: A systematic review of the literature

Abstract

The behavioural phenotype of CHARGE Syndrome: A systematic review of the literature

Craig Griffiths

CHARGE Syndrome is a neurodevelopmental syndrome with a consistent genetic aetiology but heterogeneous clinical presentation. Major diagnostic features include ocular coloboma, choanal atresia, cranial nerve dysfunction, and ear anomalies. Research with people diagnosed with genetic syndromes suggests that shared genetic attributes between individuals are in many cases associable with behavioural characteristics, with known gene-behaviour relationships referred to as behavioural phenotypes. This paper identifies and reviews relevant research to elucidate behavioural variables potentially associated with CHARGE syndrome. A systematic review of available literature, and quantitative synthesis in the form of pooled prevalence meta-analysis where possible, was conducted on 33 identified papers. Results suggest that people with CHARGE syndrome are likely to present with slower motor and adaptive skills development, intellectual disability, and issues associated with mode of communication and eating behaviour. Prevalence rates were higher than in typically developing people for behaviours associated with diagnoses of autistm spectrum disorder, attention deficit hyperactivity disorder, mood difficulties, obsessive-compulsive disorder, and aggression towards self and others. For the majority of measures, wide variability was observed between performances of individuals with CHARGE syndrome, reflecting the known heterogeneity of physical manifestations. Significant associations were found between certain behavioural traits and physical issues such as deaf-blindness. It is noted that care should be taken in attributing individual behavioural traits to potential contributory factors. Observations relevant to the clinical treatment of people with CHARGE syndrome are discussed, as are recommendations for future research.

Introduction

CHARGE Syndrome

CHARGE Syndrome (CHARGE) is a genetic neurodevelopmental syndrome first recognised in 1979 (Hall, 1979; Hittner *et al.*, 1979) and estimated to occur in around 1 in 8500 live births (Issekutz *et al.*, 2005). CHARGE is itself an acronym summarising key congenital anomalies co-occurring to varying degrees in affected individuals: coloboma (a congenital malformation of the eye affecting the iris, lens or retina); heart defect; atresia choanae (a congenital disorder causing blockage of the back of the nasal passage); retarded growth and development; genital hypoplasia; and ear anomalies/deafness. In addition to these factors there is also a suggestion CHARGE may have a unique behavioural phenotype (Lalani *et al.*, 2012).

Diagnosis of CHARGE is typically made according to clinical criteria that have undergone several revisions (Aloes *et al.*, 2001; Blake *et al.*, 1998; Pagon *et al.*, 1981; Verhoes, 2005). In Verhoes' criteria, three major or two major plus two minor features are required for typical CHARGE, with subtypes of partial and atypical CHARGE diagnosable for other combinations. Guidance suggests that any child presenting with coloboma, choanal atresia, or hypoplastic semi-circular canals should be considered for diagnosis of CHARGE (Hsu *et al.*, 2014). Table 1 presents the typical clinical features of CHARGE with prevalence estimates adapted from Lalani *et al*. (2012). This list is not exhaustive; the syndrome may present with other clinical problems such as immunodeficiency owing to DiGeorge sequence (Writzl *et al.*, 2007), dental problems (Strömland *et al.*, 2005), limb abnormalities (Brock *et al.*, 2003), scoliosis (Doyle & Blake, 2005), plus cognitive, speech or language delay (Lalani *et al.*, 2012).

Table 1 Clinical features in CHARGE syndrome

	Characteristics	Manifestations	Frequency
Major diagnostic features	Ocular coloboma	Coloboma of the iris, retina, choroid, disc; micophthalmos	80%-90%
	Choanal atresia or stenosis	Unilateral/bilateral: bony or membranous atresia/stenosis	50%-60%
	Cranial nerve dysfunction or anomaly	I: hyposmia or anosmia	90-100%[1]
		VII: facial palsy (unilateral of bilateral)	40%
		VIII: hypoplasia of auditory nerve	100%[2]
		IX/X: swallowing problems with aspiration	70%-90%
	Characteristic CHARGE syndrome ear	Outer ear: short, wide ear with little or no lobe, "snipped off" helix, prominent antihelix that is often discontinuous with tragus, triangular concha, decreased cartilage; often protruding and usually asymmetric	80%-100%
		Middle ear: ossicular malformations	
		Mondini defect of the cochlea	
		Temporal bone abnormalities; absent of hypoplastic semi-circular canals	
Minor diagnostic features	Genital hypoplasia	Males: micropenis, cryptorchidism	50%-60%
		Females: hypoplastic labia	
		Males and females: delayed puberty secondary to hypogonadotropic hypogonadism	90%[1]
	Developmental delay	Delayed milestones, hypotonia	≤100%
	Cardiovascular malformation	Including conotruncal defects, AV canal defects, and aortic arch anomalies	75%-85%
	Growth deficiency	Short stature, usually postnatal with or without growth hormone deficiency	70%-80%
	Orofacial cleft	Cleft lip and/or palate	15%-20%
	Tracheoesophageal fistula	Tracheoesophageal defects of all types	15%-20%
	Distinctive facial features	Square face with broad prominent forehead, prominent nasal bridge and columella, flat midface	70%-80%

[1]Estimates from The CHARGE Syndrome Foundation (2018)
[2]Estimate from Buchman *et al.* (2006)

Clinical diagnoses may be confirmed using gene analysis (see e.g. van Ravenswaaij-Arts *et al.*, 2015). A genetic basis of CHARGE was suspected after Tellier *et al.* (1998) found associations between the presence of CHARGE and higher mean paternal age at conception, alongside elevated concordance in monozygotic twins and rare familial cases. The genetic association has been confirmed in multiple studies (e.g. Husu *et al.*, 2013; Zentner *et al.*, 2010). A heterozygous mutation or deletion in the gene encoding chromodomain helicase DNA-binding protein 7 (CHD7) has been identified in 90-95% of people meeting clinical criteria (Hsu *et al.*, 2014). SEMA3E has been identified as a potential genetic factor in the past (Lalani *et al.*, 2004) but no longer appears on lists of genetic factors (Lalani *et al.*, 2012). There is no

indication that people showing clinical characteristics without CHD7 variation differ systematically from those who do, and clinical diagnoses are thus sometimes made even in the absence of CHD7 aberations.

Although the same genetic mutations are likely to be shared between most people receiving clinical diagnosis, CHARGE has an extremely heterogeneous presentation, such that one diagnosed individual may not share a majority of clinical features with another person sharing the diagnosis. Intellectual functioning, for example, may vary from average to IQ scores below 20 and whilst some people are considered deaf-blind, others have normal hearing and vision. This wide variation in characteristics can present difficulties for research and practice; the literature on CHARGE is replete with small case studies of atypical presentations of the condition and researchers of CHARGE must be conscious that no two individuals are necessarily alike. Variation may complicate life for people affected and their families (e.g. Wulffaert *et al.*, 2009), who are unlikely to have prior experience with CHARGE as 97% of CHD7 mutations occur with no family history (Sanlaville & Verloes, 2007).

Behavioural phenotypes

In addition to clarifying the physical manifestations of genetic abnormalities, advances in molecular genetics have made it possible to learn more about relationships between genetic factors and behaviour (Dykens & Rosner, 1999). The idea of a behavioural phenotype originated with Nyhan (1972) and has since been refined and garnered more interest as technology has improved. A behavioural phenotype is a set of motor, cognitive, linguistic and social characteristics that tend to be shared between individuals who can be assumed to share a genetic attribute (Flint & Yule, 1994). For a compelling case to be made for any feature to represent part of a behavioural phenotype, it must occur in one syndrome more than in others (Dykens & Hodapp, 2001).

Identifying behavioural phenotypes for specific conditions can have positive consequences. Firstly, greater awareness of behavioural patterns may facilitate faster recognition and diagnosis of conditions, leading to faster admission into services. Secondly, diagnosed individuals, their families, and services are likely to be affected by behavioural patterns, and better research may help each anticipate and prepare for atypical development. Knowledge that behaviour is part of a condition may help to externalise perceived causation for difficulties from the person and onto the condition itself, and thereby arguably help families cope with specific behavioural challenges. Finally, identification of behavioural phenotypes may itself lead to the elucidation of the genetic influences on behaviour, contributing to scientific understanding (Flint, 1998).

Conclusively identifying a behavioural phenotype for any given syndrome is fraught with difficulty. Behaviours are likely to develop through gene-environment interactions in which the physical characteristics of each individual form an idiosyncratic part of their physical reality (Taylor & Oliver, 2008). Flint (1998) identified that even in relatively simple situations sample sizes of over 100 may be required to find statistical significance for behaviours that occur in fewer than 25% of cases. Also, for CHARGE, in which people present with multiple congenital anomalies, clarifying whether a behaviour is due to one feature of the condition or another may be difficult. Certainly, it is important to compare reported behavioural features against data on behaviours associated with relevant deficits to ensure the two are differentiated and the relationship between physical features (including genetic aberrations) and behaviour is clearly delineated. It is also crucial that researchers employ well-matched control groups to aid in comparison between similar groups, such as people with comparable levels of cognitive functioning, as some behaviours are generally seen more frequently with intellectual disability.

Despite complexities, it has been possible to develop reliable and valid behavioural profiles for a range of genetic syndromes. One of the more common genetic syndromes, Down syndrome, has an associated behavioural phenotype that includes: slower cognitive development; language delay; charming, affectionate, and outgoing social behaviour; and delayed motor development (Fidler *et al.*, 2009). Behavioural phenotypes require careful exploration and an appreciation of complexity; a diagnosable condition (such as autism spectrum disorder, or ASD) identified in people with one syndrome may differ in how it presents for that group than others. One syndrome group with a known association with ASD diagnosis may display a different pattern (or profile) of behaviours to people from a different syndrome group with the same diagnostic association, limiting the ease of direct comparability in syndrome groups and raising questions about the diagnostic concepts commonly applied to these groups (Moss & Howlin, 2009; Moss *et al.*, 2013).

CHARGE does not currently have a clearly delineated behavioural phenotype, and there has, to the author's knowledge, been no prior systematic attempt at synthesising research. There are, however, many behaviours which have been reported to be common in the syndrome. Lalani *et al.* (2012) list repetitive, obsessive-compulsive, aggressive, and self-abusive behaviours, as well as patterns of behaviour often associated with the 'ADHD' label. Identifying a behavioural profile for CHARGE is complicated by the wide range of variability in presentation and by the severely disabling effects of associated symptoms. Any behaviours recognised may represent attempts at communication (Brown, 2005; Salem-Hartshorne & Jacob, 2005), result from sensory disability (Hartshorne & Cypher, 2004), be due to other associated developmental problems such as 'ASD' (Johansson *et al.*, 2006), or be caused by repeat childhood hospitalisation (Vervloed *et al,* 2006).

This review aimed to further the delineation of a behavioural phenotype for people with CHARGE by systematically identifying and reviewing available literature on the behaviour

of people with CHARGE. It was hoped that this would help researchers, clinicians, and the families and individuals affected, to gain a clear reference point through which they may better understand behaviours and associated difficulties.

Method

Search strategy

A systematic review of research literature databases was completed to identify research articles that might pertain to the review aims. The PSYCInfo, MEDLINE, and EMBASE databases were selected to include research from psychological, medical, genetic, and healthcare disciplines. Appendix B presents rationales for database selection.

Title and abstract search terms were developed based on topics pertaining to the two main aspects of the review question: CHARGE and behaviour (summarised in Table 2). CHARGE terms were taken from the Online Mendelian Inheritance in Man (OMIM) website (OMIM, 2017). Behaviour terms were developed reflexively with the literature, to cover features of behaviour, cognition, emotion, ability, language, sensory function, and development; many terms were included to maximise sensitivity.

Table 2 Search terms used

CHARGE	Behaviour	
CHARGE Association*	Behavio*	Infant
CHARGE Syndrome*	Psych*	ASD
Hall-Hittner	Emotion*	Repetiti*
HHS	Cognit*	Ritual*
CHD7	Phenotyp*	Stereotyp*
SEMA3E	Abilit*	Social
[Coloboma AND Heart anomaly AND Choanal Atresia AND Retardation AND "Genital and Ear Anomalies"]	Learning	Sociability
	IQ	Anxi*
	Intell*	Mood
	Retardation	Depressi*
	Processing	Affect*
	Development*	Sensory
	Language	Sleep
	Linguistic	Memory
	Communicat*	Executive function*
	Speech	Function*
	Verbal	Adaptive
	Motor	Maladaptive
	Psychomotor	Self-injur*
	Autis*	Self-harm
	Child	Personalit*

Database search options were used to limit results to those published: in academic journal articles to ensure quality and scientific rigor; in the English language; and since 1979 to keep results relevant to the association as recognised by Hall and Hittner.

The literature search of titles and abstracts generated 3285 articles. Of these, 236 were produced in PSYCInfo, 1628 in MEDLINE, and 1421 in EMBASE, (Appendix C). These 3285 articles were exported to RefWorks where duplicates were identified and removed, leaving 1777 articles.

Shortlisting process

Title and abstract screening was completed according to set inclusion and exclusion criteria. Criteria were applied hierarchically according to Table 3 such that each article must pass through the first criterion before being considered against the second, then third and so on. Articles excluded because they had 10 or fewer participants or presented case studies

were retained and processed separately (Appendix D); they are not included in the following review. Through the process of title and abstract screening an additional 49 duplicates were identified and removed

Table 3 Articles removed by application of inclusion and exclusion criteria

	Criterion	Removed
Inclusion	Article must be an original research study of any design	244
	Article must be published in a peer-reviewed journal	0
	Article must only involve human participants, or be designed such that human data can be extracted from data from other sources	120
	Article must only concern people with CHARGE syndrome, or be designed such that CHARGE syndrome data can be extracted from data from other sources	1025
	Article methodology must investigate some aspect of behavioural phenotypes. This may include: motor, linguistic, cognitive, emotional, or social development or behaviour. Where articles also investigate physical features and/or biological and genetic mechanisms, behavioural data must be presented such that it can be extracted clearly	236
Exclusion	Article must not be an intervention study and designed such that pre-intervention data may not be clearly extracted	11
	Article must not only investigate prevalence of the CHARGE syndrome	1
	Article must not only investigate a service	0
	Article must not only investigate physical features of CHARGE	20
	Article must not have 10 or fewer participants or present only a case study or series of case studies (processed separately)	25

At the end of this process, 46 papers remained. Reference sections of the remaining papers and citations listed on databases were checked for additional articles that may have been missed in the main search. This process identified four new papers (Abi Daoud *e al.*, 2002; Jure *et al.*, 1991; Souriau *et al.*, 2005; Wiznitzer *et al.*, 1987). The final total of articles assessed as meeting all inclusion criteria was 50 (Appendix E).

Full versions of the remaining 50 articles were obtained and individually screened. Articles were read in full and rechecked against inclusion and exclusion criteria. Reapplying inclusion and exclusion criteria caused a further 14 articles to be removed.

Quality appraisal

All 36 remaining papers were then assessed for quality. Quality rating criteria designed to control for low-validity research were adapted from Richards *et al.* (2015). Criteria were for sample identification, confirmation of CHARGE syndrome, tools used to assess symptomatic and behavioural features, and comparison group. Figure 1 presents the criteria as applied. To provide a simple visual matric of evidence quality, each article received one rating colour code for each of the four criteria, either: red if scored 0, orange if scored 1, amber if scored 2, and green if scored 3. The comparison or control group criterion was applied reflexively with the methodology of each individual paper; where no comparison or control group was appropriate to the design the criterion would be marked n/a and removed from score calculations. Where no comparison or control data were offered but results could be compared with readily-available and published TD norms the ratings were made against the quality of these norms. The maximum quality score per article was 12. A score between 0 and 1 was calculated for each paper by dividing the attained score by the maximum possible score; all papers scoring 0.33 or higher were included. Multiple ratings were made for papers that employed multiple methodologies (thus, in theory, an article could "pass" for one area of assessment but "fail" for another). Three articles (Abi Daoud *et al.*, 2002; Blake & Brown, 1993; Lieberman *et al.*, 2012) failed to reach minimum quality criteria and were removed from the review. Figure 2 presents a PRISMA diagram summarising papers removed at each stage (Moher et al., 2009). At the end of this process 33 papers remained for full review.

	Quality Rating			
	0 - Poor	**1 - Adequate**	**2 – Good**	**3 - Excellent**
Sample Identification	Not specified/reported	Single restricted or non-random sample e.g., a specialist clinic or previous research study[1] Single regional sample e.g., regional support groups.	Multiple restricted or non-random samples e.g., multi-region specialist clinics National non-random sampling e.g., national parent support groups.	Random or total population sample.
Confirmation of syndrome	Not confirmed/reported Clinical diagnosis only suspected	Clinical diagnosis by 'generalist' e.g., GP or Paediatrician, or not stated.	Clinical diagnosis by 'expert' e.g., Clinical Geneticist or Specialist Paediatrician.	Molecular/Cytogentic/ Metabolic confirmation of diagnosis.
Assessment of characteristic	Not specified/reported	Self/informant-report only, bespoke data collection methods.	'Generalist' clinical judgement only, or clinical instrument completed by non-professional, including self/informant.	Specialist clinical judgement and/or at least one clinical instrument completed by a professional.
Comparison/control group	Comparison group is not matched at all[1]; only matches age on adult/child basis; or includes measure norms from TD population without more specific matching.	Comparison group – a little relevant matching[1]; includes measure norms where some degree of matching is possible (one or two low-relevance matching variables).	Well-matched[1] comparison group (two+ low-relevance matching variables or one high-relevance matching variable).	Very well-matched[1] comparison group (two+ high-relevance matching variables or one high-relevance variable with at least one low-relevance variable).

[1]Matching variables Low-level: age, gender; High-relevance: ability level, sensory disability, physical disability,

Figure 1 Quality Criteria

[1] For individuals recruited as part of a larger *ongoing* study, if the recruitment strategy is described, it is coded. If not, it is coded as 1, indicating the sample has come from one source (i.e., the larger ongoing study).

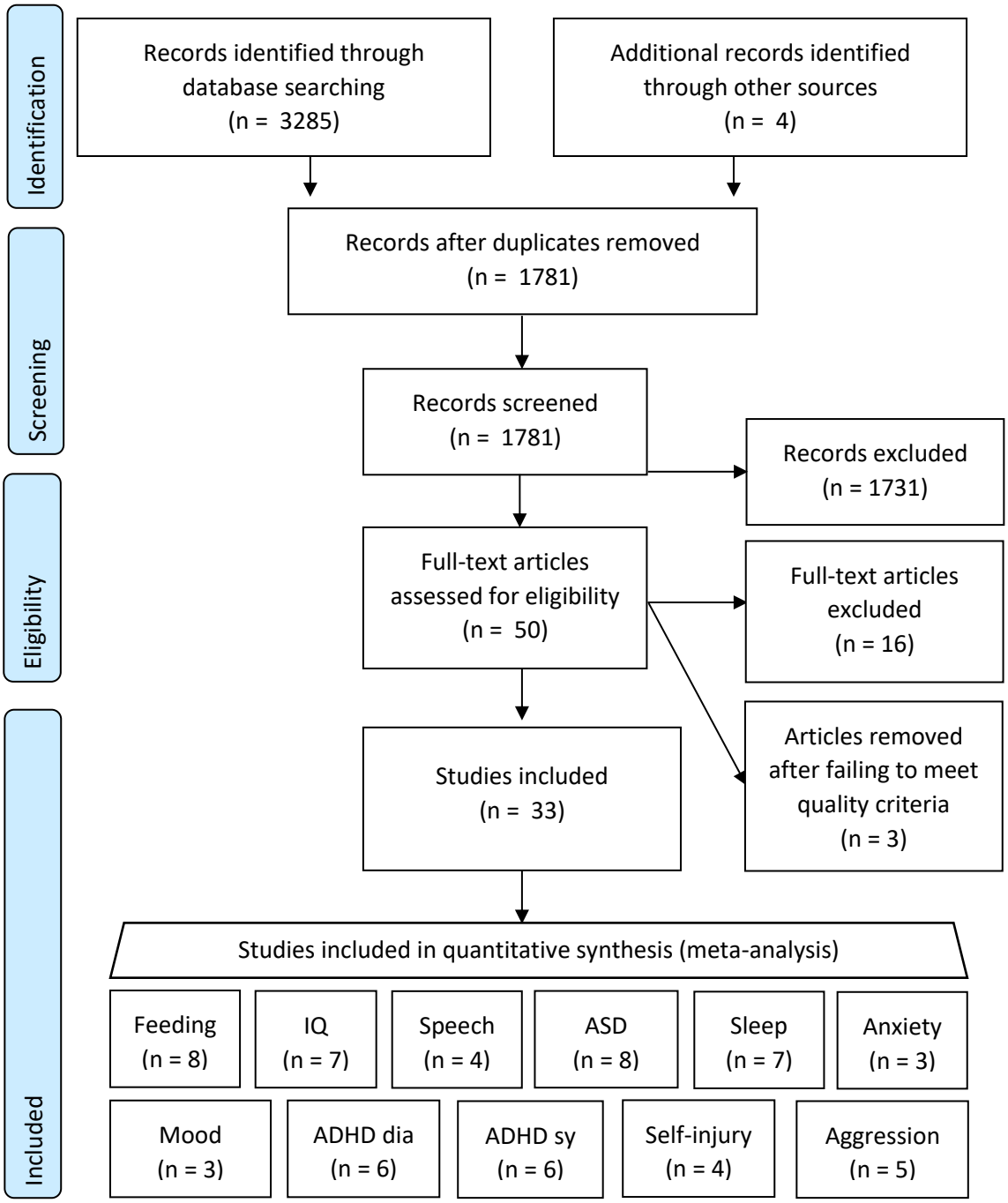


Figure 2 PRISMA Flow Diagram

Data analysis

Meta-analysis of the prevalence of a number of characteristics (feeding difficulties, intellectual disability, verbal speech modality, ASD diagnosis, sleep difficulties, anxiety difficulties, mood difficulties, ADHD diagnosis, ADHD symptomatology, self-injury, and aggression to others) was conducted. Data were analysed using MetaXL v.5.3 (Baredregt & Doi, 2016) to generate estimates of pooled prevalence. A random effects model was selected

for this analysis. This model assumes two sources of variability: 1) sampling error; and 2) differences at the level of the studies. It aims to control for these in the weightings assigned to each study. This contrasts with a fixed effects model, which assumes that all differences between studies are a function of sampling error and was not considered suitable for the current data given the apparently large variability in the prevalence and nature of reported characteristics in the studies. The random effects model does not account for differences in quality between studies, so a quality-effects model was also generated using quality ratings described, which research suggests maintains a correct coverage probability of the confidence interval and to be robust to subjectivity in quality assessment (Doi *et al.*, 2015). Meta-analysis data tables are presented in Appendix F.

Results

General and motor development

Ten papers reported on general development. Developmental delay was observed in between 80-85% (Husu *et al.,* 2013; Strömland *et al.,* 2005) and 100% (Hudson *et al.*, 2016), though diagnosis of pervasive developmental disorder occurred in only 13% of 87 people according to Wachtel *et al.* (2007). Functioning levels were generally low, with several studies finding that most score three standard deviations below TD averages (Abadie *et al.,* 2000; Salem-Hartshorne & Jacob, 2004; 2005; Santoro *et al,* 2014). Strömland *et al.* (2005) found 'profound deficits' in 35% and 'mild/moderate deficits' in 18%. Wulffaert *et al*. (2009) reported an adaptive functioning range between 0.2 and 8.6 years for a chronological age range of 1.7-22.2 years. There were greater differences for older participants as the capabilities of TD children moved away from those achievable for most people with CHARGE (Salem-Harshorne & Jacob, 2005; Santoro *et al*., 2014). Prevalence of health problems was associated with greater delay (Vervloed *et al.,* 2006).

Twelve papers reported on attainment of gross motor skills. Delayed motor milestones were observed for almost all children with CHARGE (Hartshorne *et al.,* 2007; 2005; Husu *et al.,*

2013). Raqbi *et al.*, (2003) found that the average developmental quotient for children aged zero-four was 50, suggesting markedly delayed development, with most displaying global impairment. Gross motor skills appear to be weaker than fine motor skills (Haibach & Lieberman, 2013; Santoro *et al.*, 2014). Regarding average age ranges within which walking has been observed to be achieved (Table 4), the latest mean estimate for TD was six months sooner than the earliest estimate for people with CHARGE, suggesting substantial differences. Delays of at least one year for walking are suggested.

Table 4 Observed average ages at which people with CS achieved motor milestones

Motor skill	Mean age	Article	N	SI[2]	CS	AC	GC	TD estimates[1]
Crawling	19 m	Hartshorne *et al.* (2007)	98					9-12 months
Walking	2-3 yr	Abadie *et al.* (2000)	17					
	3-4 yr	Dammeyer (2012)	17					10-18 months
		Haibach & Lieberman (2013)	21					
		Harsthorne *et al.* (2007)	98					
		Hartshorne *et al*. (2016)	53					
		Hartshorne & Cypher (2004)	100					
		Salem-Hartshorne & Jacob (2005)	85					
	4+ yr	Blake *et al.* (2005)	30					
		Hartshorne & Cypher (2004)	100					
		Salem-Hartshorne & Jacob (2005)	85					

[1] Estimates from NHS Choices (2018)

Three papers offered information regarding the relationship between development and age of gross motor milestone acquisition. Age of walking was correlated with Behaviour Rating Inventory of Executive Function (BRIEF) index scores (r=.23-.29, p<0.05; in Hartshorne et al., 2007), and Adaptive Behaviour Evaluation Scale raw scores (r=.39, p<.01 in Salem-Hartshorne & Jacob, 2004; r=.55, p<.01 in Salem-Hartshorne & Jacob, 2005).

Balance was associated with difficulty achieving gross motor skills. Vestibular difficulties were present in up to 87.5% of children (Johansson *et al.,* 2006; Strömland *et al.,* 2005), though higher quality studies produced lower estimates (77% in Husu *et al.,* 2013; 44%

[2] Coloured columns correspond to quality criteria in Figure 1.

in Issekutz *et al.,* 2013). Fifty-seven percent of children with CHARGE were at medium to high risk of falls (Haibach & Lieberman, 2013), tending to perform better in familiar places with stable footing (Abadie *et al.,* 2000; Haibach & Lieberman, 2013; Souriau *et al.,* 2005). Confidence is another factor; Haibach & Lieberman (2013) found that all children with CHARGE reported 0/10 confidence in their balance for any activity.

Adaptive skills/activities of everyday living

Blake *et al.* (2005) and Hartshorne *et al.* (2016) reported on how many people in their sample had achieved functional independence in key developmental areas (Table 5). These suggest a significant minority of people with CHARGE do not achieve independence in basic tasks and demanding tasks are achieved by a small minority. As elsewhere, the range of observed ability varied widely; where mean age of toileting was 5.5 years, standard deviation was 3.1 years (Blake *et al.*, 2005). Santoro *et al.* (2014) provided a range of relevant developmental quotient data suggesting developmental quotients of: ~30% for feeding, dressing, toileting, and communication; and ~75% for washing themselves. Deficits were most pronounced for people aged over three years. Younger people scored lowest relative to peers in health and self-care, though these areas became a relative strength with age (Salem-Hartshorne and Jacob, 2004; 2005).

Table 5 Percentages of people with CHARGE achieving levels of independence for activities

Article	N	Quality				Independence level	Toileting	Dressing	Washing	Cleaning	Travelling	Shopping	Cooking	Finances
		SI	CS	AC	GC									
Blake *et al.* (2005)	30					None	33	33	33	41	56	66	57	86
						Little/Some	13	6	23	38	11	21	43	10
						Most/All	53	60	43	20	30	13	0	3
Hartshorne *et al.* (2016)	53					None	9	8	15	32	58	52	43	68
						Little/Some	23	31	34	43	19	35	43	23
						Most/All	68	62	51	25	22	12	13	9

Nine studies reported on eating difficulties, eight of which suggested elevated prevalence for people with CHARGE (Table 6). Pooled prevalence estimates based on feeding

and swallowing difficulties together suggested that such difficulties may exist in 71% to 83% (95% confidence interval) of people (Figure 3). Where described, swallowing problems were relatively severe (MacDonald *et al.,* 2017). Issekutz *et al.* (2005) associated bilateral posterior choanal atresia with fewer chewing and swallowing issues, and more major clinical characteristics with a greater number of difficulties. In addition, Hudson *et al.* (2016), in a lower-quality study focused on feeding, reported that 95% over-stuffed their mouths with food and 30% held food in their mouths for hours. Eating difficulties may not be more prevalent overall than for children with other developmental disorders but may vary depending upon physical malformations present. This was associated with mouth under-sensitivity and reflexive processes where fear and defensiveness became associated with mealtimes due to negative impacts on relationships (Hudson *et al.,* 2016).

Table 6 Observed prevalence rates of eating difficulties for people with CHARGE

Difficulty	Rate	Article	N	Quality				Other estimates[1]
				SI	CS	AC	GC	
Any	80%	Strömland *et al.* (2005)	31					TD children: 25-45% Children with developmental disorders: 30-80%
Feeding	88%	Issekutz *et al.* (2013)	16					
Swallowing	46%	Pagon *et al.* (1981)	13					
	74%	Hartshorne & Cypher (2004)	100					
	74%	Hartshorne *et al*. (2007)	98					
	79%[2]	Hartshorne *et al.* (2005)	160					
	80%	Husu *et al.* (2013)	15					
	90%	Dobbelsteyn *et al.* (2008)	39					
Pooled prevalence estimates								
Random effects model 77.6% (95% CI 71.9% – 82.8%)								
Quality effects model 77.2% (95% CI 70.9% – 83.0%)								

[1] Observed level from American Speech-Language-Hearing Association (2018)
[2] Taken to be 127 individuals for meta-analysis, specific number not reported

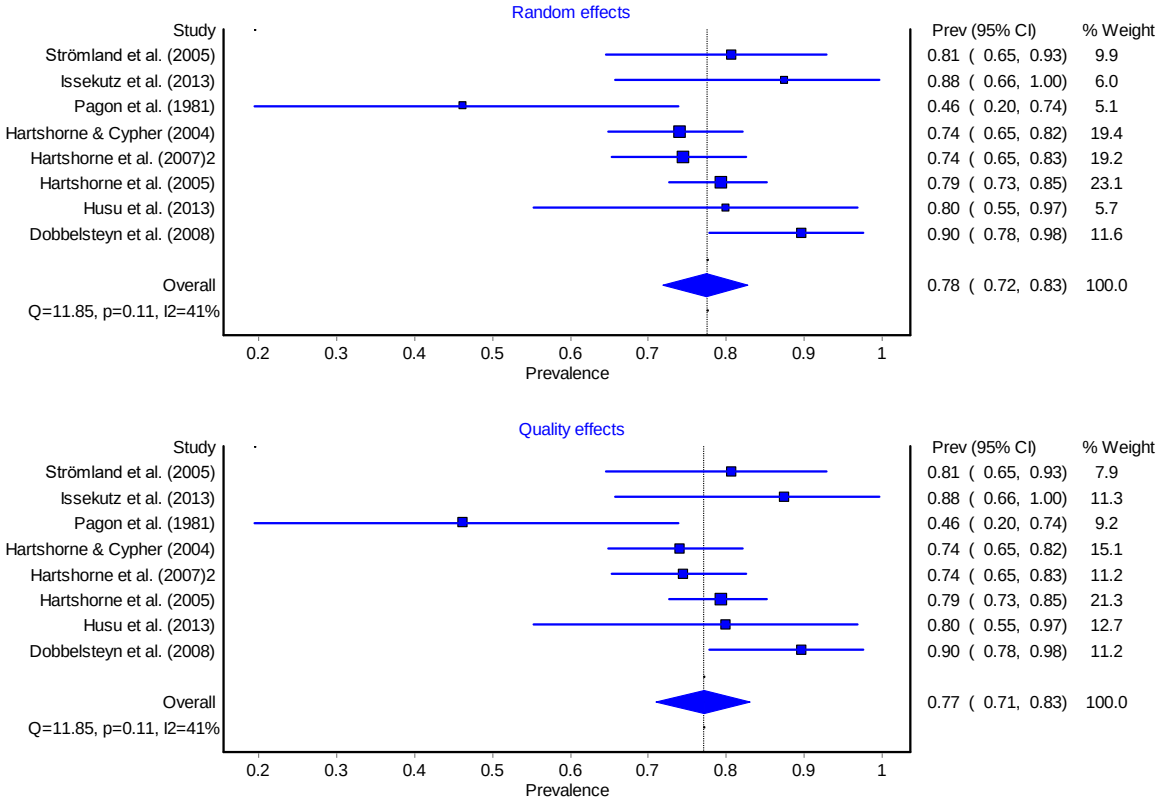


Figure 3 Pooled prevalence estimates of feeding and swallowing difficulties

Activity levels amongst people with CHARGE were described in two papers. These found levels were significantly lower than for TD people (Forward *et al.,* 2007), equivalent to people with Down and Williams syndromes, and higher than people with Prader-Willi syndrome (Graham *et al.,* 2005). Three studies looked at range of and preference for certain activities: Graham *et al.* (2005) found no evidence for a restricted set of activities and interests whilst Hartshorne *et al.* (2016) and Souriau *et al.* (2005) observed that physical and sensory ability influenced preferences.

Cognitive development and executive functioning

Nine papers reported on intellectual functioning, seven reporting IQ score estimates (Table 7). Pooled prevalence estimates suggested 52-81% (95% confidence interval) may present with an IQ below 70 (Figure 4). Pagon *et al.* (1981) found 19% of 21 people had 'profound retardation' and Souriau *et al.* (2005) that 59% of 71 had difficulty with 'complex information.' IQ score ranges varied widely. Santoro *et al.* (2014), using an adapted measure of child development, found that cognitive skills in children under three years-old had a

developmental quotient range of <10-130, with a median of 65. Intellectual ability correlated negatively with visual impairment, microcephaly, and brain malformation (Johansson *et al.,* 2006; Raqbi *et al.,* 2003). Hartshorne *et al*. (2007) presented data on executive functioning; a majority had clinically insignificant scores but mean scores were elevated, indicating greater difficulty, except in 'organisation of materials.' Over half had high scores on Shift, Monitor, and Behavioural Regulation indices, the latter correlating positively with deaf-blindness.

Table 7 Percentages of people with CHARGE scoring within ID diagnostic ranges

Article	N	Quality				IQ > 70	IQ 51-69	IQ < 50
		SI	CS	AC	GC			
Bernstein & Denno (2005)	29					10%	62%	28%
Dammeyer (2012)	17					71%	18%	12%
Johansson *et al.* (2006)	28					21%	68%	11%
Raqbi *et al.* (2003)	21					24%	24%	52%
Strömland *et al.* (2005)	14					36%	29%	36%
Vesseur *et al.* (2016)	41					41%	59%*	-
Wulffaert *et al.* (2009)	20					25%	20%	55%
Pooled prevalence estimates								
Random effects model 68.6% (95% CI 54.2 – 81.4)								
Quality effects model 67.5% (95% CI 52.3% – 81.1%)								

*Only a figure for IQ < 70 is presented, without any further breakdown of IQ scores

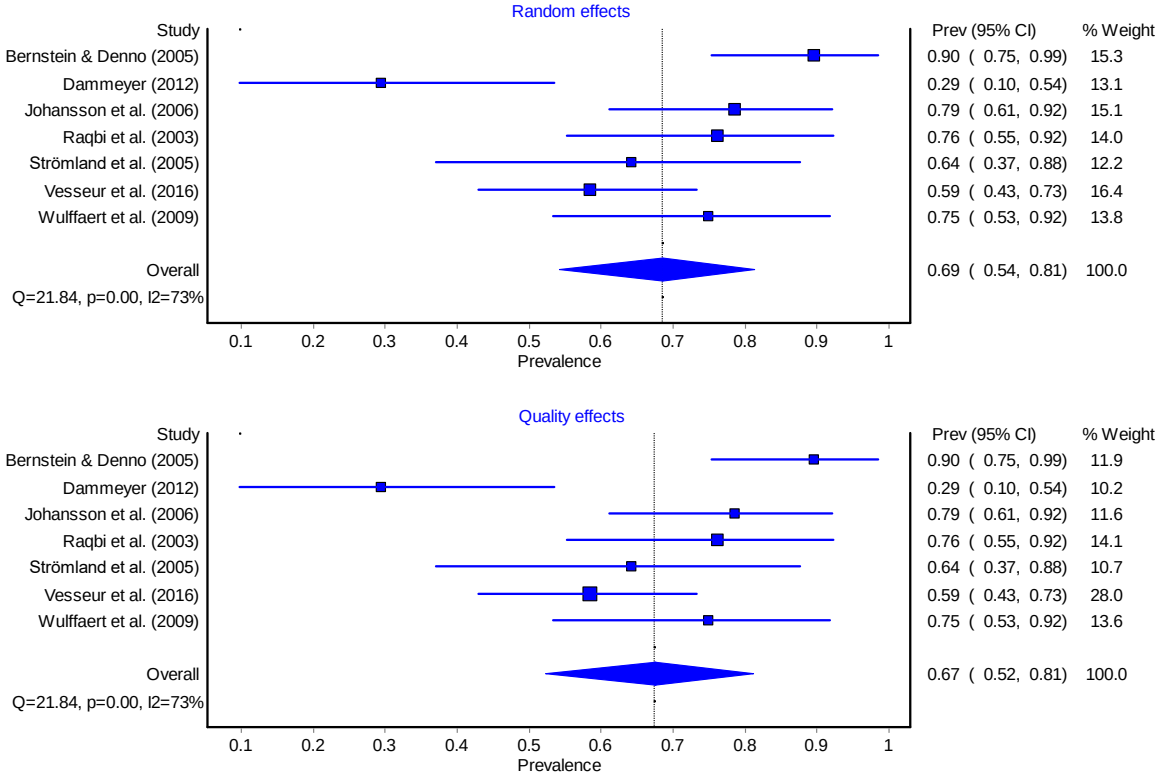


Figure 4 Pooled prevalence estimates of intellectual disability

Language development

Language development was discussed in nine papers. Prevalence of communication deficits was reported in three, indicating 80% to 100% may have substantial communication difficulties (Dammeyer, 2012; Johansson *et al.,* 2006; Vesseur *et al.*, 2016). Four reported on severity of deficits: two estimating them as much as three standard deviations below norms (Santoro *et al.,* 2014; Wulffaert *et al.,* 2009), while Vesseur *et al.* (2016) reported deficits at least one standard deviation below the norm in almost all cases. Dammeyer (2012) found severely delayed language in 18% of people, and moderate delay in 65%. Four articles reported on numbers achieving spoken or sign language. Pooled prevalence estimates suggested 29-47% are likely to achieve spoken language (Table 8; Figure 5). As might be expected, deaf-blindness, hearing loss and cognitive delay were negatively associated with receptive language development (Vervloed *et al.,* 2006; Vesseur *et al.,* 2016).

Table 8 Percentages of people with CHARGE achieving communication modalities

Article	N	Quality				Spoken language	Sign language	Pre-verbal[1]
		SI	CS	AC	GC			
Dammeyer (2012)	17					29%	53%	18%
Hartshorne *et al.* (2016)	53					38%	51%[2]	10%
Strömland *et al.* (2005)	26					42%[3]	-	58%[4]
Thelin and Fussner (2005)	28					39%	21%	39%
Pooled prevalence estimates								
Random effects model 38.2% (95% CI 29.8% – 46.8%)								
Quality effects model 38.1% (95% CI 29.4% – 47.1%)								

[1]Refers to all communication modalities other than spoken and sign language
[2]Figure includes people using a mixture of spoken and sign language
[3]People identified as having 'partly incomprehensible speech' are included
[4]All people identified as having 'no speech' – no further information is offered regarding non-verbal language

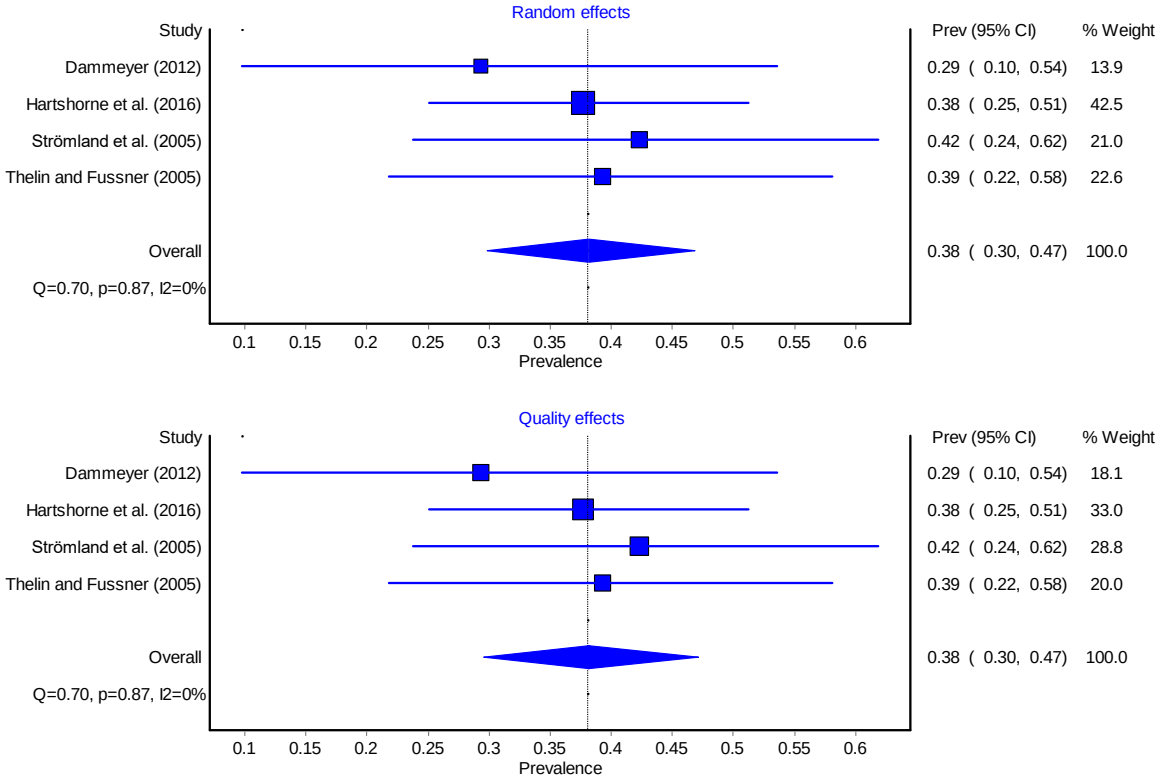


Figure 5 Pooled prevalence estimates for achieving verbal communication modality

Features associated with 'ASD:' Social development; repetitive behaviours; sensory issues

Issues relating to autism spectrum conditions including social development, repetitive behaviours, and sensory issues were reported in 18 papers. Eight offered information relating generally to social development and preferences, and 16 described social issues for people with CHARGE with reference to a potential association with features assessed when diagnosing ASD. The possibility of 'ASD' being associated with CHARGE was the most thoroughly investigated topic amongst literature generated in this review.

Two of the eight papers reported on general social development in terms of skill deficits, suggesting most people with CHARGE have a deficit in social development (Table 9). In Santoro *et al.* (2014) the full range of performance quotients ranged from around 5 to 150, where the average is 100, indicating wide variability. For people aged over three years, the median age-equivalent social skills score (~20 months) was substantially lower than median age (~75 months). Two reports highlighted prevalence of deficits with social rules: 38% in Souriau *et al.* (2005); Hudson *et al. (*2016) found 10% broke social rules around mealtimes.

Table 9 Percentage of people with CHARGE reported to have a social skills deficit

Article	N	Quality				Estimate
		SI	CS	AC	GC	
Blake *et al.* (2005)	30					53%
Thelin and Thusner (2005)	28					86%

A theme appeared among five studies that people with CHARGE may present as withdrawn, isolated, and self-absorbed. Souriau *et al.* (2005) concluded 25-60% tend towards social withdrawal; a quarter isolate themselves around adults, and a third around children. In Thelin and Fussner (2005), parents identified their children as lacking in engagement in communication for interpersonal purposes. Wulffaert *et al.* (2009) observed that over 50% were reported as 'aloof and in their own world.' Hartshorne *et al.* (2009) found people scored on average, above 50th percentiles for difficulties with self-absorption and communication disturbance. Finally, Graham *et al.* (2005) found that people with CHARGE were significantly more withdrawn and had less social contact or proclivity to help others relative to people with other genetic syndromes known for higher sociability such as Williams and Down Syndromes.

Table 10 presents observed prevalence of four types of atypical behaviour. Pooled prevalence estimation was not attempted because of inconsistencies in how behaviours were labelled between studies. For example, Bernstein and Denno (2005) report on many behaviours that might otherwise be labelled as motivated by an urge to maintain order or routine but identify all actions in their report as 'repetitive behaviours.' They found 11.2 'repetitive behaviours' per person, with all exhibiting at least one, 72% spending one or more hour per day in such activities, and 48% persevering following attempted redirection. For 72%, such behaviours were found to interfere with social activities and relationships and 83% with daily routines. Prominent behaviours included: doing things in order; eating set foods at set meals; shirt tucked in; objects in their place; schedules followed; things must be empty to be finished; perfectionism; pressing or tight clothing; looking for 90-degree angles; interest in numbers or dates; and perseverative questions.

Higher-quality studies suggested that over 50% of people with CHARGE engage in at least one of the types of behaviours identified. More detail is offered about tactile defensiveness: Hudson *et al.* (2016) found 25% would not mix liquid and solid foods during meals, a feature also found by MacDonald *et al.* (2017). Johansson *et al.* (2006) found unusual interest in auditory stimuli in 14%, oversensitivity to noise in 18%, and unusual interest in sensory stimuli in 36-39%. Souriau *et al.* (2005) observed that substances most cited as difficult had unstable sensory information. Souriau *et al.* (2005) found a positive relationship between the need to put things away and enjoyment of jigsaws. Graham *et al.* (2005), in a study with a particularly well-matched control group, found people with CHARGE scored higher on maintaining order than people with other genetic syndromes.

Table 10 Observed prevalence rate of behaviours associated with ASD

Trait type	Rate	Article	N	Quality			
				SI	CS	AC	GC
Maintaining order/routine	15% - 30%	Hudson *et al*. (2016)	20				
	68%	Johansson *et al*. (2006)	28				
	34%	Souriau *et al*. (2005)	71				
Repetitive behaviours	av. 11.2 each	Bernstein & Denno (2005)	29				
Stereotypic movement	1% *(diagnosed)*	Graham *et al.* (2005)	14				
	50%	Johansson *et al.* (2006)	28				
	61% *self-stimulation* 14% *rhythmic rocking*	Thelin and Fussner (2005)	28				
Tactile defensiveness	40%	Blake *et al.* (2005)	30				
	51%	Hartshorne *et al.* (2016)	53				
	54%	Thelin & Fussner (2005)	28				
	28%-54%	Souriau *et al.* (2005)	71				

Four articles identified levels of reduced sensitivity to stimuli amongst people with CHARGE (Table 11). Pain insensitivity was a common feature, present in over 50% of the higher-quality samples. Also, Deuce *et al.* (2012) reported that 5% of their sample reported no fear of danger, the only study to report on this characteristic.

Table 11 Observed prevalence rates of reduced reactivity indicators

Behaviour	Estimate	Article	N	Quality			
				SI	CS	AC	GC
Pain Insensitivity	34%	Souriau *et al.* (2005)	71				
	54%	Johansson *et al.* (2006)	28				
	51-60%	Wulffaert *et al.* (2009)	22				
No fear of danger	5%	Deuce *et al.* (2012)	44				

The possibility that the set of behavioural atypicalities observed in individuals with CHARGE may represent presence of autism spectrum disorder was addressed in 10 articles (Table 12). Research focusing on pre-existing diagnoses offered lower estimates than those looking to directly assess evidence of 'ASD' amongst their sample. Pooled prevalence estimates suggested 10-26% may reliably exceed clinical diagnostic thresholds (Figure 6). In total, up to 60% may present with a behavioural characteristic that could be interpreted as at least weaker evidence of diagnosable ASD, or of sub-clinical ASD. In addition, Hartshorne and Cypher (2004) note that 15 of 25 behaviours associated with ASD were present in at least one-third of their sample.

Table 12 Observed 'ASD' prevalence rate by type of assessment

Assessment	Rate	Article	N	Quality				TD rate
				SI	CS	AC	GC	
Diagnosed or diagnosable with autism spectrum disorder	5%	Deuce *et al*. (2012)	44					1.5%[1]
	6%	Hartshorne & Cypher (2004)	100					
	11%	Wachtel *et al.* (2007)	87					
	20%	Johansson *et al.* (2006)	25					
	20%	Strömland *et al.* (2005)	25					
	23%	Blake *et al.* (2005)	30					
	26%	Hartshorne *et al.* (2016)	53					
	28%	Hartshorne *et al*. (2005)	160					
Traits or evidence of 'ASD' below diagnostic thresholds	16%	Miller *et al.* (2004)	31					
	20%	Strömland *et al.* (2005)	25					
	48%	Johansson *et al.* (2006)	25					
	51-60%	Wulffaert *et al.* (2009)	22					
Pooled prevalence estimates								
Random effects model 17.2% (95% CI 10.4% - 25.3%)								
Quality effects model 17.3% (95% CI 10.2% – 25.7%)								

[1] Estimate from Christensen et al. (2012)

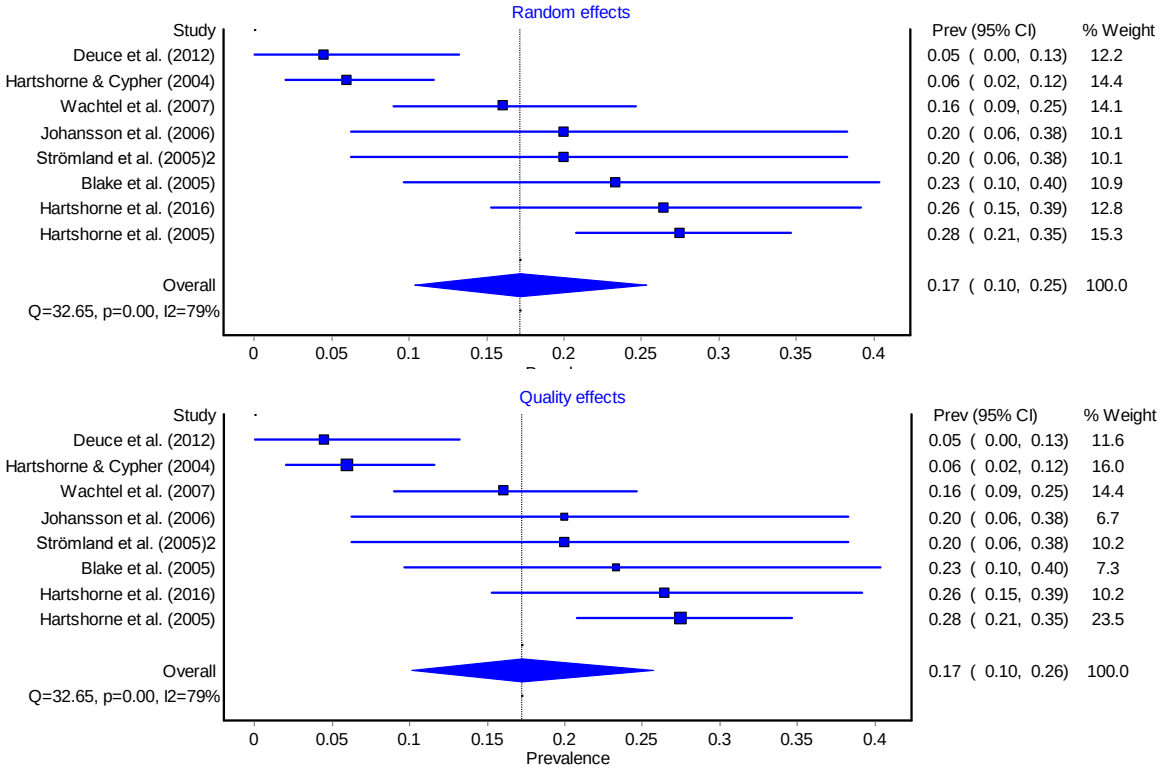


Figure 6 Pooled prevalence estimates for ASD diagnosis

The two reports focusing most exclusively upon ASD-associated features amongst people with CHARGE produced evidence of elevated rates of behaviours indicative of ASD, but not in the same way as in ASD as identified in people with no other neurodevelopmental diagnosis. Hartshorne et al. (2005), using the Autistic Behaviour Checklist measure, found mean scores lower than those typically found in people reaching diagnostic thresholds for ASD and higher than those for deaf-blind people, with most variance for people with CHARGE. This was supported by Graham *et al.* (2005), who found their sample more likely to show behaviour associated with ASD diagnosis, but with lower impairment. Scores were more similar to those of people diagnosed with ASD on items rating social and self-help factors, and it may be on these measures that people with CHARGE most commonly 'tip the scales' of diagnostic assessment tools. Statistically significant relationships found between other features and ASD-associated symptomatology are summarised in Table 13. This may corroborate a position that associated difficulties in people with CHARGE may be more likely to be due to sensory impairments than to ASD as generally defined.

Table 13 Factors reported to be significantly correlated with ASD-associated symptomatology

Article	Associated factor	Direction of association	N	Quality			
				SI	CS	AC	GC
Hartshorne & Cypher (2004)	Deaf-blindness	Positive	100				
	Age	Positive					
	Number of medical conditions	Positive					
Hartshorne *et al.* (2009)	Adaptive functioning	Negative	87				
Hartshorne *et al.* (2016)	Age of walking	Positive	53				
	Deaf-blindness	Positive					
Johansson *et al.* (2006)	Visual impairment	Positive	25				
	Hearing impairment	Positive					
Wachtel *et al.* (2007)	Diagnostic behaviour checklist scores	Positive	87				
Wulffaert *et al.* (2009)	Parenting stress	Positive	22				

Emotions and features associated with mental health diagnoses

Eighteen articles reported results that may be associated with mental health of people with CHARGE. These are separated here into sleep difficulties, emotional difficulties, psychiatric diagnoses, ADHD and associated symptoms, and harming behaviours.

Seven papers reported on the presence of sleep difficulties (Table 14). Observed prevalence of significant difficulties varied widely, between 14-59%, with pooled prevalence estimates suggesting that between 20-49% experience difficulties with sleep (Figure 7). Only Dammeyer (2012) appeared to account for milder problems, which, added to reports of more substantial trouble, could suggest some level of difficulty in up to 88%, a level not dissimilar to reported difficulties for people with 'pervasive developmental disorders' more generally (Couturier *et al.*, 2005). Hartshorne *et al.* (2009) found sleep difficulties were associated with behavioural difficulties, deaf-blindness, ear infections, and the extent to which parents rated their children as "self-absorbed."

Table 14 Reported prevalence rates of sleep difficulties

Article	Rate	N	Quality				Other estimates
			SI	CS	AC	GC	
Deuce *et al.* (2012)	14%	44					TD: 26%[1]
Issekutz *et al.* (2005)	31%	16					PDD: 78%
Johansson *et al.* (2006)	29%	28					
Dammeyer (2012)	47% 'a lot' 41% 'some'	17					
Blake *et al.* (2005)	50%	30					
Hartshorne *et al.* (2009)	57.5%	87					
Hartshorne *et al.* (2016)	59%	53					
Pooled prevalence estimates							
Random effects model 35.0% (95% CI 21.9% – 49.4%)							
Quality effects model 33.2% (95% CI 20.0% - 47.8%)							

[1]Estimates from Couturier *et al.* (2005)

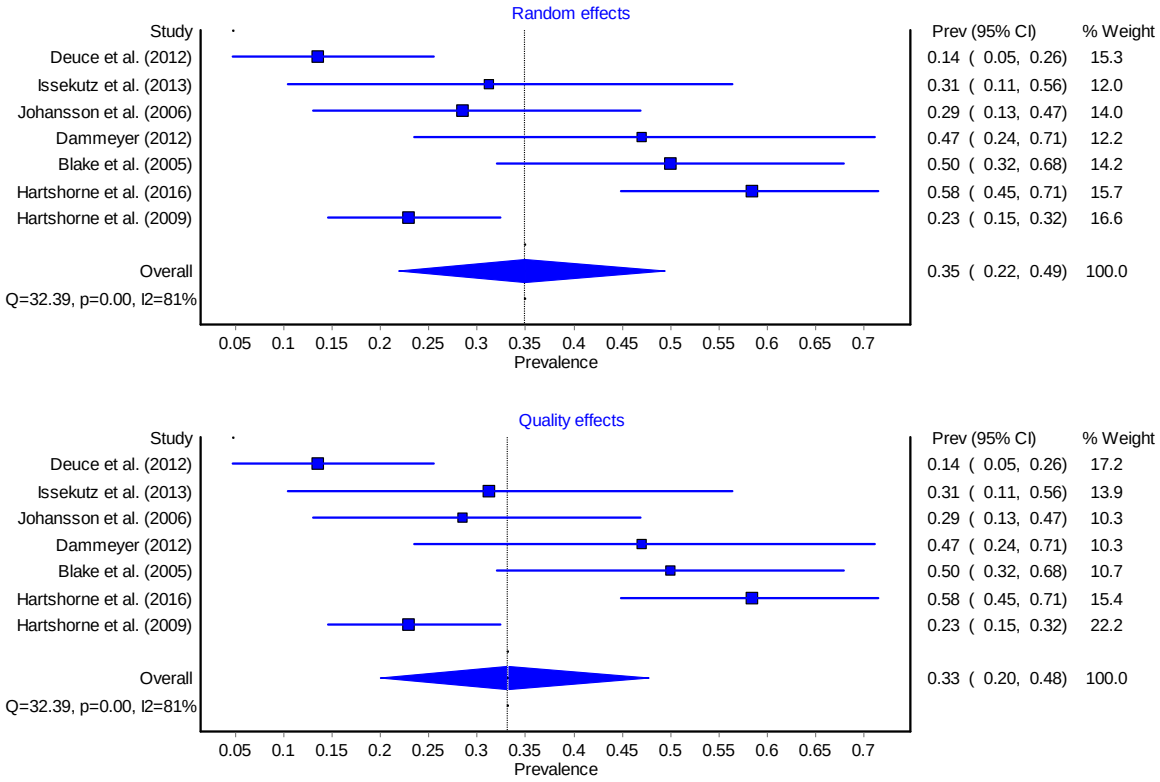


Figure 7 Pooled prevalence estimates for sleep difficulties

Four research papers produced estimates of emotional problems within two common areas of emotional difficulty: anxiety and low mood (Table 15). Pooled prevalence estimates (Figures 8 & 9) suggest elevated levels of both compared with TD people, but lower than rates in ASD diagnosed populations. In addition, Hartshorne *et al.* (2009) found overall mean anxiety and low mood scores within average ranges. Correlations were identified between emotional problems and age (r=.46, p<0.05), number of hospitalisations (r=-.59, p<.001) (Vervloed *et al.,*

2006), and other emotional problems (Souriau *et al.,* 2005). Pooled prevalence estimates were calculated separately for anxiety and low mood estimates; due to the large difference caused by means of data collection, Wachtel *et al.* (2007) data was not included.

Table 15 Reported prevalence rates of emotional difficulties

Emotion	Rate	Article	N	Quality				Other estimates
				SI	CS	AC	GC	
Anxiety	6%*	Wachtel *et al.* (2007)	87					TD:3-30%[1]
	31%	Souriau *et al.* (2005)	71					ASD:40-60%[2]
	37%	Blake *et al*. (2005)	30					
	45%	Hartshorne *et al.* (2016)	53					
Low mood	1%*	Wachtel *et al.* (2007)	87					TD: 4.4%[3]
	8%	Hartshorne *et al.* (2016)	53					ASD: 44%[4]
	13%	Blake *et al*. (2005)	30					
	24%	Souriau *et al.* (2005)	71					
Pooled prevalence estimates								
Anxiety		Random effects model	37.3% (95% CI 28.6% – 46.3%)					
		Quality effects model	37.3% (95% CI 28.6% – 46.3%)					
Low mood		Random effects model	14.7% (95% CI 5.8% – 26.5%)					
		Quality effects model	15.5% (95% CI 6.1% – 27.7%)					

[1] Estimates from Martin (2003) and Bendelow & Michaelis (2015)
[2] Estimates from van Steensel *et al.* (2011) and Strang *et al.* (2012)
[3] Estimates from WHO (2017)
[4] Estimates from Strang *et al.* (2012)
* Estimate provided is reported as being based on a diagnosis

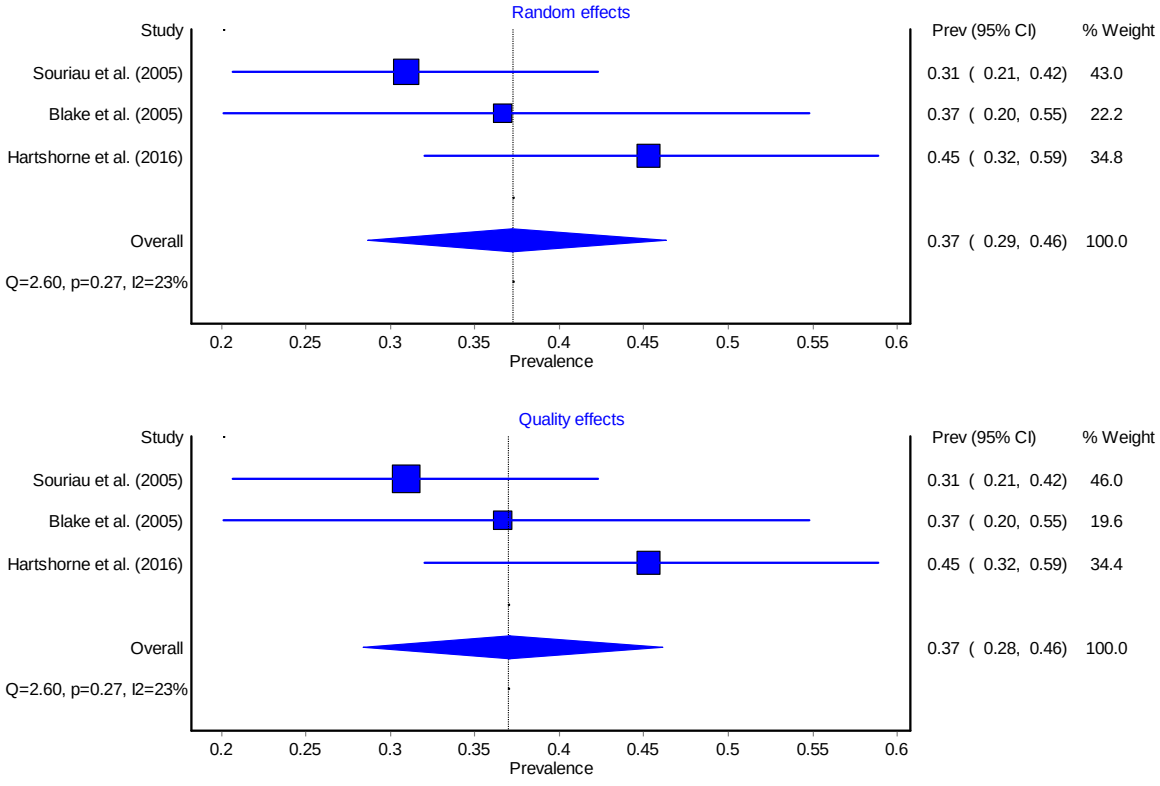


Figure 8 Pooled prevalence estimates for anxiety difficulties

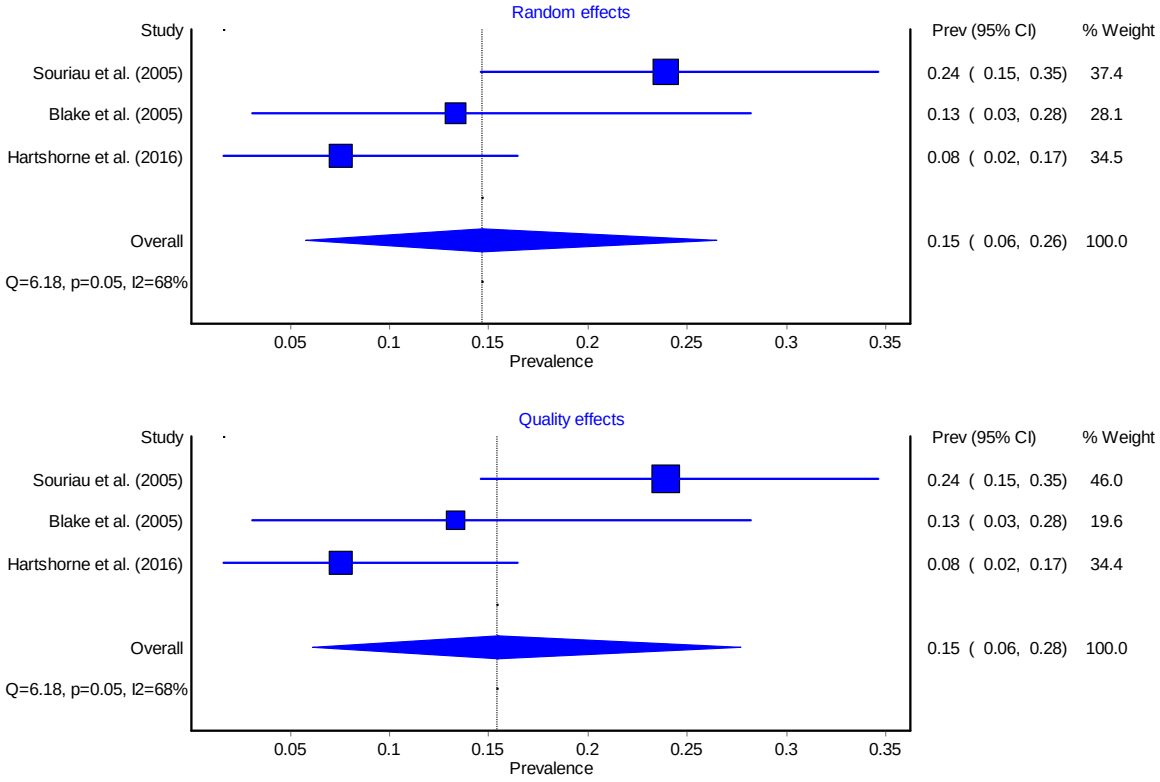


Figure 9 Pooled prevalence estimates for difficulties with low mood

Seven articles reported on the presence of behavioural features that are closely aligned with specific psychiatric diagnostic labels. These are presented in Table 16. For clarity, estimates relating to 'ADHD,' attention, and hyperactivity are presented separately. Where appropriate comparison data were identified, people with CHARGE tended to be identified as struggling with higher numbers of features associated with emotional distress relative to TD people and at levels similar to people with ASD diagnosis. Particularly common issues included obsessive-compulsive problems, and Tourette's syndrome/Tics. Hartshorne & Cypher (2004) also reported that one or more of 13 Obsessive-Compulsive Disorder-associated and one of two tic behaviours occurred in at least one third of their sample. It appeared that research using more formal or professional assessment methods produced higher estimates of diagnosis-consistent behaviour. Added to this list, Graham *et al.* (2005) reported on somatic complaints, finding people with CHARGE had fewer somatic complaints than people with Prader-Willi Syndrome, but equivalent levels to people with Down or Williams Syndrome.

Some significant associations were found: Hartshorne & Cypher (2004) identified a positive correlation between age and obsessive-compulsive problem behaviours (r =.23, p<0.05), and deaf-blind people with CHARGE had a greater number of problematic behaviours across the diagnostic spectrum. Vervloed *et al*. (2006) found that children who spent more time in hospital tended to have fewer 'delinquent behaviours' (r=-.49, p<0.05) and that boys with CHARGE were not at increased risk of delinquency even when appearing frustrated.

Table 16 Reported prevalence rates of difficulties associated with psychiatric diagnoses

Diagnosis	Rate	Article	N	Quality				TD rate
				SI	CS	AC	GC	
Psychosis	1%*	Wachtel *et al*. (2007)	87					TD: 3%[1]
Eating distress	7%*	Blake *et al.* (2005)	30					TD: 1-4%[2]
Obsessive Compulsive problems	3%*	Hartshorne & Cypher (2004)	100					TD: 2-4%[3]
	9%*	Deuce *et al.* (2012)	44					
	43%	Blake *et al.* (2005)	30					
	44%	Issekutz *et al.* (2005)	16					
Tourette's and tics	2%*	Hartshorne & Cypher (2004)	100					TD: <1%[4]
	7%*	Johansson *et al.* (2006)	31					
	17%	Hartshorne *et al.* (2016)	53					
	33%	Blake *et al.* (2005)	30					
Conduct disorder	11%*	Deuce *et al.* (2012)	44					TD:2.1-4.7%[5]
	13%*	Blake *et al.* (2005)	30					ASD: 1.4-11.3%[6]
	13%	Hartshorne *et al.* (2016)	53					

[1] Estimate from Perälä *et al.* (2007)
[2] Estimate from Smink *et al.* (2012)
[3] Estimates from Boileau (2011) and Martin (2003)
[4] Estimate from Bitsko *et al.* (2014)
[5] Estimate from O'Connell *et al.* (2009)
[6] Estimate from Pondé *et al.* (2017)
* Estimate provided is reported as being based on a diagnosis

Co-occurrence of CHARGE with difficulties in attention were common (Table 17). Pooled prevalence of diagnosed ADHD was estimated at between 6-14%, higher than TD children and lower than children with ASD diagnosis. Observed relevant behaviours were observed in up to 42-77%, and nine or more of ten ADHD behaviours were rated as present in at least 33% of people in Hartshorne and Cypher's (2004) study. Behaviours that may be labelled as representing attention deficits, impatience, and hyperactivity may therefore be commonly observed in people with CHARGE. Additionally, hyperactivity was on average the highest scoring domain for people with CHARGE on the developmental behaviour checklist in Wulffaert *et al*. (2009) and was the most prevalent problem associated with sleep problems in

Trider *et al*. (2012). Owing to the difference between estimates of diagnosed ADHD and reported prevalence of behavioural features associated with the disorder, pooled prevalence estimates were calculated separately for these two groups (Figures 10 and 11).

Table 17 Reported prevalence rates of ADHD and associated symptoms

Diagnosis	Rate	Article	N	Quality				Other rates
				SI	CS	AC	GC	
ADHD*	7%	Hartshorne & Cypher (2004)	100					TD children: 5-7%[1]
	10%	Blake *et al*. (2005)	30					
	13%	Wachtel *et al*. (2007)	87					
Attention deficit	24%	Raqbi *et al.* (2003)[3]	21					Children with autism spectrum disorder diagnosis: 48-50%[2]
	36%	Johansson *et al.* (2006)	28					
	71%	Thelin and Fussner (2005)	28					
	61-70%	Wulffaert *et al*. (2009)	22					
Hyperactivity	44%	Issekutz *et al.* (2005)	16					
	54%	Souriau *et al.* (2005)	71					
	64%	Johansson *et al.* (2006)	28					
	61-70%	Wulffaert *et al*. (2009)	22					
Impatience	61%	Souriau *et al.* (2005)	71					
	86%	Wulffaert *et al*. (2009)	22					
Impulsivity	11%	Johansson *et al.* (2006)	28					
	24%	Raqbi *et al.* (2003)[3]	21					
Pooled prevalence estimates								
Diagnosed		Random effects model	9.9% (95% CI 6.2% – 14.2%)					
		Quality effects model	9.9% (95% CI 6.2% – 14.2%)					
Symptomatology		Random effects model	59.4% (95% CI 43.4% – 74.5%)					
		Quality effects model	58.6% (95% CI 42.2% – 77.1%)					

[1] Estimate from Fayyad et al. (2007)

[2] Estimate from Kwok *et al.* (2017) and Pondé *et al.* (2017)

[3] Figure of Raqbi *et al.* (2003) is duplicated as it states five children had relevant symptoms

* Estimates provided are reported as being based on a diagnosis

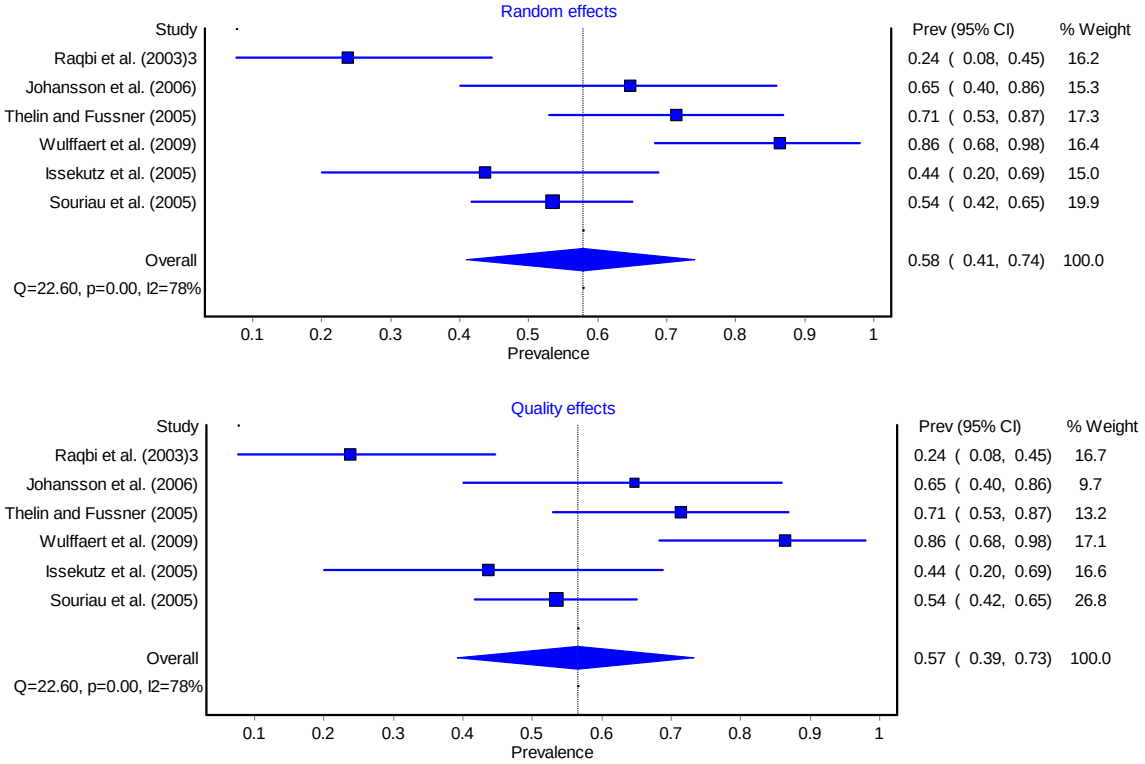


Figure 10 Pooled prevalence estimates for ADHD diagnosis

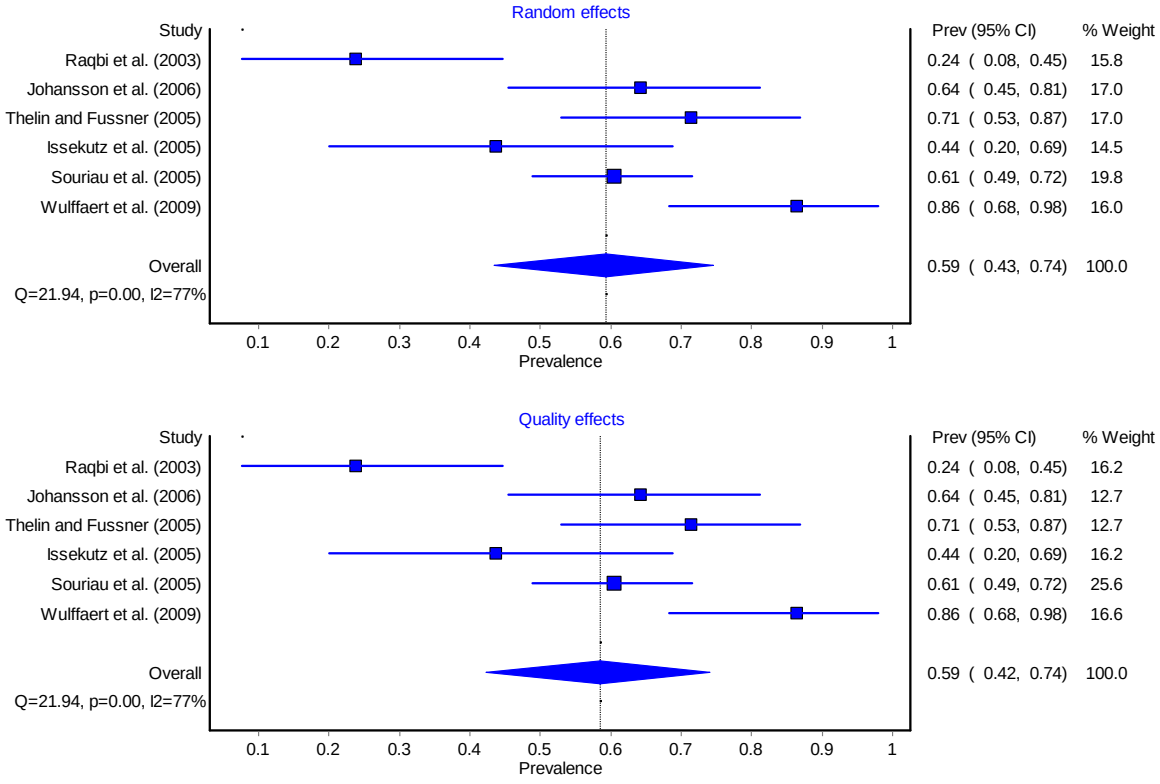


Figure 11 Pooled prevalence estimates for ADHD symptomatology

Five papers reported on the extent to which people with CHARGE were observed to engage in behaviours that could cause injury to themselves or others (Table 18). Estimates of

the prevalence of aggression were consistently reported as substantially higher than for TD people or those with ASD diagnoses. Souriau *et al.* (2005) found significant correlations between aggression to self and aggression to others. Much of the aggressive behaviour may be due to management of the individual; Bernstein and Denno (2005) found that if people with CHARGE were redirected when engaging in repetitive behaviours, 34% responded with self-injurious behaviours or with hitting or kicking at the adult. Hudson *et al*. (2016) added that 15% of people with CHARGE would become angry or aggressive if their plate was taken away from them during feeding. When comparing CHARGE with other syndromes, a pattern was found whereby people with CHARGE appeared equivalent in anxiety and low mood, but more prone to difficulties with anger (Graham *et al.,* 2005; Wulffaert *et al.*, 2009). Pooled prevalence estimates were calculated separately for self-injury and aggression (Figures 12 & 13). Due to the differences caused by means of data collection, results from Wachtel *et al.* (2007) were not included.

Table 18 Reported prevalence rates of harming behaviours

Behaviour	Rate	Article	N	Quality				TD rate
				SI	CS	AC	GC	
Self-injury	1%*	Wachtel *et al.* (2007)	87					TD: 6-8%[1]
	40%	Souriau *et al.* (2005)	71					ASD: 33%[2]
	47%	Hartshorne *et al.* (2016)	53					
	50%	Blake *et al*. (2005)	30					
	54%	Johansson *et al*. (2006)	28					
Aggressiveness towards others	2%*	Wachtel *et al.* (2007)	87					
	38%	Souriau *et al.* (2005)	71					TD: 2.8-3.5%[3]
	46%	Thelin & Fussner (2005)	28					
	51%	Hartshorne *et al.* (2016)	53					ASD: 1.4-11.3%[4]
	53%	Blake *et al*. (2005)	30					
	68%	Johansson *et al.* (2006)	28					
Pooled prevalence estimates								
Self-injury		Random effects model		45.6% (95% CI 38.5% – 52.9%)				
		Quality effects model		45.6% (95% CI 38.5% – 52.9%)				
Aggressiveness towards others		Random effects model		50.0% (95% CI 40.4% – 59.7%)				
		Quality effects model		48.6% (95% CI 38.8% – 58.4%)				

[1] Estimate from Moran et al. (2012)
[2] Estimate from Akram *et al.* (2017)
[3] Estimates are of diagnoses of conduct and defiance disorders from NRC and IOM (2009)
[4] Estimates are of diagnoses of conduct and defiance disorders from Pondé *et al.* (2017)
* Estimates provided are reported as being based on a diagnosis

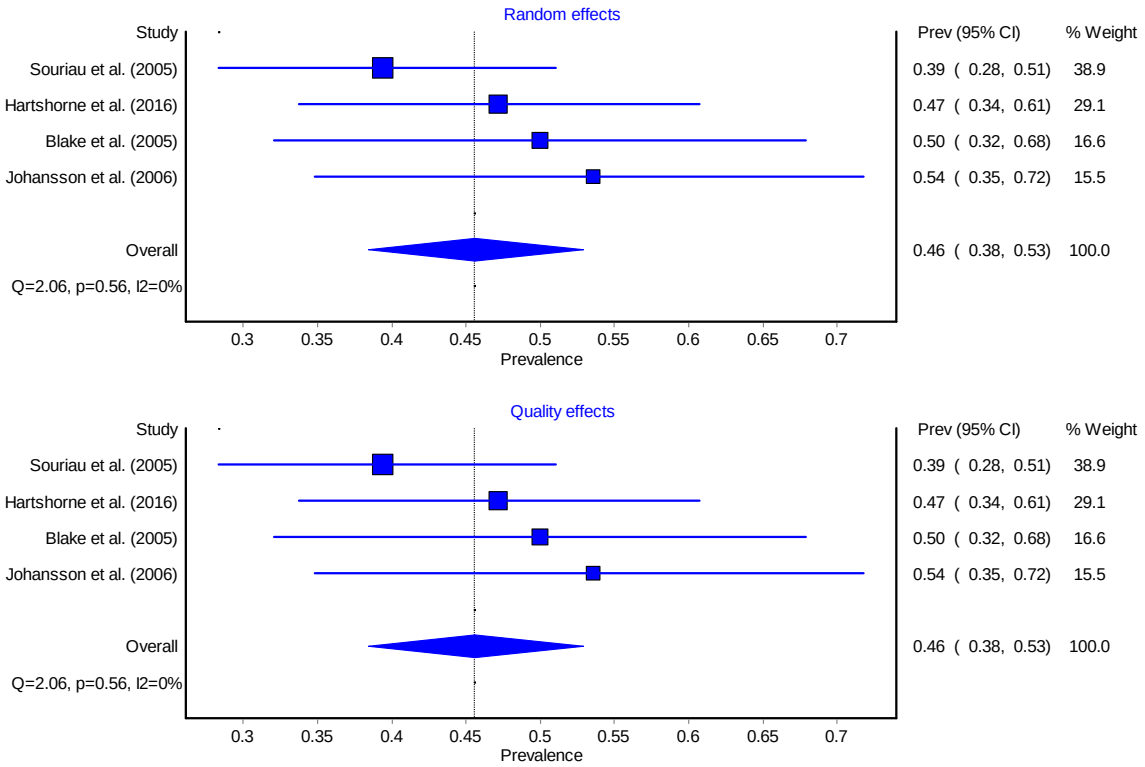


Figure 12 Pooled prevalence estimates for self-injury

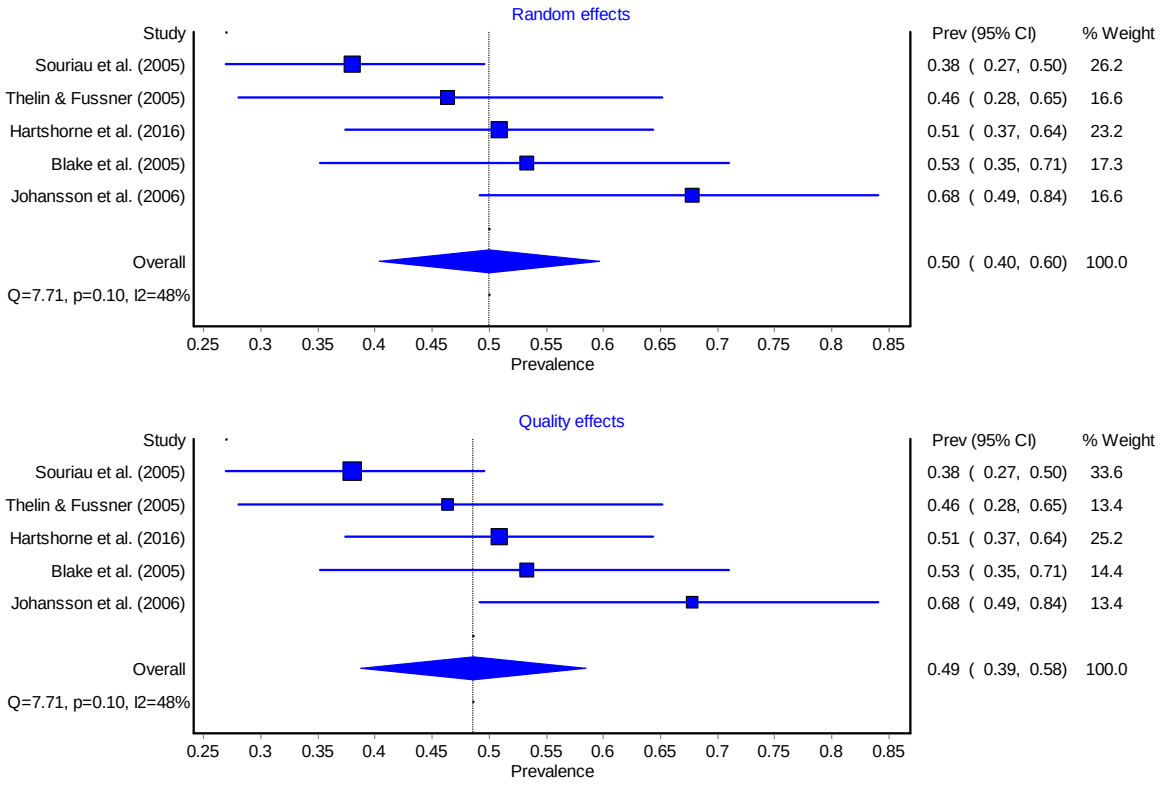


Figure 13 Pooled prevalence estimates for aggressiveness towards others

Discussion

This review found a total of 33 papers of sufficient quality and relevance to the observed behaviour of people with CHARGE syndrome. Besides levels of concordance with

clinical diagnostic characteristics, the behavioural areas attracting the most attention were features associated with ASD and aspects of maturation and development including language and motor skills. Quality ratings ranged from 0.33 to 0.92 with a median score of 0.50. Only one paper identified employed a random or total population sample (Issekutz *et al.*, 2005), and only two directly compared people with CHARGE to a control group matched on highly-relevant criteria (Graham *et al.*, 2005; Issekutz *et al.*, 2005), such as intellectual ability; most relied upon TD norms.

People with CHARGE appear to vary significantly in their fundamental abilities relative to the average whilst very young, then to diverge markedly from typical development trajectories as their peers advance. In Santoro *et al.* (2014) abilities varied up to 3 years of age; and the oldest participants (up to 33 years-old) had the greatest delays. Reduced functioning three standard deviations below average was found for several basic developmental tasks including achieving motor milestones, adaptive functioning, and language ability. Around one-fifth of people appear to have average-level IQ, while 50-80% potentially have IQs that justify a diagnosis of intellectual disability. Most adolescents and adults achieved independence in basic self-care skills but fewer than half did so for more complex skills such as managing finances. Only 29-47% of people achieved verbal communication, with 21-53% achieving sign language, and 10-39% never achieving symbolic language at all.

Socially, people with CHARGE appear to be at risk of lower ability and tend towards behaving in a withdrawn manner. Difficulties may be particularly apparent around children and groups, and people may benefit from having a single adult supervisor. People with CHARGE appear to be most at risk of emotional difficulties associated with diagnoses of OCD, attention and hyperactivity, anxiety, and sleep difficulties, and to engage in harmful behaviour. People with CHARGE showed consistently elevated prevalence rates for characteristics that are often associated with diagnostic categories of ASD and ADHD. In both cases, actual diagnostic levels fell significantly short of reported behavioural difficulties associated with those conditions. There was some dispute about the possibility that observed

ASD 'traits' may be caused by a 'primary' ASD condition, with sensory difficulties also posited to have strong explanatory potential (Graham *et al.*, 2005; Hartshorne *et al.*, 2005; Hartshorne & Cypher, 2004). As ASD may be argued to itself represent a heterogeneous social construction with evidence of a biological basis showing limited reliability (e.g. Runswick-Cole *et al.*, 2016), it is perhaps unsurprising that the literature presents an unclear picture.

Unsurprisingly, a complex picture of interrelationships emerged that makes it difficult to make strong assertions as to causal relationships between behavioural features. Some features were repeatedly associated with difficulties in other areas. For example: age of walking was associated with adaptive functioning; deaf-blindness with adaptive functioning and developmental delay, language form and delay, poorer executive functioning, social ability, sleep problems, 'ASD' features, and a greater number of problematic behaviours; ASD-associated features were positively correlated with prevalence of self-injury, hyperactivity, medical conditions, and problematic behaviours. Mental health difficulties also tended to be associated with greater numbers of problematic behaviours. Where aggression occurred, it seemed to relate to frustration at preferred behaviours being disrupted by others. Primary difficulties with ability appeared to be exacerbated by interactive processes resulting in low confidence and relationship difficulties. Perhaps owing to this difficulty in clarifying causality, clinical diagnoses of, for example, ASD, ADHD, and mental health difficulties, appeared to be rarer than prevalence estimates obtained in more direct research, perhaps reflecting the wider issue of diagnostic overshadowing (Mason & Scior, 2004).

Difficulties identifying causation in these research papers are exacerbated by frequent lack of clarity in how CHARGE diagnoses were confirmed, plus relatively rare adoption of well-matched comparison or control groups. The latter factor makes it difficult to identify putative differences between people with CHARGE and people with deaf-blindness caused by other factors, or between people with CHARGE and other genetic syndromes causing intellectual or physical disability. In addition, where relationships were reported between behavioural factors, this was often done in the absence of the data for each factor. For example, two

papers (Hartshorne et al, 2005; Wachtel *et al.* 2007) reported correlations between age of walking and other factors without reporting the mean age of walking observed. Whilst many papers fared better on the quality criterion of assessment of symptoms, still many relied upon the reports of parents and carers for symptom report, relatively few involved direct consultations with medical consultants and even where papers reported diagnoses, it was often difficult to determine whether the children were diagnosed and with what specific diagnosis (e.g. Wachtel *et al.*, 2007). Much of the evidence reported here may therefore be seen more as a description of how people with CHARGE are experienced by those around them, than a cataloguing of verified characteristics.

As expected, these problems raise issues with the possibility of achieving a clearly delineable behavioural phenotype for CHARGE. The variability of physical and behavioural characteristics observed in people with CHARGE is a problem added to by the lack of consensus in the research about how behaviours and syndromes are reported, such as whether clinically diagnosed cases are included alongside genetically-verified diagnoses. Several reports did focus exclusively on genetically-verified cases and researchers appeared to be increasingly reporting upon numbers of genetic diagnoses and focusing on genetic cases (e.g. Husu *et al.,* 2013; Santoro *et al.,* 2014). Bernstein and Denno's (2005) use of 'repetitive behaviour' as a term to summarise a range of behaviour features, although typical of intellectual disabilities literature, differed from other studies here and blurred the distinctions between, for example, 'repetitive behaviour' and 'stereotypic movements.' Although behavioural trends were identified, observed prevalence rates for most features were below 50%, and as such any individual diagnosed is less likely than not to experience each behaviour. Finally, regarding behavioural phenotype research, it is notable that every single behavioural feature mentioned is considered in terms of deficit; no piece of research used here offered any single examples of positive ways in which people with CHARGE may be experienced, which may conceivably lead to an argument that behavioural phenotypes could further stigmatise an already disadvantaged group.

Following the results of this review, diagnosticians may be aided by an awareness of how certain features may appear to represent one type of difficulty (ASD-associated characteristics), but may actually be a consequence of another, such as deaf-blindness. Arguably, this should not dissuade attempts at reaching functional diagnoses for individuals and their families, as an under-diagnosis of relevant problems could lead to under-resourcing of support for those in need. As the research is not at this stage able to help clarify what features may be caused by which factors, intervention and support plans may need to be applied holistically and scientifically. Clinicians should not, for example, be discouraged by failure of an intervention focused on features associated with ASD diagnosis to reduce self-destructive behaviours, and instead consider other features of an individual's presentation as potentially relevant. Policymakers, likewise, should recognise the complexity that is intrinsic in treating people affected by CHARGE and offer appropriately flexible support. Researchers would benefit the increasing knowledge base around people with CHARGE by developing a clear and consistent shared language. This is a particular problem in CHARGE due to the variety of presentation. There are, for example, several apparently outdated terms, such as 'Hall-Hittner Syndrome' and 'CHARGE Association,' associated with the condition still in use and these do not seem to consistently represent the condition since a meaningful genetic marker was discovered. Likewise, symptom-specific measures continue to vary widely in their use and consensus, limiting the potential for focused meta-analysis.

This project benefited from a broad search strategy that allowed for many relevant research papers pertaining to behavioural features in CHARGE to be recognised. This has its drawbacks however, as a high volume of irrelevant papers was generated and therefore many quite stringent inclusion and exclusion criteria were required, potentially reducing replicability. This difficulty may also reinforce the stated need for authors to be consistent in terminology. Quality appraisal helped determine which papers were more valid and reliable, however it did not account for the relevance of information contained. Hudson *et al.* (2016), for example, produced highly-relevant data but scored lower because of reliance upon self-completion

methods and a limited control group. Some nuance may have been lost by giving equivalent weighting to each of the four factors. A further difficulty was that due to the variety of papers reporting on the topic, drawn from a variety of research strands and from groups that varied on, for example, means of diagnosis or age, for many papers data relevant to this topic was reported with little depth or context and it is therefore possible that in synthesis some data may have been inaccurately or simplistically compared.

Future research should, in addition to following the guidelines set out above, aim to aid in the delineation of causality with regards to behavioural features. This would enable diagnosticians and clinicians to identify which aspects of a person's presentation are associated with which others, and to anticipate problems that may develop in future. One way of achieving this would be to focus on producing longitudinal research with meaningful comparison groups. In particular, it is important to draw clear comparisons, using consistent assessment methods, between people with CHARGE and people with other genetic conditions, deaf-blindness, or ASD diagnosis.

To conclude, CHARGE is a highly variable genetic condition that results in a range of physical, sensory, and behavioural issues. This heterogeneity creates difficulties for the applicability of the behavioural phenotype model, as it is difficult to identify a clear set of behavioural features for the condition, or to infer causation with much accuracy owing to the interrelatedness of individual features. Nonetheless, this project has offered some possible insight into the types of behavioural tendencies that have been discussed in the literature since the condition was recognised in 1979. With some more consistency in the approaches of future research endeavours, it may be possible to assert more clearly which behavioural features may be associated with CHARGE itself, and which may be due to the other interlacing problems faced by those with the condition and their families.

References

***** Denotes articles included in the review

*Abadie, V., Wiener-Vacher, S., Morisseau-Durand, M-P., Porée, C., Amiel, J. … Manac'h, Y. (2000). Vestibular anomalies in CHARGE syndrome: investigations on and consequences for postural development. *European Journal of Pediatrics, 159,* 569-574.

Abi Daoud, M. S., Gradstein, J. & Blake, K. D. (2002). CHARGE into the adolescent and adult decades. *Paediatrics and Child Heath, 7A*, 28.

Akram, B., Batool, M., Rafi, Z., & Akram, A. (2017). Prevalence and predictors of non-suicidal self-injury among children with autism spectrum disorder. *Pakistan Journal of Medical Sciences, 33*(5), 1225-1229.

American Speech-Language-Hearing Association (2018). *Pediatric Dysphagia*. Retrieved on 12/01/2018 from: https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934965&section=Incidence_and_Prevalence

Amiel, J., Attiee-Bitach, T., Marianowski, R., Cormier-Daire, V., Abadie, V., Bonnet, D., … Lyonnet, S. (2001). Temporal bone anomaly proposed as a major criteria for diagnosis of CHARGE syndrome. *American Journal of Medical Genetics, 99,* 124-127.

Bandelow, B. & Michaelis, S. (2015). Epidemiology of anxiety disorders in the 21st century. *Dialogues in Clinical Neuroscience. 17*(3), 327-335.

Barendregt, J. J. & Doi, S. A. (2016). MetaXL Version 5.3. *Epigear International Pty Ltd*, Queensland, Australia.

*Bernstein, V. & Denno, L. S. (2005). Repetitive behaviors in CHARGE syndrome: Differential diagnosis and treatment options. *American Journal of Medical Genetics Part A, 133A*, 232-239.

Blake, K. D. & Brown, D. (1993). CHARGE association looking at the future: The voice of a family support group. *Child: Care, Health and Development, 19,* 395-409.

Blake, K. D., Davenport, S. L., Hall, H. D., Hefner, M. A., Pagon, R. A. … Graham, J. M. (1998). CHARGE association: An update and review for the primary paediatrician. *Clinical Pediatrics, 37*(3), 159-173.

*Blake, K. D., Salem-Hartshorne, N., Abi Daoud, M., & Gradstein, J. (2005). Adolescent and adult issues in CHARGE syndrome. *Clinical Pediatrics,* 151-159.

Boileau, B. (2011). A review of obsessive-compulsive disorder in children and adolescents. *Dialogues in Clinical Neuroscience, 13*(4), 401-411.

Brock, K. E., Mathiason, M. A., Rooney, B. L., & Williams, M. S. (2003). Quantitative analysis of limb anomalies in CHARGE syndrome: correlation with diagnosis and characteristic CHARGE anomalies. *American Journal of Medical Genetics Part A,* 123A, 111-121.

Brown, D. (2005). CHARGE syndrome "behaviors": challenges or adaptations? *American Journal of Medical Genetics Part A, 133A,* 268–272.

Buchman, C. A., Roush, P. A., Teagle, H. F. B., Brown, C. J., Zdanski, C. J., & Grose, J. H. (2006). Auditory neuropathy characteristics in children with cochlear nerve deficiency. *Ear & Hearing, 27*, 399-408.

Christensen, D. L., Baio, J., Braun, K. V., Bilder, D., Charles, J., … & Yeargin-Allsopp, M. (2012). Prevalence and characteristics of autism spectrum disorder among children aged 8 years – autism and developmental disabilities monitorying network, 11 sites. *Surveillance Summary 2016, 65*(No. SS-3), 1-23.

Couturier, J. L., Speechley, K. N., Steele, M., Norman, R., Stringer, B., & Nicolson, R. (2005). Parental perception of sleep problems in children of normal intelligence with pervasive developmental disorders: prevalence, severity, and pattern. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*(8), 815-822.

Critical Appraisal Skills Programme (2017). CASP (Case Control Study) Checklist. [online] Available at: http://docs.wixstatic.com/ugd/dded87_afbfc99848f64537a53826e1f5b30b5c.pdf. Accessed: 11/09/17.

*Dammeyer, J. (2012). Development and characteristics of children with Usher syndrome and CHARGE syndrome. *International Journal of Pediatric Otorhinolaryngology, 76*, 1292-1296.

*Deuce, G., Howard, S., Rose, S., Fuggle, C. (2012). A study of CHARGE syndrome in the UK. *The British Journal of Visual Impairment, 30*(2), 91-100.

*Dobbelsteyn, C., Peacocke, S. D., Blake, K., Crist, W., & Rashid, M. (2008). Feeding difficulties in children with CHARGE syndrome: Prevalence, risk factors, and prognosis. *Dysphagia, 23*, 127-135.

Doi, S. A., Barendregt, J. J., Khan, S., Thalib, L. & Williams, G. M. (2015). Advances in the meta-analysis of heterogeneous clinical trials II: The quality effects model. *Contemporary Clinical Trials, 45*, 123-129.

Doyle, C. & Blake, K. (2005). Scoliosis in CHARGE: a prospective survey and two case reports. *American Journal of Medical Genetics Part A, 133A,* 340–343.

Dykens, E. M. & Hodapp, R. M. (2001). Research in mental retardation: Toward an etiological Approach. *Journal of Child Psychology and Psychiatry, 42*(1), 49-71.

Dykens, E. M. & Rosner B. A. (1999). Refining behavioural phenotypes: Personality-motivation in Williams and Prader-Willi Syndromes. *American Journal on Mental Retardation, 104*(2), 158-169.

Fayyad, J., De Graaf, R., Kessler, R., Alonso, J., Angermeyer, M. … & Jin, R. (2007). Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *British Journal of Psychiatry, 190*, 402-409.

Fidler, D., Most. D., & Philofsky, A. (2009). The Down syndrome behavioural phenotype: Taking a developmental approach. Retrieved 13/12/2017 from: https://www.down-syndrome.org/reviews/2069/

Flint, J. (1998). Behavioural phenotypes: Conceptual and methodological issues. *American Journal of Medical Genetics (Neuropsychiatric Genetics), 81,* 235-240.

Flint, J. & Yule, W. (1994). Behavioural phenotypes. In Rutter, M. R., Taylor, E., & Hersov, L. (eds): "Child and Adolescent Psychiatry," Oxford: Blackwell Scientific, pp 666-687.

*Forward, K. E., Cummings, E. A. & Blake, K. D. (2007). Risk factors for poor bone health in adolescents and adults with CHARGE syndrome. *American Journal of Medical Genetics Part A, 143A,* 839-845.

*Graham, J. M., Rosner, B., Dykens, E., & Visootsak, J. (2005). Behavioral features of CHARGE yndrome (Hal-Hittner Syndrome) comparison with Down syndrome, Prader-Willi syndrome, and Williams syndrome. *American Journal of Medical Genetics Part A, 133A*, 240-247.

*Haibach, P. S. & Lieberman, L. J. (2013). Balance in adolescents with and without visual impairments. *Journal of Visual Impairment & Blindness,* 297-309.

Hall, B. D. (1979). Choanal atresia and associated multiple anomalies. *Journal of Pediatrics, 95,* 395-398.

*Hartshorne, T. S., & Cypher, A. D. (2004). Challenging behavior in CHARGE syndrome. *Mental Health Aspects of Developmental Disabilities, 7*(2), 41-52.

*Hartshorne, T. S., Grialou, T. L. & Parker, K. R. (2005). Autistic-like behaviour in CHARGE syndrome. *American Journal of Medical Genetics Part A, 133A*, 257-261.

*Hartshorne, T. S., Nicholas, J., Grialou, T. L., & Russ, J. M. (2007). Executive function in Charge syndrome. *Child Neuropsychology, 13*(4), 333-344.

*Hartshorne, T. S., Heussler, H. S., Dailor, A. N., Williams, G. L. Papadopoulos, D., & Brandt, K. K. (2009). Sleep disturbances in CHARGE syndrome: Types and relationships with behaviour and caregiver well-being. *Developmental Medicine & Child Neurology, 51*, 143-150.

*Hartshorne, N., Hudson, A., MacCuspie, J., Kennert, B., Nacarato, T., … & Blake, K. (2016). Quality of life in adolescents and adults with CHARGE syndrome. *American Journal of Medical Genetics Part A, 170A,* 2012-2021.

Hittner, H. M., Hirsch, N. J., Kreh, G. M., & Rudolph, A. J. (1979). Colobomatous microphthalmia, heart disease, hearing loss and mental retardation: a syndrome. *Journal of Pediatric Ophthalmology and Strabismus, 16*(2)*,* 122-128.

*Hudson, A., MacDonald, M. & Blake, K. (2016). Packing and problematic feeding behaviors in CHARGE Syndrome: A qualitative analysis. *International Journal of Pediatric Otorhinolaryngology, 82,* 107-115.

Hsu, P., Ma, A., Wilson, M., Williams, G., Curotta, J., … Mehr, S. (2014). CHARGE syndrome: A review. *Journal of Paediatrics and Child Health, 50,* 504-511.

*Husu, E., Hove, H. D., Farholt, S., Bille, M., Tranebjaerg, L., … Kreiborg, S. (2013). Phenotype in 18 Danish subjects with genetically verified CHARGE syndrome. *Clinical Genetics, 83*, 125-134.

*Issekutz, K. A., Graham, J. M. Jr., Prasad, C., Smith, I. M., & Black, K. D. (2005). An epidemiological analysis of CHARGE Syndrome: Preliminary results from a Canadian study. *American Journal of Medical Genetics Part A, 133A*, 309-317.

*Johansson, M., Råstam, M., Billstedt, E., Danielsson, S., Strömland, K. & Miller, M. (2006). Autism spectrum disorders and underlying brain pathology in CHARGE association. *Developmental Medicine and Child Neurology, 48,* 40-50.

Jure, R., Rapin, I., & Tuchman, R. F. (1991). Hearing-impaired autistic children. *Developmental Medicine and Child Neurology, 33*(12), 1062-1072.

Kwok, J., Lai, K., Luk, E., Hung, S. F. & Leung, P. (2017). Prevalence of Comorbid Attention Deficit Hyperactivity Disorder (ADHD) in Chinese Hong Kong Children with Autism Spectrum Disorder (ASD). *Austin Journal of Autism & Related Disabilities, 3*(2), 1044.

Lalani, S., Safiullah, A., Molinari, L., Fernback, S., Martin, D. & Belmont, J. (2004). SEMA3E mutation in a patient with CHARGE syndrome. *Journal of Medical Genetics, 41*(7), e94.

Lalani, S. R., Hefner, M. A., Belmont, J. W., Davenport, S. L. H. (2012). CHARGE syndrome. *GeneReviews.* Retrieved 21/12/2017 from https://www.ncbi.nlm.nih.gov/books/NBK1117/

Lieberman, L. J., Haibach, P. & Schedlin, H. (2012). Physical education and children with CHARGE syndrome: Research to practice. *Journal of Visual Impairment and Blindness, 106*(2), 106-119.

*MacDonald, M., Hudson, A., Bladon, A., Ratcliffe, E., & Blake, K. (2017). Experiences in feeding and gastrointestinal dysfunction in children with CHARGE syndrome. *American Journal of Medical Genetics Part A, 173A*, 2947-2953.

Martin, P. (2003). The epidemiology of anxiety disorders: a review. *Dialogues in Clinical Neuroscience. 5*(3), 281-298.

Mason, J. & Scior, K. (2004). “Diagnostic overshadowing” amongst clinicians working with people with intellectual disabilities in the UK. *Journal of Applied Research in Intellectual Disabilities, 17*, 8-90.

*Miller, M. T., Strömland, K., Ventura, L., Johansson, M., Bandim, J. M. & Gillberg, C. (2004). Autism with ophthalmologic malformations: The plot thickens, *Transactions of the American Ophthalmological Society, 102,* 107-121.

Moder, D., Liberati, A., Tetzlagg, J., Altman, D. G., & The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med, 6*(7), e1000094. Doi: 10.1374/journal.pmed1000097

Moran, P., Coffey, C., Romaniuk, H., Olsson, C., Borschmann, R., Carlin, J. B., & Patton, G. C. (2012). The natural history of self-harm from adolescence to young adulthood: a population-based cohort study. *The Lancet, 379,* 236-43

Moss, J., Howlin, P. (2009). Autism spectrum disorders in genetic syndromes: implications for diagnosis, intervention and understanding the wider autism spectrum disorder population. *Journal of Intellectual Disability Research. 53*(10), 852-873.

Moss, J., Oliver, C., Nelson., L., Richards, C., & Hall, S. (2013). Delineating the profile of autism spectrum disorder characteristics in Cornelia de Lange and Fragile X syndromes. *American Journal of Inellectual Developmental Disabilities, 118*(1), 55-73.

NHS Choices (2018). Birth to five development timeline. Retrieved 04/01/2018 from: https://www.nhs.uk/Tools/Pages/birthtofive.aspx

Nyhan, W. L. (1972). Behavioral phenotypes in organic genetic disease. Presidential address to the Society for Pediatric Research. *Pediatric Research, 6,* 1-9.

O'Connell, M. E., Boat, T. & Warner, K. E. (Eds.) (2009). *Preventing mental, emotional, and behavioural disorders amongst young people: Progress and possibilities.* Washington: The National Academies Press

OMIM website: (retrieved 25/10/2017 from https://www.omim.org/entry/214800?search=charge%20syndrome&highlight=syndromic%20charge%20syndrome

*Pagon, R. A., Graham, J. M., Zonana, J. & Young, S. L. (1981). Congenital heart disease and choanal atresia with multiple anomalies. *Journal of Pediatrics, 99,* 223-227.

Perälä, J. Suvisaari, J., Saarni, S. L., Kuoppasalmi, K., Isometsä, E. … & **Lönnqvist J**. (2007). Lifetime prevalence of psychotic and bipolar disorders in a general population. *Archives of General Psychiatry, 64*(1), 19-28.

Pondé, M. P., Matos, M. L., & de Oliveira, C. C. P. B. (2017). Prevalence of attention-deficit/hyperactivity disorder, oppositional defiant disorder and conduct disorder in children with autism spectrum disorder. Brazilian Journal of Medicine and Human Health, 5(2), 39-46.

*Raqbi, F., Le Bihan, C., Morisseau-Durand, M. P., Dureau, P., Lyonnet, S., & Abadie, V. (2003). Early prognostic factors for intellectual outcome in CHARGE syndrome. *Developmental Medicine & Child Neurology, 45*, 483-488.

Richards, C., Jones, C., Moss, J., Groves, L. & Oliver, C. (2015). The prevalence of autism spectrum disorder phenomenology in genetic disorders: A systematic review and meta-analysis. *Lancet Psychiatry, 2*, 909-916.

Runswick-Cole, K., Mallett, R., & Timimi, S. (Eds.) (2016). *Re-thinking autism: Diagnosis, identity and equality.* Philadelphia: Jessica Kingsley Publishers.

*Salem-Hartshorne, N. & Jacob, S. (2004). Characteristics and development of children with CHARGE association/syndrome. *Journal of Early Intervention, 26*(4), 292-301.

*Salem-Hartshorne, N., & Jacob, S. (2005). Adaptive behavior in children with CHARGE syndrome. *American Journal of Medical Genetics Part A, 133A,* 262–267.

Sanlaville, D. & Verloes, A. (2007). CHARGE syndrome: An update. *European Journal of Human Genetics, 15*, 389-399.

*Santoro, L., Ficcadenti, A., Zallocco, F., Del Baldo, G., Piraccini, F., … & Gabrielli, O. (2014). Cognitive-motor profile, clinical characteristics and diagnosis of CHARGE syndrome: An Italian experience. *American Journal of Medical Genetics Part A, 164A,* 3042-3051.

Smink, F. R. E., van Hoeken, D. & Hoek, H. W. (2012). Epidemiology of eating disorders: Incidence, prevalence and mortality rates. *Current Psychiatry Reports, 14*(4), 406-414.

*Souriau, J., Gimenes, M., Blouin, C., Benbrik, I., Benbrik, E., … & Churakowskyi, B. (2005). CHARGE Syndrome: Developmental and behavioural data. *American Journal of Medical Genetics, 133A,* 278-281.

Strang, J. F., Kenworthy, L., Daniolos, P., Case, L., Wills, M. C., … & Wallace, G. L. (2012). Depression and anxiety symptoms in children and adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders, 6*(1), 406-412.

*Strömland, K., Sjogreen, L., Johansson, M., Ekman Joelsson, B. M., Miller, M., … Granstrom, G. (2005). CHARGE association in Sweden: Malformations and functional deficits. *American Journal of Medical Genetics Part A, 133A,* 331–339.

*Thelin, J. W. & Fussner, J. C. (2005). Factors related to the development of communication in CHARGE syndrome. *American Journal of Medical Genetics Part A, 133A*, 282-290.

Taylor, L. & Oliver, C. (2008). The behavioural phenotype of Smith-Magenis syndrome: evidence for a gene-environment interaction. *Journal of Intellectual Disability Research 52*(10), 830-841).

Tellier, A. L., Cormier-Daire, V., Abadie, V., Amiel, J., Sigaudy, S. … & Lyonnet, S. (1998). CHARGE syndrome: Report of 47 cases and review. *American Journal of Medical Genetics, 76,* 402-209.

The CHARGE Syndrome Foundation (2018). Signs & Symptoms. Retrieved 27/07/2018 from: https://www.chargesyndrome.org/about-charge/signs-symptoms/

*Trider, C-L., Corsten, G., Morrison, D., Hefner, M., Davenport, S. & Blake, K. (2012). Understanding obstructive sleep apnea in children with CHARGE syndrome. *International Journal of Pediatric Otorhinolaryngology, 76,* 947-956.

van Ravenswaaij-Arts, C. M., Blake, K., Hoefsloot, L., & Verloes, A. (2015). Clinical utility gene card for: CHARGE syndrome-update 2015, *European Journal of Human Genetics, 23*(11), doi:10.1038/ejhg.2015.15.

van Steensel, F. J. A., Bögels, S. M., & Perrin, S. (2011). Anxiety disorders in children and adolescents with autistic spectrum disorders: A meta-analysis. *Clinical Child and Family Psychology Review, 14*(3), 302-317.

Verloes, A. (2005). Updated diagnostic criteria for CHARGE syndrome: a proposal. *American Journal of Medical Genetics Part A, 133A*(3), 306-308.

*Vervloed, M. P. J., Hoevenaars-van den Boom, M. A. A., Knoors, H., van Ravenswaaij, C. M. A., & Admiraal, R. J. C. (2006), CHARGE syndrome: Relations between behavioural characteristics and medical conditions. *American Journal of Medical Genetics Part A, 140A*, 851-862.

*Vesseur, A., Langereis, M., Free, R., Snik, A., van Ravenswaaij-Arts, C. & Mylanus, E. (2016). Influence of hearing loss and cognitive abilities on language development in CHARGE syndrome. *American Journal of Medical Genetics Part A, 170A*, 2022-2030.

Vissers, L. E., van Ravenswaaij, C. M., Admiraal, R., Hurst, J. A., de Vries, B. B., … van Kessel, A. G. (2004). Mutations in a new member of the chromodomain gene family cause CHARGE syndrome, *Nature Genetics, 36,* 955-957.

*Wachtel, L. E., Hartshorne, T. S. & Dailor, A. N. (2007). Psychiatric diagnoses and psychotropic medications in CHARGE syndrome A pediatric survey. *Journal of Developmental and Physical Disabilities, 19*, 471-483.

Wiznitzer, M., Rapin, I., Van De Water, T. R. (1987). Neurologic findings in children with ear malformations. *International Journal of Paediatric Otorhinolaryngology, 13*, 41-55.

World Health Organization (2017). Depression and other common mental disorders: Global health estimates. Geneva: WHO

Writzl, K., Cale, C. M., Pierce, C. M., Wilson, L. C., Hennekam, R. C. (2007). Immunological abnormalities in CHARGE syndrome. *European Journal of Medical Genetics, 50,* 338-345.

*Wulffaert, J., Scholte, E. M., Dijkxhoorn, Y. M., Bergman, J. E. H., van Ravenswaaij-Arts, C. M. A., & van Berckelaer-Onnes, I. A. (2009). Parenting stress in CHARGE syndrome and the relationship with child characteristics. *Journal of Developmental and Physical Disabilities, 21,* 301-313.

Zentner, G. E., Layman, W. S., Martin, D. M., & Scacheri, P. C. (2010). Molecular and phenotypic aspects of CHD7 mutation in CHARGE syndrome. *American Journal of Medical Genetics Part A, 152A,* 674-686.

Part B: Empirical Report

How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others?

Abstract

How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others?

Craig Griffiths

People with intellectual disabilities are understood to be particularly vulnerable to problems of social exclusion, stereotyping, and negative social attitudes. Research has suggested that one factor influencing social judgments is facial appearance. Genetic neurodevelopmental synstomes are conditions understood to result from mutative alterations in DNA structure affecting many aspects of functioning. Examples include Down syndrome, Williams syndrome, Angelman syndrome, Prader-Willi syndrome, Fragile-X syndrome, Cornelia de Lange syndrome, and Smith-Magenis syndrome. Each of these GNSs is associated with a dysmorphic facial phenotype, such that people with the condition share facial similarities that would not typically be seen in people without that diagnosis. Autism spectrum disorder (ASD) is a behaviourally defined diagnostic category that has not been associated with a genetic causality, but which some researchers have associated with a different facial profile. This project aimed to identify whether and in what ways the facial morphology of children with a GNS or ASD diagnosis influences trait judgments. Fifty-eight undergraduate students were shown merged face images representing GNS groups at age 12 and ASD diagnosed children at age 9 and asked to make trait ratings whilst an eye-tracker recorded their viewing behaviour. Results suggested significant differences between trait judgments made between each face and a typically developing, age-matched control image. All images representing people with a GNS were rated as less approachable, attractive, intelligent, and trustworthy than matched control images representing typically developing people. Eye-tracker results suggested differences in how participants looked at GNS face images compared with TD face images, with no difference for ASD diagnosed face images. Observations relevant to the clinical and social treatment of people with GNSs are discussed, as are implications for future research into face-based trait judgments.

Introduction

Social attitudes and people with intellectual disabilities

People with intellectual disabilities (ID) in the UK suffer particularly from problems of social exclusion (Cummins & Lau, 2003). Social inclusion/exclusion describes the extent to which particular people have no recognition, voice, or stake in society, and exclusion may result from a range of factors including employment, education, health, and race (Charity Commission, 2001). Major policy bodies have stressed the need to promote greater inclusion for people with ID (House of Lords, 2008; United Nations, 2006). Social attitudes and stereotyping are linked with social inclusion (Nicholson & Cooper, 2013) and are known to be a problem faced by this group (Ditchman *et al.*, 2013, Staniland, 2011). In a recent review, Pelleboer-Gunnink *et al.* (2017) identified that even amongst health professionals, people with ID can be perceived stereotypically as, for example, potentially aggressive, intimidating, uncooperative, child-like and unpredictable.

Social judgments and facial morphology

One factor that research suggests exerts a demonstrable impact upon social attitudes is facial morphology, the form or structure of the human face. People readily infer personality and social traits from faces alone with remarkable consistency. Ratings of specific faces are often remarkably consistent, with minimal differences found between adult raters and children as young as five years-old (Cogsdill *et al.*, 2014). Certain facial features, such as eye size, mouth shape, and jawline, have been shown to reliably influence a distinct range of trait judgments such that face images can be manipulated so that they will elicit desired character ratings (Oosterhof & Todorov, 2008; Sutherland *et al.*, 2013; Vernon *et al.*, 2014).

The real-world validity of face-based social judgments is a subject of controversy amongst researchers. Some studies have found evidence of correlation between face-based judgments and the actual personal or behavioural disposition of the person subject to evaluation (e.g. Enea-Drapeau *et al.*, 2012) whilst others find no such relationship (e.g.

Efferson & Vogt, 2013; Penton-Voak *et al.*, 2006). A possible association between face-based judgments and actual personality could be explained in a number of ways, representing the multiple influences on development. For instance, a certain amount of influence may be due to underlying genetic factors that are predictive both of facial morphology and behaviour (Sallis *et al.*, 2018). In addition, *prima-facie* judgments could interact with behaviour development through social interactions, confirmation bias (Sherman *et al*., 2012), and 'indirect effects' (Hodapp, 1997; 1999), leading to self-fulfilling prophecies in which originally invalid inferences later become valid (Jussim & Harber, 2005; Snyder *et al.*, 1977).

Early research in the area of facial trait inferences focused primarily upon ratings of attractiveness, finding evidence for a 'halo effect' in which physical attractiveness was associated with positive personal traits (Miller 1970). More recent research has attempted to combine the many possible ratings that any individual might make of a person into a set of reliable ratings made consistently between different faces and multiple observers. In this way, Oosterhof and Todorov (2008) produced a dyadic model including 'trustworthiness,' associated with approachability and emotional expression, and 'dominance,' signaling physical strength. Sutherland *et al*. (2013) expanded upon this, finding evidence for an additional factor of 'youthful-attractiveness' in their model. Some ratings that had previously been suggested as being readily inferred from faces showed stronger loading onto these categories than others; with 'baby-facedness' and 'intelligence' each loading lower than 0.5 onto any one factor. In reaching for reliability, these models may therefore lose some of the nuance of facial trait inferences. In addition to this, there is evidence that trait inferences may be based on an interaction between facial structure and facial expression, and that this is complicated by the observations firstly that certain facial gestalts may themselves resemble emotional expressions (Said *et al.*, 2009) and secondly that perceived intensity of emotional expression increases with certain facial structures (Oosterhof & Todorov, 2009).

Face-based trait inferences may have a substantial impact upon the lived experiences of people in the real world. Langlois (1995) found evidence that the attractiveness of infants

correlated with maternal attitudes and behaviours, suggesting that people's relationships may be affected from birth. Hassin and Trope (2000) showed that trait judgments based on appearance change how verbal information about a person is understood, and influence subsequent decision-making. Todorov *et al.* (2005) found evidence that the success of candidates in real-world elections could be predicted based on inferences of competence made from faces alone, and other research has suggested that leaders may be identifiable by their facial features alone (Olivola *et al.*, 2014). Also, more baby-faced people are less likely to be convicted if charged with intentional crimes, but more likely if charged with negligence (Montepare & Zebrowitz, 1998). In the modern world of social media, where a still image of a person's face may be the only representation of them available during social contact, understanding the influence of facial appearance is of increasing importance (Vernon *et al.*, 2014).

The faces of typically developing (TD) people tend to vary within a consistent range subject to factors of, for example, age, sex, and 'race.' As such, faces may be considered to be more or less average. Research looking at the facial trait inferences has thus far focused exclusively upon how judgments are made of such TD faces. Faces can, of course, vary outside of typical ranges and this has been associated with a range of personal and interpersonal challenges. Examples of facial differences associated with adverse social experiences include orofacial clefting (Tobiasen, 1987), disfigurement owing to accident or disease (Bonanno & Esmaeli, 2012), or facial paralysis (Bogart *et al.*, 2014). The impact of living with facial differences are largely understood to be negative, and can commonly include experiences such as being stared at, feeling left out, teasing, and even physical violence (Strauss *et al*., 2007).

Genetic neurodevelopmental syndromes

Genetic neurodevelopmental syndromes (GNSs) are conditions thought to be the product of mutative alterations in a person's DNA structure affecting numerous aspects of

functioning including neurodevelopment. Certain GNSs are considered to be associated with specific sets of intellectual, physical, personal, and social characteristics that differ from what would commonly be observed in TD people or people with ID due to other causes. These patterns of differences are collectively referred to as phenotypes. Five of the most frequently researched GNSs are Down syndrome (DS), Williams syndrome (WS), Angelman syndrome (AS), Prader-Willi syndrome (PWS), and Fragile-X syndrome (FXS) (Di Nuovo & Buono, 2011), with a number of further genetic syndromes, such as Cornelia de Lange syndrome (CdLS) and Smith-Magenis syndrome (SMS) also receiving increased research attention (REFS). Increasingly sophisticated genetic testing is also leading to an increasing number of identified genetic syndromes.

Whist GNSs may be associated with specific behavioural and psychological corollaries, they are defined primarily by their genetic underpinning or a set of clinical characteristics recognised and categorised by clinical geneticists and related medical professions. DS, for example, is now known to be caused by trisomy of chromosome 21. This contrasts with diagnoses such as 'autism spectrum disorder' (ASD), which is a behaviourally-defined and behaviourally-diagnosed category. Although there is evidence that some genetic factors may correlate with the set of characteristics associated with the ASD label, and many candidate genes are suspected (Yoo, 2015), a single gene cause is generally not found. Numerous hypotheses exist for a biological aetiology of ASD, such as the disrupted connectivity hypothesis (Belmonte *et al.*, 2004), or the theory that ASD may be underlain by autoimmune processes (Ashwood & Van de Water, 2004). One influential theory hypothesises that the condition may be associated with development of an 'extreme male brain' involving increased presence of fetal testosterone (Baron-Cohen, 2002; Baron-Cohen *et al.*, 2011). As with the genetic aetiology hypothesis, evidence supporting these other theories is limited, and therefore, although diagnostic categories exist, it would be inaccurate within the present state of evidence to imply equivalence between categories of GNSs and ASD (Timimi & McCable, 2016).

Many GNSs are associated with a dysmorphic facial phenotype. For example, DS is associated with a facial profile that includes a small nose and mouth, a flat nasal bridge, and eyes that slant upwards and outwards (NHS Choices, 2015) whilst the faces of people with CdLS tend to feature confluent, high-arched eyebrows, thin lips, a small nose, long eye-lashes, and a small jaw (Clark *et al.*, 2012). Despite attempts to position ASD as a neurodevelopmental condition, it is not typically thought to be associated with a divergent facial profile, although some research suggests that there may be atypicalities including facial asymmetry, possibly due to uneven neurological development (Hammond *et al*., 2008). Hypermasculinity in facial morphology has also been associated positively with ASD symptomatology (Tan *et al*., 2017).

GNSs are theorised to contribute to the development of particular behavioural patterns. The notion of behavioural phenotypes was introduced by Nyhan (1972) and behavioural phenotypes have become a focus of increasing interest in GNS research as genetic technology improves (Dykens & Rosner, 1999). A behavioural phenotype might include motor, cognitive, linguistic, social, or psychiatric features (Flint & Yule, 1994), which occur more in one syndrome than in others (Dykens & Hodapp, 2001). DS, for example, has been associated with: relatively strong expressive communication; lowered motivation in challenging activities; aggression and disruptive behaviour; and affectionate and outgoing social behaviour (Daunhauer & Fidler, 2011; Fidler *et al.*, 2008; Visootsak & Sherman, 2007). ASD has traditionally been defined by impairments in social communication and imagination, alongside repetitive behaviours or restrictive interests (Wing's 'triad of impairments;' Wing & Gould, 1979). Diagnostic criteria have developed over time and DSM-5 now defines ASD in terms of a dyad (American Psychiatric Association, 2013): ASD is currently characterized as consisting of social and communication impairments plus repetitive behaviours or restrictive interests, and sensory sensitivity, obsessions, a need for routine, and difficulty in social situations (The National Autistic Society, 2017), as well as a greater predisposition towards 'systemising' over empathising skills (Baron-Cohen, 2002).

Behavioural phenotypes and facial appearance

People's behaviour is generally accepted to arise and develop via interaction with the environment (e.g. Fidler *et al.*, 2008). Differences in behaviour between groups of people may, as implied by behavioural phenotype research, reflect differences at the level of neurophysiological development. Differences in behaviour may also arise via differences in the environment, and thus the behavioural phenotype model is, implicitly or explicitly, based on the presupposition that people in these groups receive the same treatment in the same environments. If, however, people are subject to systematic biases in their social interactions as a result of their appearance, as indicated by trait judgment research, then this assumption may be violated. Just how the environment might differ systematically for people with GNSs has received little research attention.

Since the differences in facial appearance in people with a GNS are relatively consistent (to the extent that geneticists often make hypotheses about the presence of a GNS based on facial morphology) and often pronounced, it is possible that people may make reliably divergent trait inferences about the face profiles of affected people. This is a largely untested hypothesis. If it is the case, then implications may be profound, since judgments may then impact upon the quality of social interactions and behavioural development as well as the judgments of behavioura contributing to the characterisation of behavioural phenotypes. Fidler and Hodapp (1999) found evidence that the youthful craniofacial appearance of people with DS was associated with a perception of 'baby-facedness' and propensity to behave in an immature manner. Assessing the trait judgments made of people with disability is difficult, however, owing to the possibility that people may recognise the presence of a syndrome and make inferences corresponding to known clinical features of the disease, or according to social desirability effects (Enea-Drapeau *et al.*, 2012; Verhulst & Lodge, 2013; Wilson & Scior, 2014). It may be possible to circumvent such effects by not informing people about the presence of GNSs. As very few GNSs share the social status of DS, people may be less likely to identify the presence of a syndrome just from viewing face images out of any wider context.

Facial processing

With advances in technology, researchers are able to explore the ways that different faces are 'read' by observers in ever more nuanced ways. Research using eye-tracking equipment suggests that, at least in the 'West,' faces are processed in a distinctive T-like pattern that involves emphasis on the internal features of the eyes, the nose, and the mouth, particularly the eyes (Janik *et al.*, 1978; Walker-Smith *et al.*, 1977; Peterson & Eckstein, 2012). This is important as people who tend to focus their attention on internal features of the face are better able to accurately identify expression than those who look at distal features (Rennels & Cummings, 2013). Systematic differences in how people explore faces have been shown to be influenced by culture and social attitudes, and may provide an implicit measure of prejudice (Blais *et al.*, 2008; Hansen *et al.*, 2015). There are indications that people tend to dwell disproportionately on areas of marked facial difference when looking at atypical faces (Hills & Pake, 2013; Madera & Hebl, 2012; van Schjindel et al., 2015). Unbalanced attention paid to aspects of facial difference may emphasise or exaggerate those differences in the eyes of the observer, leading to a greater perception of difference that could exaggerate trait inferences and social consequences for the individual.

Technology has not only improved the reliability with which it is possible to observe how a person looking at a face behaves in response to visual stimuli, but has also enabled ever-greater means of standardizing the images themselves. The potential to 'merge' a collection of face images together to make a single image that represents an average of constituent images has advanced quickly in recent years. It has become possible for anybody to produce such images via open access online tools such as facesearch.org (DeBruine & Jones, 2017), and more complex tools are available for interested researchers (e.g. InterFace; Kramer *et al.*, 2017). Proponents of the technology have advocated its utility as a means for making clinical diagnoses of conditions associated with a reliable facial phenotype. In several articles, Professor Peter Hammond (see, e.g. Hammond & Suttie, 2012), has produced sets of three-dimensional face models for a range of GNSs, and has shown that it may be possible to

diagnose genetic conditions based on face shape alone using these methods. This work has produced a set of high-quality merged images of people with these conditions that make it possible to explore how the facial phenotypes of these conditions might affect facial processing.

Research suggests that people reliably 'read' the faces of other people in similar ways. They tend to follow a familiar pattern in how they look at faces, and make potentially invalid but influential trait inferences about people based on what they see. It is not clear to what extent these processes remain true when people view the faces of people with GNSs with phenotypical facial dysmorphology. If people respond to the faces of people with a GNS in reliably different ways then this could have consequences for the development and social inclusion of affected persons. Although it has no known consistent genetic or biological aetiology (Timimi & McCabe, 2016), ASD is a diagnostic label purported to represent a more-or-less reliable behavioural presentation and has been associated with a facial profile that differs from people without the condition (Aldridge *et al.*, 2011). It is possible that people might interact with people with ASD diagnoses differently where any dysmorphology exists, and this too requires clarification. It may also be the case that top-down processes, such as knowledge that a person has a diagnosis of a genetic condition, influences trait judgments.

This project aims to identify whether and in what ways the facial morphology in children with a GNS or ASD diagnosis influence how they are perceived by others relative to children with typical facial morphology. Specifically, whether their faces are 'read' differently, with more attention paid to differences in facial morphology, and whether they are judged differently according to social trait dimensions. It also aims to identify whether knowledge that the faces belong to people with genetic neurodevelopmental syndromes significantly affects either of these factors.

Research questions

1. Are there differences in trait judgments made of face images representative of people with a GNS or ASD diagnosis and face images representative of those with typical development?

2. Are there differences in the attention paid to facial features when looking at face images representative of people with a GNS or ASD diagnoisis and face images representative of those with typical development?

3. Are there differences in the total number of fixations made when looking at face images representative of people with a GNS or ASD diagnosis and face images representative of those with typical development?

4. Are there differences in the trait judgments made depending upon whether participants are informed about the presence of images representing people with a GNS or ASD diagnosis?

5. Are there differences in the time it takes to make a trait judgment for faces representative of a GNS or ASD diagnosis and faces representative of those with typical development?

6. Are there differences in how much impact informing participants about the presence of images representing people with GNSs has on social judgments depending on which face image is being looked at?

Method

Participants

Participants were 58 undergraduate students who completed the research in exchange for course credit as part of the Experimental Participation Requirement at the University of Leicester. All 58 contributed data to the judgment rating procedure, 48 to the eye-tracking procedure.[3] In the judgment rating procedure there were 28 in the informed

[3] Eye-tracking data for 10 participants were removed due to concerns regarding the preservation of equal conditions amongst all participants that resulted from methodological inconsistency between these participants. These 10 had lower lighting levels than the remaining 48, which affected data quality.

condition, 30 in the uninformed condition. In the eye-tracking procedure, participants were split equally between the information conditions. Although nobody declined to participate in the research, seven participants could not be satisfactorily set up in the eye-tracking machine and so data collection was not completed.[4] Such problems with calibration are common in eye-tracking research and have been discussed elsewhere (e.g. Vadillo *et al.*, 2015). All participants had normal or corrected-to-normal vision and confirmed that they could clearly see the stimuli before proceeding. Participant demographics information can be found in Appendix H. Sample size was informed by a power calculation based on two pilot studies (unpublished).

Apparatus and stimuli

The experiment was conducted using the Eyelink 1000 system for Windows Version 4.594 (SR Research Ltd.). The research programme was created using SR Experiment Builder and displayed on a flat-screen monitor (21" CRT monitor; screen resolution 1024 x 768 pixels; 85hz), the top of which was positioned 745mm from the fixed chin and forehead rest, the bottom 770mm. Participant eye level was 3/4 of the distance up the screen. Participants interacted with the programme using a standard mouse in their dominant hand. They sat in an office chair that could be adjusted for their comfort.

Stimuli consisted of seventeen images obtained from Professor Peter Hammond (Appendix I). These were three-dimensional models of face shape averages created by using laser and photogrammetric devices to capture meshes of points on individual human faces and averaging them together to produce a face model composite which represents the contributing faces. This technique was applied by Hammond (see, e.g. Hammond & Suttie 2012) to age-matched children with a range of GNSs and also TD children to produce face model averages that may be said to represent those groups at those ages. There were eight

[4] In almost all cases, difficulties with calibration was due to reliance upon visual aids that distorted the eye image.

twelve-year-old GNS images representing AS, CdLS, DS, FXS, PWS, SMS, and WS. All GNS images were 'sex-neutral,' having been produced from a mixture of images from males and females. Two twelve-year-old TD images served as controls, one showing an average of female faces and the other of male faces, each developed in the same way as the GNS images. For all comparisons, the data for the TD male and female faces were averaged together to produce a set of single, combined control scores. Two further images were used: one male diagnosed with ASD (age standardised to nine) plus an age- matched TD control. The remaining six images served as distractors, showing TD face compositions for males and females at ages eight, sixteen, and twenty, and were included to reduce the ratio of images that might more clearly suggest GNSs in the hope that this would reduce the likelihood that uninformed participants might intuit that manipulation.

Images were standardised (using paint.net 4.0.16) to reduce the possibility that irregularities would distract from facial morphology. Image height was standardised to 500 pixels (13cm) with no gap between the edge of the face and the edge of the whole image. To preserve facial proportions, images therefore varied in width. Image 'noise' pixels (random light or dark pixels that stood out from surrounding pixels) left over from the averaging process were removed to produce an even texture. Pupils were altered in density and size to produce clearly defined pupils pointing forwards with corneal light reflections shown in both eyes. Images were also blurred slightly to reduce pixilation at the edges. All images were presented in greyscale upon a solid black background. All faces had ears removed due to low image quality on the ears of many of the faces. Foreheads were cropped above the eyes using a black arc shape standardised at four points, one at either end and two at equal intervals within the line. The points at either end of the line were positioned 64 pixels below the top of the image at either end of the face and the two points within were then set 7 pixels from the top of the image.

A unique set of interest areas (IAs) was created, each individually made so as to correspond to each face type and account for the variability in positioning of facial features

between faces (Appendix I). These were for each eye, the nose, and the mouth, reflecting precedent in the literature (e.g. Hessels *et al.*, 2016). Attempts were made initially to use the limited-radius Voronoi-tessellation method (Hessels *et al.*, 2016) to construct IAs, however, variation in the size of individual features for certain faces meant that the resulting interest areas did not cover all possible fixations on some areas. Eye and nose IAs were all circles 150 pixels in diameter, centred on the pupil and the tip of the nose. All left eye and right eye fixation counts, percentages, dwell counts, dwell percentages, were combined to produce a set of single, combined eye scores. Mouth IAs differed in size and shape to fit each image. To achieve this, an ellipsis was drawn centrally with the top touching but not overlapping the bottom end of the nose IA. Then, the sides were dragged to cover either side of the mouth and the bottom dragged to cover the bottom. At the end, all mouth IAs covered the mouth images with a distance of at least 5 pixels between the edge of mouth image and any part of the IA. No two IAs overlapped.

Trait judgments

Selection of trait judgments to be included in this procedure was based upon salient judgments identified in the literature and those that might be particularly relevant to individuals with these genetic disorders. The major sources of these were Oosterhof and Todorov (2008), Sutherland *et al.* (2013), and Vernon *et al.* (2014). Selected judgments on which faces were to be rated were the extent to which each appeared 'dominant,' 'trustworthy,' 'attractive,' 'baby-faced,' 'aggressive,' 'intelligent,' and 'approachable.' Table 19 indicates the rationale behind the selection of each. Although prominent in the literature, 'youthfulness' was not directly included due to the young age of all face images.

Table 19 Rationales for use of traits

Trait	Rationale
Trustworthiness	Validated in models of Oosterhof & Todorov (2008), Sutherland *et al.* (2013), & Vernon *et al.* (2014). Clinical relevance to behaviours that challenge services.
Dominance	Validated in the model of Oosterhof & Todorov (2008) & Vernon *et al.* (2014).
Attractiveness	Contributor to youthful/attractiveness validated domain in the models of Sutherland *et al.* (2013) & Vernon *et al.* (2014).
Baby-facedness	Contributor to youthful/attractiveness validated domain in the model of Sutherland *et al.* (2013) & Vernon *et al.* (2014). Known to affect adults' attributions of behaviours.
Approachability	Only negative loadings in Sutherland *et al.* (2013) but no positive load elsewhere in the model.
Intelligence	Relatively low factor loadings in Sutherland *et al.* (2013). Clinical relevance to people with ID and GNSs.
Aggressiveness	Validated in model of Sutherland *et al.* (2013). Clinical relevance to behaviours that challenge services.

Procedure

Participants completed consent (Appendix J) and demographics forms. Participants were allocated to either the informed or uninformed condition at random using a random number generator and given a corresponding information sheet[5] (Appendix K). Participants were then verbally asked "what do you understand about the images you are going to see?"; every participant in the informed condition was then reminded that some images would feature people with a GNS. Informed participants were asked not to discuss this aspect of the research with other potential participants.

The computer procedure (Appendix L) was arranged into two parts, each of which began with a standard 9-point calibration and validation procedure with a maximum average error of 0.5˚ and a maximum individual error of 1.0˚ (as per the methodology of Peterson & Eckstein, 2012). Prior to the appearance of each face image a manual drift check was

[5] In error, 12 participants in the uninformed condition received consent forms displaying the project title, potentially spoiling the condition. 12 contributed data to the rate procedure, 6 to the eye-tracking procedure. None of these 12 indicated awareness of the presence of GNSs when asked prior to testing and it was therefore assumed that the error was not noticed and each was analysed within the Uninformed condition.

completed up to the maximum value of 1.0˚ (as per the methodology of Valuch *et al.*, 2015). Where it was not possible to achieve a check within this value within 10 seconds a recalibration was performed. This procedure meant that the first fixation point was standardised to be on the nose interest area for every image.

For the first part of the experiment, participants were asked to simply look at all seventeen face images one by one. Each image was presented three times, arranged in three blocks so that each of the 17 images was presented once before being repeated a second then third time. Image order was randomised within blocks. Data from the three blocks were averaged together for each IA to produce a set of single, combined IA scores.

For the second part of the procedure, participants were asked to look at face images without distractors and to rate each according to the trait judgments. Responses were arranged into trait blocks, such that participants rated all faces on one trait in turn before moving on to the next trait. Presentation order of the traits was randomised between participants, and the presentation order of face images was randomised within each trait block. Participants made trait ratings using a continuous vertical scale on which they could click anywhere between the two extremes to indicate the strength of their impression. This produced a possible score range (in pixels) from 1-505.

At the end of the experiment, participants were given a debrief form summarising the purpose of the research (Appendix M).

Analysis

Data were analysed using IBM SPSS for Statistics v.24. GNS and ASD data were analysed independently using their separate matched controls (based on availability of images from Peter Hammond). Factorial mixed ANOVAs were used in all analyses with information condition as a between-subjects variable and face type as a within-subjects variable. Separate analyses were conducted for: each trait rating; response times; total number of fixations; dwell times and percentages for each IA; and fixations and fixation percentages for each IA.

Huynh-Feldt corrections for non-sphericity were used throughout unless specified. Whilst ANOVA is considered to be reasonably robust to violations of the assumptions of linear parametric tests (e.g., Schmider *et al*., 2010), such as assumptions of normality and homoscedasticity, since these assumptions were violated in places, all significant effects were confirmed non-parametrically where possible. Owing to the large number of planned contrasts, a more stringent alpha level of 0.01 was adopted throughout. For all eye-tracking analyses data from each of the three viewing trials were averaged using the mean for each participant to produce one score per face. A statement of epistemological position is presented in Appendix G.

Ethics

Ethical approval for this project was obtained from the University of Leicester Ethics Sub-Committee for Psychology (Appendix N).

Results

Typically developing images

To check whether merging the results for the TD male and female faces would create an appropriate combined-TD control group, paired-samples t-tests were completed for planned comparisons (Appendix P). As it was more important here that Type II error be minimised, the alpha level was set at the less conservative 0.05 level. Results for trait ratings were in line with the literature on sex differences (Oosterhof & Todorov, 2008); the female face was rated as less aggressive $t(57) = -3.85$, $p < .001$, more approachable $t(57) = 2.03$, $p < .05$ and less dominant $t(57) = -2.55$, $p < .05$, No differences were found for other dependent variables, including all eye-tracking data. As a result, TD data were combined as planned for all analyses except trait ratings, where TD data were analysed separately. For trait ratings the male face was used as control to maintain consistency with the control image in the ASD comparison, and because the male image differed less from the experimental images on almost all measures and so provided a more conservative estimate of significant differences.

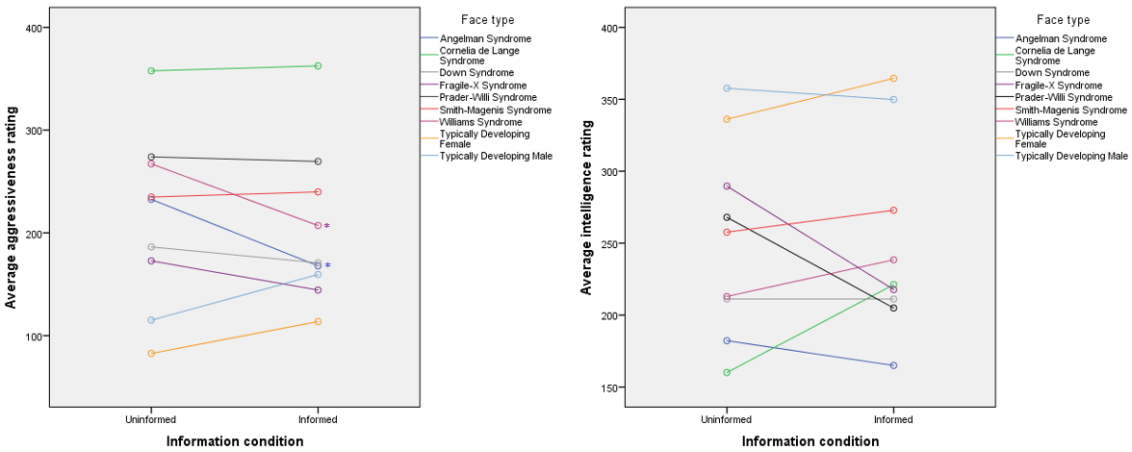
Trait ratings

Individual factorial mixed ANOVAs were completed separately for each rating type to identify which face images differed significantly from the male TD image on which traits. All main trait rating data tables are presented in Appendix Q. Main effects of face type were found for every trait rating (Table 20), indicating that every trait rating was affected by the face image participants were looking at whilst rating. These were confirmed by Friedman tests.

Table 20 ANOVA outputs of main effects of face type by trait rating

Trait rating	Df	F	*p*.
Aggressiveness	7.1	48.090	.000
Approachability	6.8	64.490	.000
Attractiveness	5.9	65.229	.000
Baby-facedness	6.2	19.159	.000
Dominance	6.7	29.007	.000
Intelligence	6.9	31.065	.000
Trustworthiness	6.9	49.973	.000

No main effects were found for information condition, indicating that no trait rating was reliably affected by informing participants about the stimuli. However for two traits an interaction was found between face type and information condition, indicating the effect of informing participants may be different for different faces: aggressiveness $F(7.1, 396.2) = 2.68$, $p < .05$; and intelligence $F(6.9, 385.6) = 3.52$, $p < .001$. Comparisons are presented in Figure 14 and suggest that informing people changed how participants rated the AS and WS faces on aggressiveness, with a marginal difference for FXS. No significant differences were found for intelligence, though differences for CdLS, FXS, and PWS approached significance. Significant differences were confirmed with Wilcoxon Signed Ranks tests carried out on data in which uninformed scores had been subtracted from informed scores; these comparisons also led to some other effects becoming significant (aggressiveness: FXS $Z = -3.19$, $p < .001$; intelligence: CdLS $Z = -2.85$, $p < .05$, PWS $Z = -2.62$, $p < .05$).

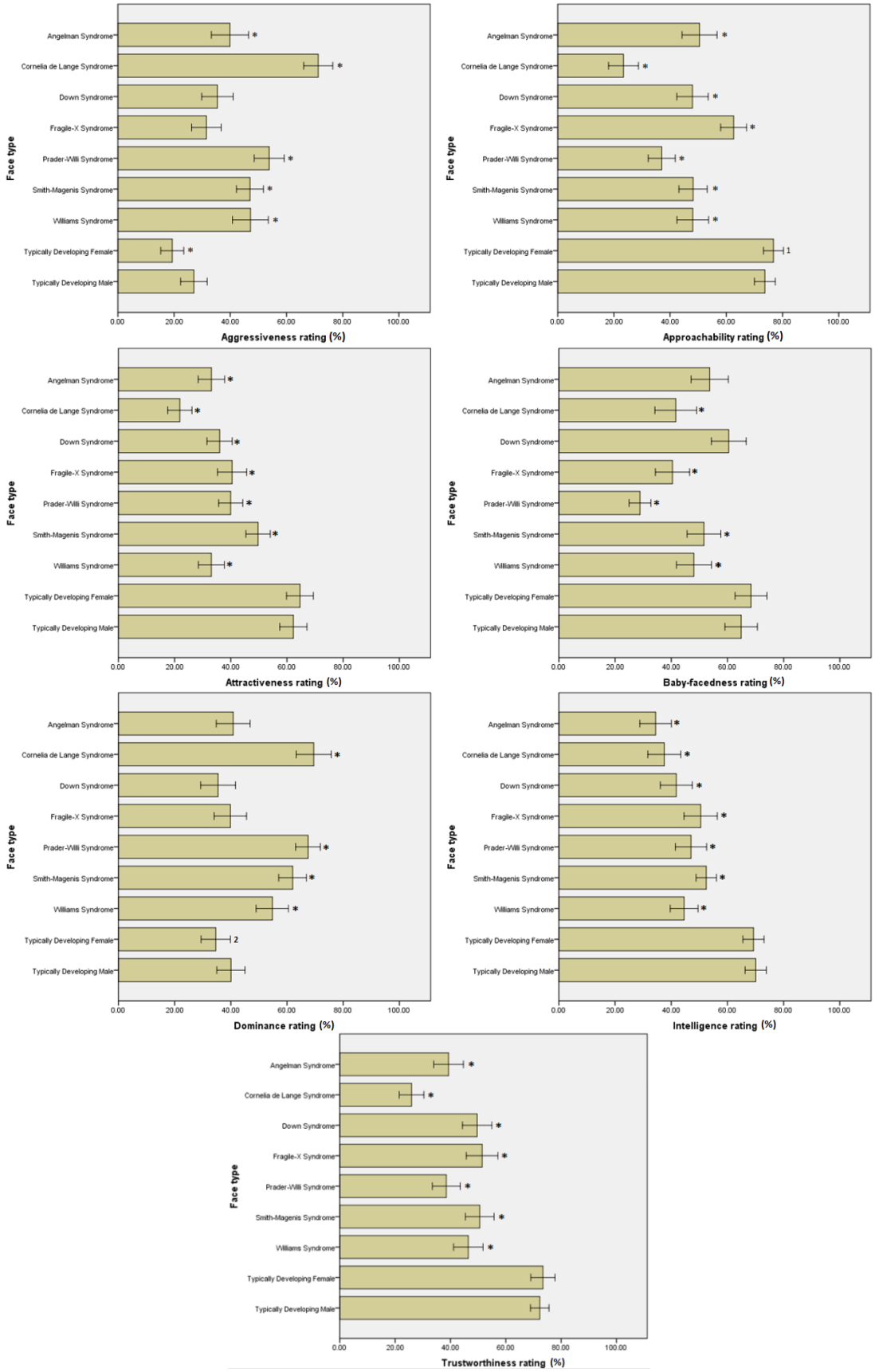


*Significantly different from Typically Developing male score at .01 level

Figure 14 Aggressiveness and intelligence ratings for face type x information condition

Simple within-subjects comparisons were planned between each face type and the male TD face, for each trait rating. The results are summarised in Figures 15 and 16[6]. All results were confirmed with Wilcoxon Signed Ranks tests. Of the comparisons made only seven did not differ significantly from the TD control image at the .01 level. Every GNS face was rated as significantly less approachable, attractive, intelligent, and trustworthy than the TD male face. This was also true for baby-facedness, except no significant difference was found for DS, and for AS the difference only approached significance. There was similarity in the pattern of results for aggressiveness and dominance, with DS and FXS not differing significantly from control on either rating. For dominance, AS also did not differ from control. CdLS, PWS, SMS, and WS face images differed significantly from TD across every trait measured.

[6] Although analysed as scores between 0-505, figures show data converted into percentage figures for ease of interpretation

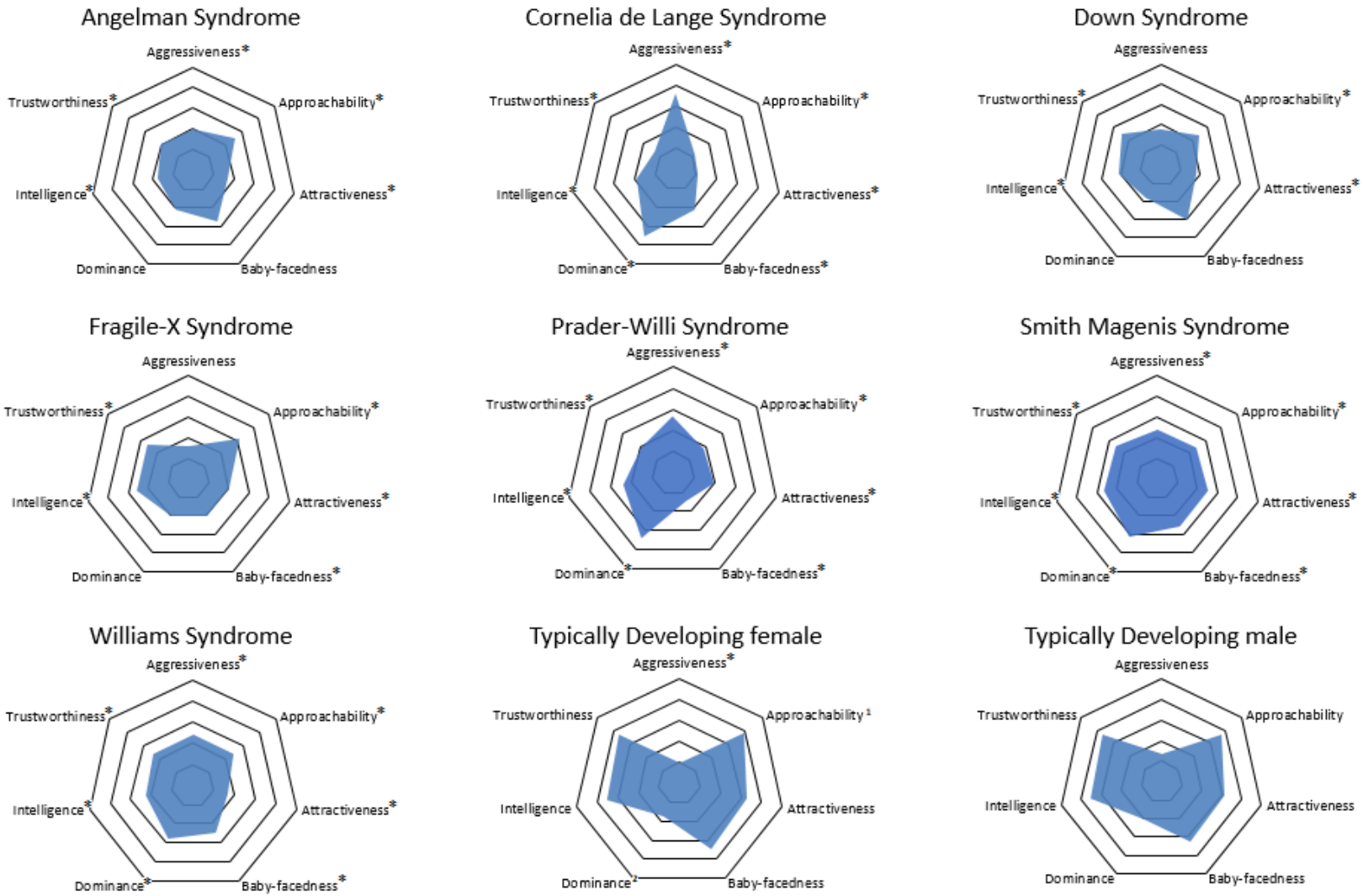


*Significantly different from Typically Developing male score at .01 level

[1] This effect was significant when tested using a Wilcoxon Signed Ranks Test Z = -2.58, $p < .05$

[2] This effect was significant when tested using a Wilcoxon Signed Ranks Test Z = -3.01, $p < .05$

Figure 15 Average trait ratings by trait



*Significantly different from Typically Developing male score at .01 level

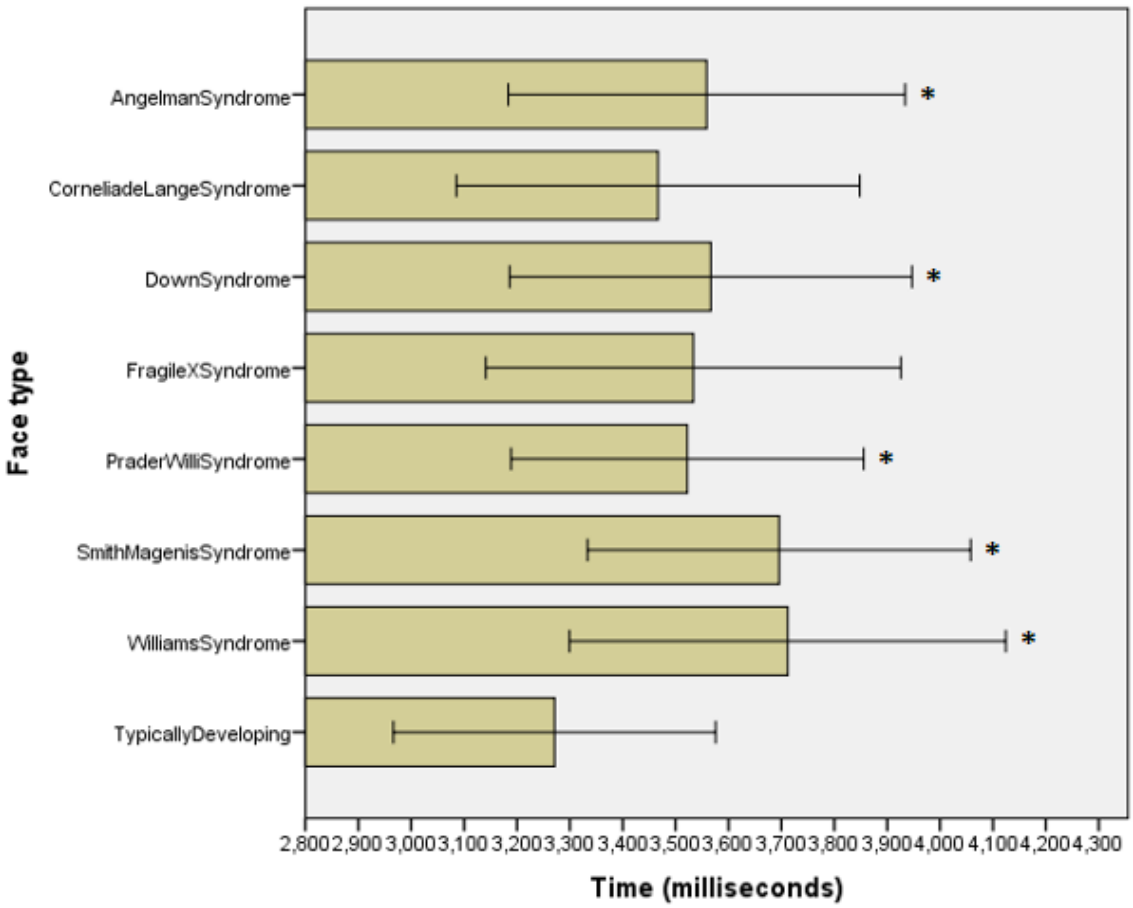
[1] This effect was significant when tested using a Wilcoxon Signed Ranks Test Z = -2.58, $p < .05$

[2] This effect was significant when tested using a Wilcoxon Signed Ranks Test Z = -3.01, $p < .05$

Figure 16 Average trait ratings by face type

Time taken to make trait ratings

A factorial mixed ANOVA with face type (within-subjects, 8 levels), trait judgment (within-subjects, 7 levels), and information condition (between-subjects, 2 levels) as independent variables and time taken to make trait judgments dependent variable was used. The main effect of face type suggested significant differences between facial images in the time taken to make ratings $F(7, 392) = 3.70$, $p < .001$. All faces representative of people with GNSs took significantly or near-significantly longer to rate than the TD images, except for CdLS and FXS (Figure 17). A Friedman test was used to confirm the main effect of face type and Wilcoxon Signed Ranks Tests were used to confirm the contrasts, each of which supported the parametric results. All other main and interaction effects were insignificant. All data output tables are presented in Appendix R.



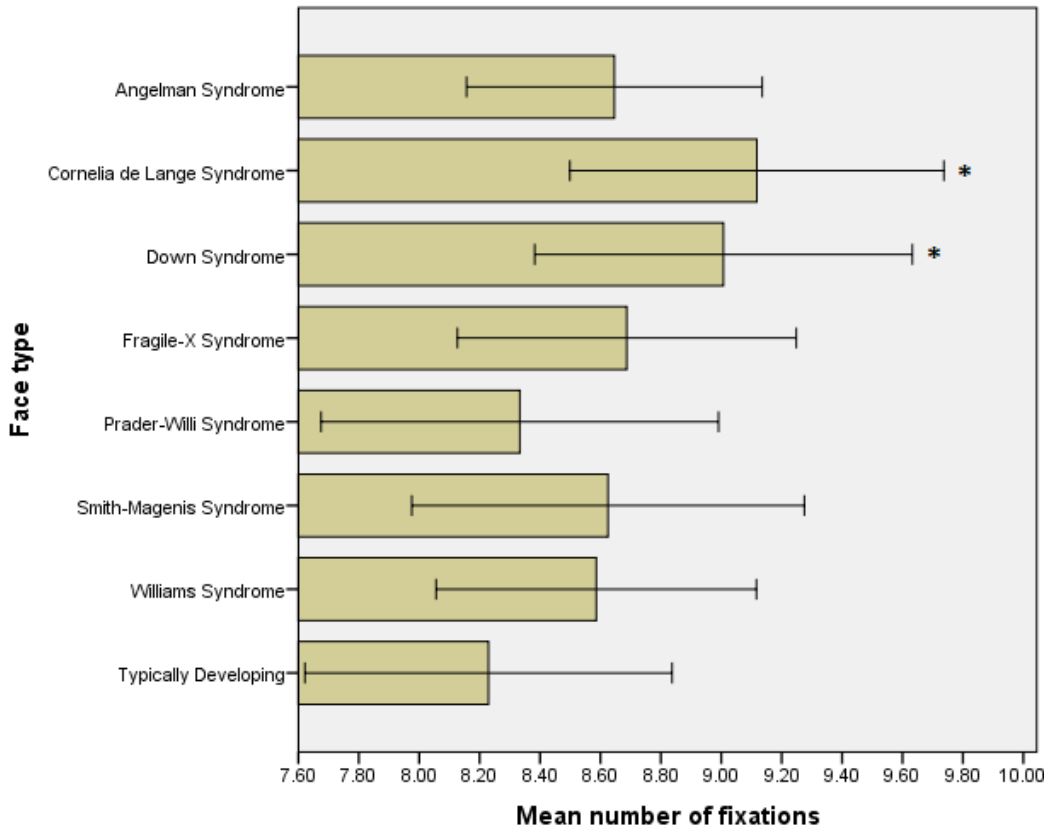
*Significantly different from Typically Developing score at .01 level

Figure 17 Mean time taken to make trait ratings by face type

Eye-tracking data

Number of fixations to the whole face

A factorial mixed ANOVA was conducted with face type and information condition as indendent variables and total number of fixations on faces during the view-only procedure as the dependent variable (Appendix S). Face type and information condition were composed as before. A statistically significant main effect was found for face type F(6.3, 289.9) = 4.095, *p* = .000, which was supported by a Friedman test. No other significant effects were found. Within-subjects contrasts for the main effect of face type are presented in Figure 18. Comparisons showed that the CdLS and DS images differed significantly from the TD controls, attracting a greater number of fixations within the time. This suggests that participants looked around these images more and is suggestive of differences in how the images were processed. A Wilcoxon Signed Ranks test confirmed the significance of the CdLS and DS comparisons.



*Significantly different from Typically Developing score at .01 level

Figure 18 Average number of fixations by face type

Interest area data

Factorial mixed ANOVAs were conducted to compare the main effects of face type (within-subjects), information (between-subjects), and interaction effects on the number of fixations, percentage of fixations, dwell time, and dwell percent to the three face areas separately (both eyes, nose, mouth). Face type and information consisted of the same levels as elsewhere. Data tables are presented in Appendix T.

Both eyes

Mauchly's Tests of Sphericity indicated that the assumption of sphericity had not been violated and sphericity-assumed data are reported. A similar pattern of results was produced for each of the eye-tracking measures. All showed significant main effects for face type, confirmed by Friedman tests. There were no other significant main or interaction effects (Table 21). This indicated that there were differences in the attention paid to the eyes depending upon which face image participants were looking at.

Table 21 Significance results for eye data

	Fixation count	Fixation percent	Dwell time	Dwell percent
Face type	$F(7, 322) = 9.45$, $p = .000$*	$F(7, 322) = 10.15$, $p = .000$*	$F(7, 322) = 7.94$, $p = .000$*	$F(7, 322) = 8.77$, $p = .000$*
Information	$F(1, 46) = 5.19$, $p = .027$	$F(1, 46) = 5.19$, $p = .027$	$F(1, 46) = 6.22$, $p = .016$	$F(1, 46) = 5.48$, $p = .024$
Facetype x Information	$F(7, 322) = 0.63$, $p = .732$	$F(7, 322) = 0.20$, $p = .986$	$F(7, 322) = 0.28$, $p = .962$	$F(7, 322) = 0.20$, $p = .986$

Within-subjects contrasts identified that the AS and WS images differed from the TD images in attention paid to the eyes (Table 22). Figure 19 shows that in each case these faces received less attention to the eyes than other images. Wilcoxon tests confirmed comparison results.

Table 22 *p* values for within subjects face-type contrasts for eye data

Face type	Fixation count	Fixation percent	Dwell time	Dwell percent
1. AS	.000*	.000*	.000*	.000*
2. CdLS	.981	.045	.013	.018
3. DS	.051	.904	.668	.868
4. FXS	.867	.430	.126	.131
5. PWS	.166	.174	.046	.052
6. SMS	.757	.596	.156	.212
7. WS	.002*	.000*	.000*	.000*

*$p < .01$

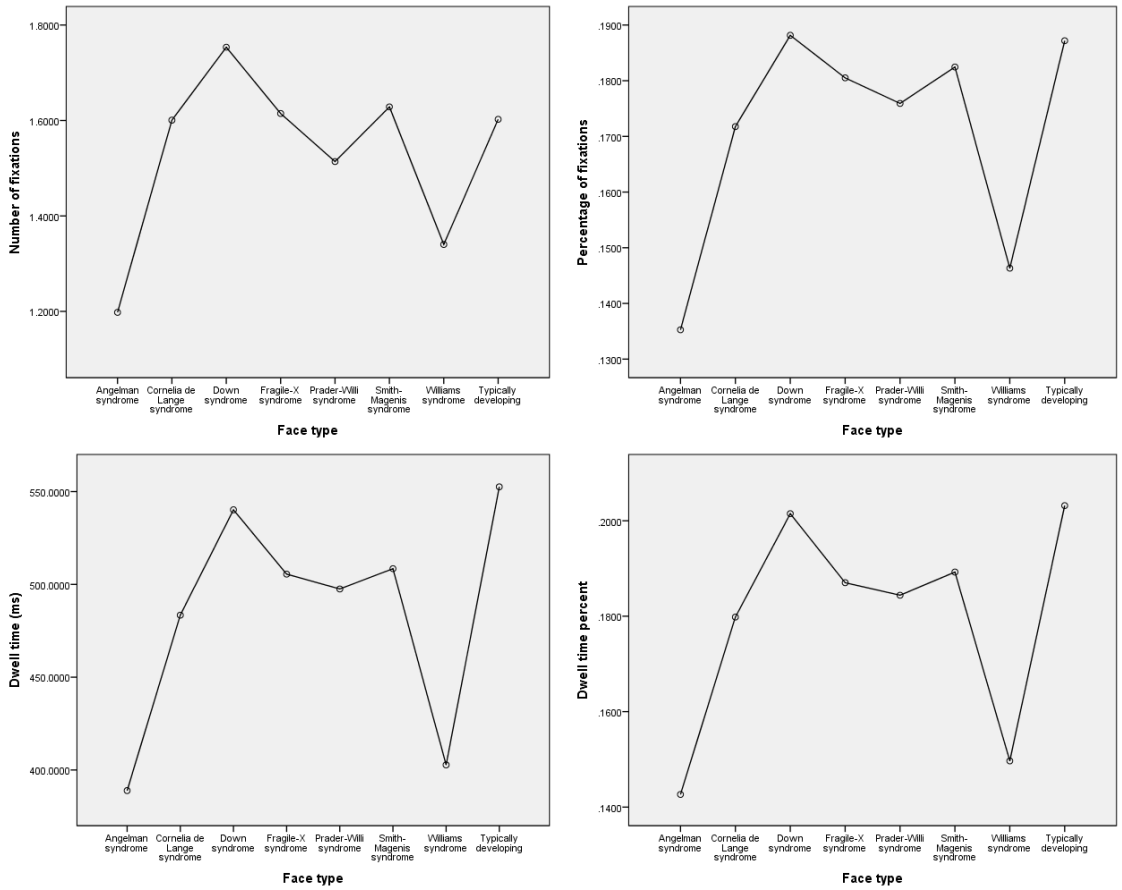


Figure 19 Mean eye data scores by face type

Nose

Sphericity-assumed results are presented for fixation data as Mauchly's test was not violated. Significant main effects were found for face type on dwell measures but not fixation measures (Table 23), however significant results became only marginally significant when repeated with Friedman tests: dwell time $X^2(7) = 17.923$, $p = .012$; dwell time percent $X^2(7) = 18.270$, $p = .011$. This suggests that participants may not differ markedly in how frequently

they looked at the noses of images, but they tended to remain looking at the nose of some faces more than others.

Table 23 Significance results for nose data

	Fixation count	Fixation percent	Dwell time	Dwell percent
Face type	F(7, 322) = 1.67, *p* = .115	F(7, 322) = 1.77, *p* = .093	F(6.6, 301.3) = 2.81, *p* = .009*	F(6.6, 302.9) = 2.85, *p* = .008*
Information	F(1, 46) = 4.05, *p* = .050	F(1, 46) = 1.90, *p* = .175	F(1, 46) = 1.33, *p* = .255	F(1, 46) = 1.92, *p* = .172
Facetype x Information	F(7, 322) = 0.36, *p* =.927	F(7, 322) = 0.48, *p* = .847	F(6.6, 301.3) = 0.38, *p* = .905	F(6.6, 302.9) = 0.46, *p* = .856

Within-subjects contrasts were completed on the dwell data to identify which faces differed from the TD images on dwell time and percent (Table 24). These revealed that no single image differed significantly from the TD images, though for PWS results approached significance, receiving more attention to the nose. Repeating the analysis using a Wilcoxon Signed Ranks Test led to these effects becoming significant Z = -2.759, *p* = .006, Z = -2.677. *p* = .007.

Table 24 *p* values for within-subjects face-type contrasts for nose data

Face type	Dwell time	Dwell percent
1. AS	.093	.110
2. CdLS	.895	.657
3. DS	.865	.925
4. FXS	.717	.873
5. PWS	.023	.015
6. SMS	.728	.660
7. WS	.396	.325

Mouth

Significant main effects were found for face type on every measure with no effect of information condition (Table 25). Friedman's tests supported significant findings.

Table 25 Significance results for mouth data

	Fixation count	Fixation percent	Dwell time	Dwell percent
Face type	F(6.3, 288.8) = 35.83, p = .000*	F(5.8, 265.1) = 34.82, p = .000*	F(5.2, 240.1) = 33.25, p = .000*	F(7, 322) = 34.34, p = .000*
Information	F(1, 46) = 1.62, p = .210	F(1, 46) = 1.97, p = .167	F(1, 46) = 1.19, p = .281	F(, 46) = 1.28, p = .264
Facetype x Information	F(6.8, 284.2) = 0.40, p = .886	F(5.8, 265.1) = 0.81, p = .562	F(5.2, 240.1) = 0.64, p = .675	F(7, 322) = 0.45, p = .870

Within-subjects contrasts suggested the inverse of eye data; the mouths of the AS and WS images were viewed significantly more than in the control images (Table 26, Figure 20). This suggests participants attended to the mouths at the expense of the eyes. FXS also had significantly more attention to the mouth than control. Wilcoxon Signed Ranks tests validated significant contrasts.

Table 26 p values for within-subjects face-type contrasts for mouth data

Face type	Fixation count	Fixation percent	Dwell time	Dwell percent
1. AS	.000*	.000*	.000*	.000*
2. CdLS	.072	.539	.315	.293
3. DS	.006*	.086	.246	.168
4. FXS	.000*	.000*	.000*	.000*
5. PWS	.499	.871	.251	.344
6. SMS	.038	.152	.044	.038
7. WS	.000*	.000*	.000*	.000*

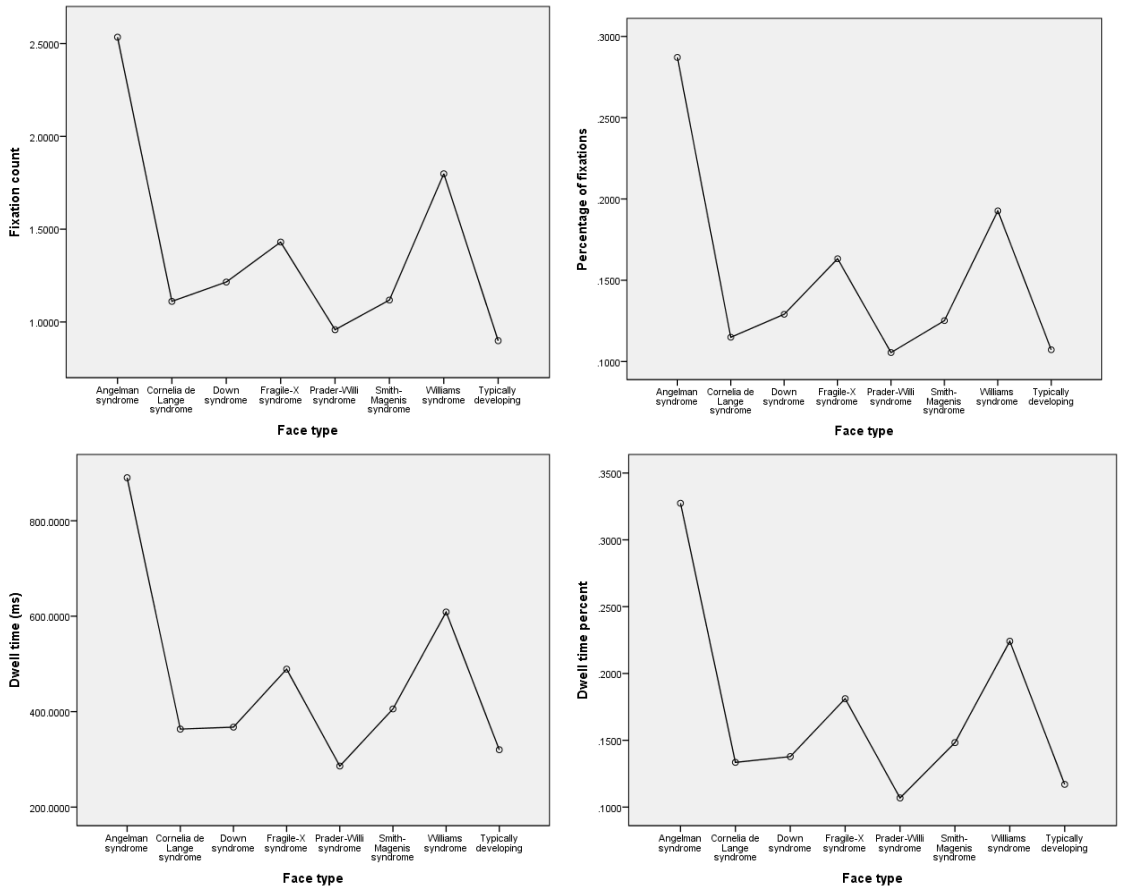


Figure 20 Mean mouth data scores by face type

Autism spectrum disorder image

Trait ratings

As with the GNS images, individual factorial ANOVAs were conducted to identify whether face type (ASD and TD) or information condition (informed or uninformed) impacted upon the seven trait ratings. Data tables are presented in Appendix U. One main effect of face type was found for baby-facedness $F(1, 56) = 17.25$, $p < .001$. The main effect of face type for dominance approached significance $F(1, 56) = 4.11$, $p = .05$. These effects were significant when repeated using Friedman Tests: $X^2(1) = 6.90$, $p = .009$; $X^2(1) = 9.931$, $p < .01$. Table 27 and Figures 21 and 22 show that the ASD face image was significantly less 'baby-faced' than the TD image according to the parametric analysis, and significantly more 'dominant' than the TD face when non-parametric analyses were undertaken. Means and standard deviations presented in

Table 27 are expressed as percentages. No other main or interaction effects showed significant differences between the ASD and matched TD face image.

Table 27 Means, standard deviations, and significance levels for trait ratings by face type

Trait	Mean *(SD)*		*p* value
	ASD	TD	
Aggressiveness	25.3 *(17.6)*	24.8 *(17.6)*	.796
Approachability	73.9 *(12.7)*	71.5 *(16.8)*	.303
Attractiveness	60.0 *(18.4)*	60.6 *(19.2)*	.705
Baby-facedness	70.5 *(18.6)*	78.2 *(16.4)*	.000*
Dominance	43.8 *(20.6)*	36.8 *(21.2)*	.047
Intelligence	65.7 *(14.1)*	64.0 *(20.2)*	.429
Trustworthiness	67.5 *(18.8)*	69.5 *(15.9)*	.379

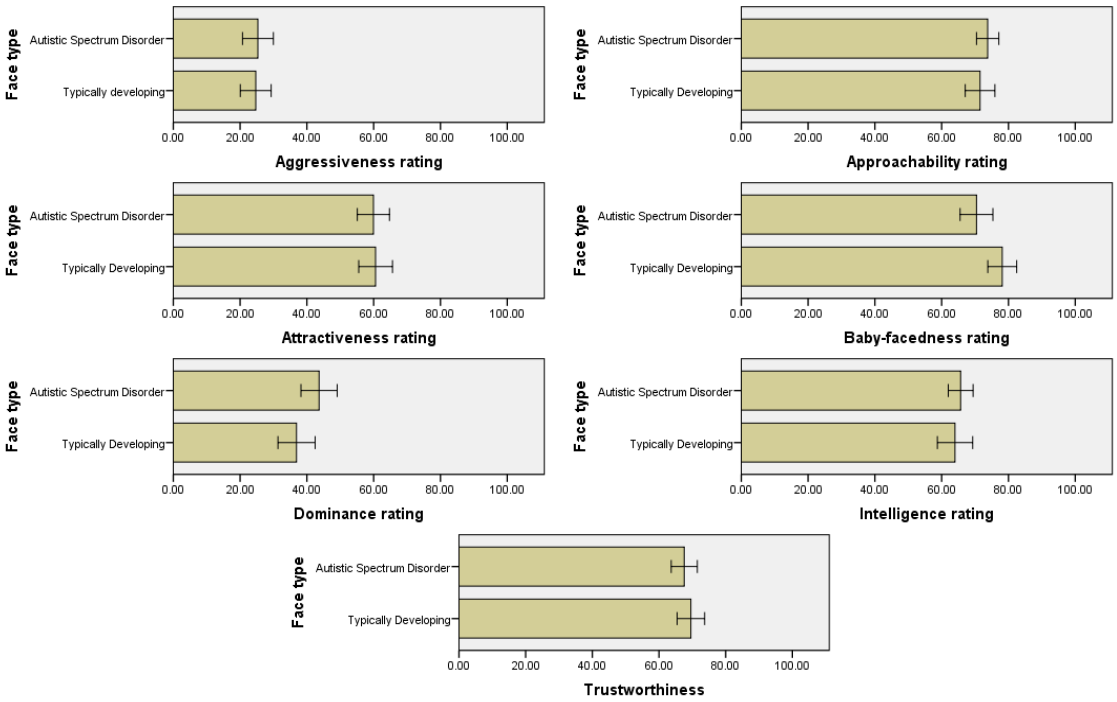


Figure 21 Average trait ratings by trait: ASD experiment

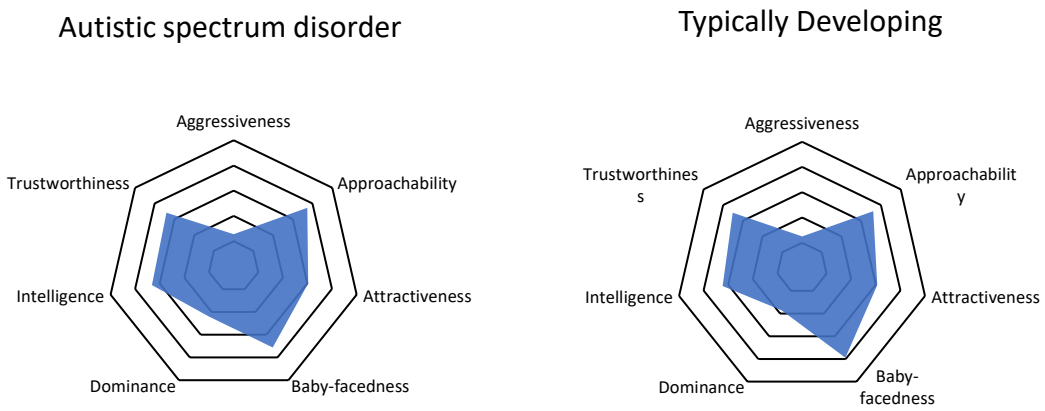


Figure 22 Average trait ratings by face type: ASD experiment

Time taken to make trait ratings

A factorial mixed ANOVA was conducted with independent variables of face type, type of judgment, and information on the dependent variable of time taken to make trait judgments. Data tables are presented in Appendix V. The levels of the ANOVA matched those for trait judgments. All main and interaction effects were insignificant: face type $F(1, 56) = 0.49$, $p = .487$; type of judgment $F(5.1, 287.8) = 1.07$, $p = .376$; information condition $F(1, 56) = .91$, $p = 0.344$, face type x information condition $F(1, 56) = 3.10$, $p = .084$, trait rated x information condition $F(5.1, 287.8) = 0.59$, $p = .714$, face type x trait rated $F(4.4, 245.4) = 0.95$, $p = .441$, face type x trait rated x information condition $F(4.4, 245.4) = 0.55$, $p = .715$.

Eye-tracking data

Number of fixations

A two (face type, within-subjects) by seven (judgment type, within-subjects) by two (information condition, between-subjects) mixed ANOVA was conducted with total number of fixations on faces during the view-only procedure as the dependent variable. Data tables are presented in Appendix W. No main or interaction effects were found; face type $F(1, 46) = 0.143$, $p = .707$, information condition $F(1, 46) = 1.170$, $p = .285$, face type x information

condition F(1, 46) = 1.170, *p* = .285. This indicated that participants did not differ reliably in how much they looked around the ASD and TD images.

Fixations and dwell times on interest areas

Separate factorial ANOVAs were conducted on face type and information for a) the number of fixations, b) the percentage of fixations, c) the time spent dwelling, and d) the percentage of time spent dwelling on each of the three face interest areas separately (eyes, nose, mouth) during the view-only procedure. No main or interaction effects were found on any analysis for eye-tracking data to interest areas. Data tables are presented in Appendix X.

Informal observations and debrief

During debrief, to identify whether they had remained naïve to the presence of GNSs in the image sample, each participant in the uninformed condition was asked the question: "was there anything else that stood out to you about the faces?" Of the 30 people in this condition, eleven spontaneously suggested that they had recognised that at least one of the faces represented a disability, ID, or a specific GNS. Four of these said that they only recognised that one of the faces represented a person with DS, and they did not recognise that the research concerned GNSs more generally. The remaining seven noticed that several faces were of people affected by these conditions, and in some cases commented that this affected how they responded to question items. Several participants commented upon the prominence of the eyebrows in the CdLS image and the mouths of the AS and WS images. As a result, it may be argued that the information manipulation was only partially successful owing to the recognisability of the facial profiles of people with GNSs.

Discussion

The results presented here have implications for the main questions outlined in the introduction section as follows:

1. Observed trait ratings suggest that there are differences in trait judgments made of face images representing people with a GNS and those representing typical development. The face image representing children with ASD diagnosis produced one significant trait judgment difference, for baby-facedness.
2. Differences were observed in the attention paid to the eyes and the mouths of certain GNS face images relative to TD, with less attention to the eyes for the AS and WS images, and greater attention paid to the mouths for AS, FXS, and WS images. No such differences were found for the ASD image.
3. The CdLS and FXS images attracted a greater total number of fixations than the TD face image. There were no significant differences for other GNS images or the ASD image.
4. There was no significant difference in trait judgments made of the faces depending on whether participants were informed about the presence of images representing people with a GNS or ASD diagnosis.
5. Face images representing people with a GNS, with the exception of CdLS and FXs images, attracted a greater number of fixations than TD images. No significant difference was found for the ASD image.
6. Informing participants about the presence of images representing people with a GNS or ASD diagnosis changed how participants rated the AS and WS faces on aggressiveness. Results also suggested that intelligence ratings were affected by which face was being looked at, but this did not appear to be driven by any individual GNS type.

Results suggest that judgments of facial stimuli representative of the morphology typically associated with a number of GNSs are likely to differ from judgments made about TD faces. The specific pattern of ratings differed for specific faces and all faces differed significantly from a corresponding TD image on most traits rated. Effect sizes for GNS trait rating data were

typically large, suggesting that facial differences had a strong effect upon trait inferences. It is interesting that the image representative of a child with ASD diagnosis also received a significantly different judgment rating in the area of baby-facedness despite the ASD label not being associated with either a consistent genetic marker or recognised diagnostically as having atypical facial morphology. In addition, people differed in the way in which they looked at the faces representative of people with GNSs: Where face images had markedly different morphology in the mouth, more attention appears to have been paid to those areas of difference at the expense of the amount of attention paid to the eyes. Eta-squared for eye-tracking data for GNS comparisons ranged 'medium'-'large-, however for ASD effect sizes for these tests was extremely small, indicating barely any impact of ASD diagnosis presence upon how faces were viewed by participants.

Every face resembling a child with a GNS or with ASD diagnosis was rated, relative to a matched image of a TD person, in a way that could have adverse repercussions for the individual in certain contexts. For some judgments, there is an obvious valence to the rating (e.g., trustworthiness, intelligence, attractiveness), although even for some of these there may be contextual factors at play. Higher perceived intelligence for example, may lead to reduced social distancing (Oullette-Kuntz, *et al.*, 2010), but may be problematic if it is inaccurate; it could mask difficulties, thereby impeding adaptations to suit individual needs, or lead to unrealistic attribution of responsibility in the context of behaviours that challenge services. For other ratings, the valence is less clear. Politicians, for instance, may benefit from a more dominant appearance, whereas the impact of this for someone in a caring profession may be the opposite. Also, whilst looking 'baby-faced' may benefit somebody in trouble, responsible professionals may gain advantage from looking less baby-faced. People with GNSs may be significantly disadvantaged by the types of automatic trait ratings that are made of them based solely upon their facial appearance; where a more obvious valence exists in a trait, GNS face images were universally rated more negatively. GNS images also took longer to rate,

suggesting that different facial appearance may make faces more difficult for participants to judge, or it could mean that participants were motivated to look at these faces for longer due to novelty. Differences for the ASD image were less pronounced than for GNS images and may potentially indicate perceptions of a less youthful or more masculine appearance (higher dominance) amongst people with that condition. This finding relating to the ASD image should arguably be treated with caution, as it is based upon only one image, and any two face images created separately would conceivably show structural differences, and therefore produce different trait inferences.

Only trait ratings of aggressiveness and intelligence appear to have been affected by whether participants were given advance knowledge of the presence of GNSs amongst the images presented, and this appears to have been driven by lower informed ratings of aggressiveness for the images representing AS and WS. There were no clear 'driver' images for intelligence. It is not clear why differences in aggressiveness ratings should be especially different for the AS and WS images. There were no other effects of information, and so participants did not appear to substantially alter their ratings or viewing behaviour dependent upon whether they knew GNSs to be present, except in these examples. This is perhaps surprising, as social demand effects may generally be presumed to impact upon data such as these. This suggests that participants' ratings may have related more to their perception of facial structure and what this might mean, than to their knowledge of GNSs, or it could be interpreted that judgments based on face structure are more unconscious and therefore less amenable to change owing to social desirability. It could also partially reflect that even 'uninformed' participants made assumptions about the face images that were concordant with the withheld information.

The differences in trait ratings observed may be consistent with previous research about how facial structure can impact upon judgments, particularly regarding overall facial

structure (Vernon *et al.*, 2014) and the extent to which structures are suggestive of emotional expression (Said *et al.*, 2009). Of the GNS groups, CdLS and PWS tended to be rated similarly across traits, often receiving the most extreme ratings of all faces on each trait. In particular, these faces were rated as more aggressive and dominant than other faces, which may correlate with a perception of masculinity (although all images were 'gender balanced'). A hostile emotional significance could have been drawn from the prominent brow of the CdLS image (Vernon *et al.*, 2014). Conversely, the FXS image shows a face with a slender jawline and larger eyes, features negatively associated with masculinity (Vernon *et al.*, 2014), and it was rated as no different to the TD image on aggressiveness and dominance on average. The differences in trait inferences made of the two 12-year-old TD faces were largely in line with what might be expected owing to sex differences, with the female face rated as less aggressive, marginally less dominant, more approachable, and more attractive than its male counterpart. One interesting finding that differed from expectation was that the AS image was rated as relatively untrustworthy and unapproachable, despite the picture being the only one to smile, a feature strongly positively associated with these ratings elsewhere (Sutherland *et al.*, 2003). This last finding may be influenced by other traits being read simultaneously into the face, such as those of low intelligence and high baby-facedness observed.

These results raise intriguing questions concerning the development of understanding of behavioural phenotypes amongst people with GNSs. AS, for example, is associated with a 'child-like and excitable' demeanor (Van Buggenhout & Fryns, 2009), and the ratings here of higher baby-facedness and lower dominance are remarkably concordant with that behaviour. As elsewhere, there is an indication that DS faced may be rated as more baby-faced than other types of GNS as it was one of the few faces not to differ from TD on this measure, whilst other GNS faces did. Baby-facedness in DS facial morphology has been associated with behavioural predictions of increased affection, naïvety, and compliance (Fidler & Hodapp, 1999), which in turn can lead to more favourable treatment (Zebrowitz *et al.*, 1991) and could help to

understand the observation that children with DS may avoid difficult tasks (Wishart, 1993). PWS was consistently rated as a more aggressive and dominant looking GNS, and has been particularly associated with 'temper tantrums' (Holland *et al.*, 2003). The less dominant and aggressive ratings of people with FXS correlate well with findings that they tend more towards internalising than externalising behaviours (Smith *et al.*, 2012). Finally, the 'extreme male' cognitive abilities of people diagnosed with ASD (Baron-Cohen, 2002) may be associated with the findings of lower ratings of baby-facedness plus the non-parametric significance of dominance ratings observed, but it would be inappropriate to infer that these data support arguments regarding dysmorphic facial development for people diagnosed with ASD.

The data here may also have ramifications for how behavioural phenotype research is conducted and results understood. The findings of different social judgments made of people suggests that even when people grow up in ostensibly the same circumstances, facial morphology may be one factor leading to people, on average, being treated differently and therefore to have different subjective experiences of objectively identical environments. The suggestion that any difference in how two individuals who have grown up in the same physical environment respond to identical situations being due directly to genetic factors is therefore further questionable in light of how physical differences between them can influence people's social worlds. In addition, this research also questions whether it is reasonable to rely on retrospective reports of behaviour in establishing phenotypes because such reports are likely to also be systematically influenced by biases related to assumptions about people's characteristics.

The eye-tracking data indicated that people tended to focus most of their attention upon the three main interest areas (eyes, nose, mouth). This is in line with previous research (Mertens *et al.*, 1993). They may also have tended to dwell disproportionately on areas of marked facial difference when looking at GNS faces, as in other research with people with

facial stigmata and orofacial clefts (Madera & Hebl, 2012; van Schjindel *et al.*, 2015), although since the facial gestalt is affected more generally in GNS, it is difficult to assess how this might compare to how people attend differently to individual distinctive marks. For the AS and WS faces, attention appears to have been drawn disproportionately to the mouth at the expense of attention paid to the eyes. Participants also appeared to look around faces with more prominent dysmorphic features; CdLS and DS faces gathered the greatest number of total fixations, with AS, FXS, and WS faces also receiving increased fixation rates. These findings may have clinical implications; previous research has associated attention to the eyes with empathy for faces (Cowan *et al.*, 2014). If atypical facial morphology distracts viewers from those parts of the face most expressive of emotion or pain, helpers may be less likely to show understanding and compassion in their responses.

Whilst it must be borne in mind that these are averaged ratings, made on averaged images under experimental conditions, the results gathered here may reflect significant repercussions on how people with GNSs or ASD diagnoses are treated, and on how behaviour is interpreted. Eye-tracking differences potentially indicate implicit social attitudes (Blais *et al.*, 2015), and trait judgments are likely to be present both in automatic (unconscious) and reflective (conscious) evaluative systems (see, e.g. Sherman *et al.*, 2014). The differences described in this report may therefore exert a consistent and subtle influence upon reciprocal interactions over long periods of time and between individuals (e.g. Zebrowitz *et al.*, 1991). Generally, appearance and visual scanning factors may be too subtle and too easily over-ridden by declarative processes to exert a substantial influence over interactions (Jarymowicz & Szuster, 2017), but may skew how people respond to situations in which declarative processes can be relied upon less. These include highly emotive situations and occasions in which fast, automatic reactions are required. Unconscious assessments amongst carers of higher aggressiveness or lower baby-facedness during difficult situations could conceivably lead to more punitive responses and feed patterns of troubling behaviour. As research

suggests that implicit attitudes may be accessible under certain circumstances (Hahn *et al.*, 2014), it may be of benefit to help clinical staff and carers identify their biases and develop strategies for mitigating their influence, for example by increasing access to reflective clinical supervision for front-line staff. The manner in which influences of facial morphology interact with other elements associated with GNSs, such as ID, is likely to be extremely complex and would require careful consideration.

The results here also have potential relevance to ongoing discussions and policy decisions relating to the social distancing of people with GNSs. That all GNS faces were observed to be rated as significantly less approachable, attractive, and trustworthy could arguably give additional clues as to why some people with ID experience exclusion. Observed biases in visual attention may lead to the exaggeration of perceived differences and this may not be ameliorated by knowledge of a person's condition. These data do not, however, account for familiarity with people with GNSs, and thus there is nothing here to suggest that greater contact between TD people and those affected by a GNS may not still offer a route into reducing social distance, and research with faces of typically developing people indicates that familiarity can lead people to rate them as more pleasing (Halberstadt *et al.*, 2013). It is also important to note that although this research identifies trends between groups of people, there is substantial variance in facial appearance within groups as well as between groups, and as such results pertaining to a group to which an individual belongs should not be assumed to apply equally to each person within that group.

The results here may be considered to be broadly relevant to children with the select GNSs identified, owing to the manner in which the images that were used were produced. While efforts were made to find a set of comparable photographs of individuals with other syndromes, those found were too few and variable (e.g. on lighting, definition, colour, age, etc.) to produce a reliable cohort for this experiment. By averaging a range of images into a

single image, the images used here offered a facial model that is likely to represent something of the general morphology associated with a condition. Use of these images does, however, also have limitations. Most notably, images were still, two-dimensional, and greyscale, so had less real-world validity and fewer more nuanced factors that affect how faces are interpreted in the real world, such as facial expression, body posture, movement, and social context. Also, variations within groups were naturally not represented. In addition, as a result of the averaging process there were many small discrepancies between face images that remained despite efforts to standardise them. For example, the image representing AS showed the face smiling and with an open mouth and it was not possible to get the eyes on the AS, DS, or ASD images to focus perfectly forwards. These discrepancies may arguably represent behavioural features of the syndromes, such as the 'happy demeanour' of people with AS, or reduced eye contact in people diagnosed with ASD, but the design of the study means it is not possible to assess the relative impact of the different elements of the images.

One variable that may arguably complicate interpretation of these results is facial expression. Facial expression is considered to be an important means of interpersonal communication (e.g. Frith, 2009), and research suggests that facial structure and expression may be more inextricable than might be assumed (Oosterhof and Todorov, 2009; Said *et al.*, 2009). When the images were being produced, children were asked to look at the camera but expression could not be consistently 'controlled,' and the face images were therefore not all 'neutral.' Facial expressions have been shown to exert significant effects upon character judgments (e.g. trustworthiness; Oosterhof & Todorov, 2008) and this is likely to have been a factor in trait ratings and eye-tracking data. Other than putative differences in emotional variables in behavioural phenotype research, there is little research into how emotion expression itself may differ between GNS groups. As results here indicate that some aspects of facial morphology skew perceptions based on face stimuli, it is possible that certain structures may also obfuscate facial expressions, making them more difficult to interpret. Reading

expression in faces may be particularly important for people with ID since, for instance, caregivers are encouraged to used facial cues to whether someone is unhappy or in pain, such as with the FLACC pain assessment tool (Malviya *et al*., 2005; Merkel *et al.*, 1997).

The information obtained in participant debrief offer some insight into how the results here should be interpreted. This mostly regards the lack of significant main effects of information condition. Since many participants in the nominally 'uninformed' condition realised the purpose of the study, either in full or in part, potential differences between the two groups may have reduced to the point of becoming insignificant. It is noteworthy that although insignificant, differences between the two group were still in anticipated directions, such that informed participants generally rated participants in ways that would arguably promote social inclusiveness (as less aggressive, more approachable, more attractive, more baby-faced, less dominant, and more trustworthy). The one rating that showed the opposite trend was intelligence, which had lower overall ratings in the informed condition, as might be expected if participants knew several of the participants to have a condition that could lead to ID. Observed power in the information main conditions and its interactions was small, and thus it remains possible that a real effect of knowledge of GNS influencing trait judgments exists, which the method employed here failed to detect.

There is a further consideration regarding the methodology of this project related to the trait ratings used. The wider literature from which they were drawn has focused mainly upon judgments made of the faces of adults. It is not necessarily the case that these judgments would be the same as those that would be made of the faces of pre-pubescent children. Indeed, during debrief, one participant reported that they found it unusual to be asked to make ratings of attractiveness and approachability for images representing children. In addition, the manner in which faces develop over time, and the possible psychosocial impacts of this in these groups, remains unstudied.

Future research would benefit from adapting the methods used here to incorporate more complex, and ideally more dynamic stimuli to increase ecological validity. It would also be helpful to repeat this project with images pertaining to people of a variety of ages (although fewer images exist due to increased diagnosis in younger age groups and higher levels of participation in research). Research into physiognomic judgments should aim to expand into different age ranges, such that we might better understand how children's faces are judged, and therefore how developmental trajectories could be affected by facial structure. The understanding of whether physiognomic trait judgments are implicitly or explicitly held remains quite basic, and controversies surrounding the relationship between implicit attitudes and real-world behavioural change makes it difficult to draw reliable inferences, and should be elucidated. Finally, research that seeks to report on means of decreasing social distance through educational programmes or facilitated contact between groups, or on mitigating the impact of implicit biases in care settings may be enhanced by considering the influences that these types of trait inferences may present.

To conclude, people with genetic neurodevelopmental syndromes such as Down syndrome, Fragile-X syndrome, and Angelman syndrome face a number of social challenges relative to typically developing people that research suggests commonly result in heightened risk of negative stereotyping and social exclusion. The research presented here suggests that the aetiology of these difficulties may include the types of social judgment systems that people develop for interpreting faces. People from these groups are likely to have a facial gestalt that differs from people who are unaffected, and these morphological differences appear to lead to different physiognomic assessments, such that an individual may be perceived to be more aggressive or less intelligent based upon how they look. Such differences are likely to relate to the meanings derived from facial structures, such as mouth size, and the extent to which facial features appear to resemble emotional expressions. A pattern of divergent physiognomic trait ratings for people with autism spectrum disorder may also exist,

in a manner supportive of theories that diagnosed people may have been exposed to higher levels of masculine hormones during development, but this requires further exploration.

References

Aldridge, K., George, I. D., Cole, K. K., Austin, J. R., Takahashi, T. N. … & Miles, J. H. (2011). Facial phenotypes in subgroups of prepubertal boys with autism spectrum disorders are correlated with clinical phenotypes. *Molecular Autism, 2*(1), doi: 10.1186/2040-2392-2-15.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Ashwood, P. & Van de Water, J. (2004). Is autism an autoimmune disease? *Autoimmunity Reviews, 3*(7-8), 557-562.

Baron-Cohen, S. (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences, 6*(6), 248-254.

Baron-Cohen, S., Lombardo, M. V., Auyeung, B., Ashwin, E., Chakrabarti, B., & Knickmeyer, R. (2011). Why are autism spectrum conditions more prevalent in males? *PLoS Biology, 9*(6): e1001081.

Belmonte, M. K., Cook, E. H., Anderson, G. M., Greenough, W. T. & Beckel-Mitchener, A. (2004). Autism as a disorder of neural information processing: Directions for research and targets for therapy. *Molecular Psychiatry, 9*(7), 646-663.

Blais, C., Jack, R. E., Scheepers, C., Fiset, D., & Caldara, R. (2008). Cultures shapes how we look at faces. *PlosOne, 3*(8), e3022.

Bogart, K. R., Briegel, W. & Cole, J. (2014). On the consequences of living without facial expression. In C. Muller, A. Cienki, E. Fricke, S. Ladewig, D. McNeil, S. Teßendorf (Eds.), Handbook of Body – Language – Communication: An International Handbook.

Bonanno, A. & Esmaeli, B. (2012). Cancer and facial disfigurement: reducing survivors' stigma in social interaction. *Clinical Journal of Oncology Nursing, 16*(2), 153-159.

Charity Commission (2001). The promotion of social inclusion. Retrieved on 27/07/2018 from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/359358/socinc.pdf

Clark, D. M., Sherer, I., Deardorff, M. A., Byrne, J. L., Loomes, K. M., Nowaczyk, M. J. … Krantz, I. D. (2012). Identification of a prenatal profile of Cornelia de Lange syndrome (CdLS): A review of 53 CdLS pregnancies. *American Journal of Medical Genetics Part A, 158A*(8), 1848-1856.

Cogsdill, E. J., Todorov, A. T., Spelke, E. S. & Banaji, M. R. (2014). Inferring character from faces: A developmental study. *Psychological Science, 25*(5), 1132-1139.

Cowan, D. G., Vanman, E. J. & Nielsen, M. (2014). Motivated empathy: The mechanics of the empathic gaze. *Cognition and Emotion, 28*(8), 1522-1530.

Cummins, R. & Lau, A.L.D. (2003) Community integration or community exposure? A review and discussion in relation to people with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities, 16*(2), 145–157.

Daunhauer, L. A. & Fidler, D. J. (2011). The Down syndrome behavioral phenotype: Implications for practice and research in occupational therapy. *Occupational Therapy in Health Care*, *25*(1), 7-25.

DeBruine, L. & Jones, B. (2017). Face Research. Retrieved March 2018 from: http://faceresearch.org/faq

Di Nuovo, S. & Buono, S. (2011). Behavioral phenotypes of genetic syndromes with intellectual disability: Comparison of adaptive profiles. *Psychiatry Research, 189*, 440-445.

Ditchman, N., Wener, S., Kosyluk, K., & Jones, N. (2013). Stigma and intellectual disability: Potential application of mental illness research. *Rehabilitation Psychology, 58*(2), 206-216.

Dykens, E. M. & Hodapp, R. M. (2001). Research in mental retardation: Toward an etiological Approach. *Journal of Child Psychology and Psychiatry, 42*(1), 49-71.

Dykens, E. M. & Rosner B. A. (1999). Refining behavioural phenotypes: Personality-motivation in Williams and Prader-Willi Syndromes. *American Journal on Mental Retardation, 104*(2), 158-169.

Efferson, C. & Vogt, S. (2013). Viewing men's faces does not lead to accurate predictions of trustworthiness, *Science Reports, 3*, 1047

Enea-Drapeau, C., Huguet, P. & Carlier, M. (2012). Tracking subtle stereotypes of children with trisomy 21: From facial-feature-based to implicit stereotyping. *PLoS ONE, 7*(4), e34369.

Fidler, D. J., & Hodapp, R. M. (1999). Craniofacial maturity and perceived personality in children with down syndrome. *American journal of mental retardation, 104*(5), 410-421.

Fidler, D., Most, D. & Philofsky, A. (2008). The Down syndrome behavioural phenotype: Taking a developmental approach. Retrieved February 2016 from: http://www.down-syndrome.org/reviews/2069/

Flint, J. & Yule, W. (1994). Behavioural phenotypes. In Rutter, M. R., Taylor, E., & Hersov, L. (eds): "Child and Adolescent Psychiatry," Oxford: Blackwell Scientific, pp 666-687.

Frith, C. (2009). Role of facial expressions in social interactions. *Philosophical Transactions of the Royal Society B: Biological Sciences, 364*(1535), 3453-3458.

Hahn, A., Judd, C. M., Hirsh, H. K., & Blair, I. V. (2014). Awareness of implicit attitudes. *Journal of Experimental Psychology: General, 143*(3), 1369-1392.

Halberstadt, J., Pecher, D., Zeelenberg, R., Wai, L. I., & Winkielman, P. (2013). Two faces of attractiveness: Making beauty in averageness appear and reverse. *Psychological Science, 24*(11), 2343-2346.

Hammond, P. & Suttie, M. (2012). Large-scale objective phenotyping of 3D facial morphology. *Human Mutation, 33*(5), 817-825.

Hansen, B. C., Rakhshan, P. J., Ho, A. K. & Pannasch, S. (2015). Looking at others through implicitly or explicitly prejudiced eyes. *Visual Cognition, 23*, 612-642.

Hassin, R. & Trope, Y. (2000). Facing faces: Studies on the cognitive aspects of physiognomy. *Journal of Personal and Social Psychology, 78*(5), 837–852.

Hessels, R. S., Jemner, C., van den Boomen, C., & Hooge, I. T. C. (2016). The area-of-interest problem in eyetracking research: A noise-robust solution for face and sparse stimuli. *Behavior Research Methods, 48*(4), 1694-1712.

Hills, P. J. & Pake, J. M. (2013). Eye-tracking the own-race bias in face recognition: revealing the perceptual and social-cognitive mechanisms. *Cognition, 129*(3), 586-597.

Hodapp, R. M. (1997). Direct and indirect behavioural effects of different genetic disorders of mental retardation. *American Journal on Mental Retardation, 38*, 59-70.

Hodapp, R. M. (1999). Indirect effects of genetic mental retardation disorders: Theoretical and methodological issues. *International Review of Research in Mental Retardation, 22*, 27-50.

Holland, A. J., Whittington, J. E., Butler, J., Webb, T., Boer, H., & Clarke, D. (2003). Behavioural phenotypes associated with specific genetic disorders: evidence from a population-based study of people with Prader-Willi syndrome. *Psychological Medicine, 33*(1), 141-153.

House of Lords & House of Commons Joint Committee on Human Rights (2008). *A life like any other? Human rights of adults with learning disabilities: Seventh report of session 2007-08, Volume 1 report and formal minutes.* (HL Paper 40-1. HC 73-1). London: The Stationary Office Limited.

Janik, S. W., Wellens, A. R., Goldberg, M. L. & Dell'Osso, L. F. (1978). Eyes as the center of focus in the visual examination of human faces. *Perceptual and Motor Skills, 47*, 857-858.

Jarymowicz, M. & Szuster, A. (2017). Nonspecific impact of reflective mind on implicit evaluative processes: Effects of experimental manipulations and selected dispositional factors. *Frontiers in Psychology, 8:* 1572. doi: 10.3389/fpsyg.2017.01572

Jussim, L. & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review, 9*(2), 131-155.

Kramer, R. S. S., Jenkins, R. & Burton, A. M. (2017). InterFace: A software package for face image warping, averaging, and principle components analysis. *Behavior Research Methods, 49*(6), 2002-2011.

Langlois, J. H. (1995). The origins and functions of appearance-based stereotypes: Theoretical and applied implications. In: Eder, R. A. (eds) *Craniofacial Anomalies*. Springer: New York.

Madera, J. M. & Hebl, M. R. (2012). Discrimination against facially stigmatized applicants in interview: an eye-tracking and face-to-face investigation. *Journal of Applied Psychology, 97*(2), 317-330.

Malviya, S., Voepel-Lewis, T., Burke, C., Merkel, S. & Tait, A. R. (2005). The revised FLACC observational pain tool: improved reliability and validity for pain assessment in children with cognitive impairment. *Pediatric Anesthesia, 16*(3), 258-265.

Merkel, S. I., Voepel-Lewis, T., Shayevitz, J. R. & Malviya, S. (1997). The FLACC: a behavioural scale for scoring postoperative pain in young children. *Pediatric Nursing, 23*(3), 293-297.

Miller, A. G. (1970). Role of physical attractiveness in impression formation. *Psychonomic Science, 19*(4), 241-243.

Montepare, J. M. & Zebrowitz, L. A. (1998). "Person perception comes of age:" The salience and significance of age in social judgments, *Advances in Experimental Social Psychology, 30,* 93-161.

NHS Choices (2015). Down's syndrome – characteristics. Retrieved February 2016, from http://www,nhs.uk/conditions/Downs-syndrome/pages/symptoms.aspx

Nicholson, L. & Cooper, S. A. (2013). Social exclusion and people with intellectual disabilities: a rural-urban comparison. *Journal of Intellectual Disability Research, 57*(4), 333-346.

Nyhan, W. L. (1972). Behavioral phenotypes in organic genetic disease. Presidential address to the Society for Pediatric Research. *Pediatric Research, 6,* 1-9.

Olivola, C. Y., Eubanks, D. L. & Lovelace, J. B. (2014). The many (distinctive) faces of leadership: Inferring leadership domain from facial appearance. *The Leadership Quarterly, 25*, 817-834.

Oosterhof, N. N. & Todorov, A. (2008). The functional basis of face evaluation. *Proceedings of the National Academy of Sciences of the United States of America, 105*(32), 11087-11092.

Oosterhof, N. N. & Todorov, A. (2009). Shared perceptual basis of emotional expressions and trustworthiness impressions from faces. *Emotion, 9*(1), 128-133.

Oullette-Kuntz, H., Burge, P., Brown, H. K. & Arsenault, E. Public attitudes towards individuals with intellectual disabilities as measured by the concept of social distance. *Journal of Applied Research in Intellectual Disabilities, 23*(2), 132-142.

Pelleboer-Gunnink, H. A., Van Oorsouw, W. M. W J., Van Weeghel, J. & Embregts, P. J. C. M. (2017). Mainstream health professionals' stigmatising attitudes towards people with intellectual disabilities: a systematic review. *Journal of Intellectual Disabilities Research, 61*(5), 411-434.

Penton-Voak, I. S., Pound, N., Little, A. C., & Perrett, D. I. (2006). Personality judgments from natural and composite facial images: More evidence for a "kernel of truth" in social perception. *Social Cognition, 24*(5), 607-640.

Peterson, M. F. & Eckstein, M. P. (2012). Looking just below the eyes is optimal across face recognition tasks. *Proceedings of the National Academy of Sciences of the United States of America, 109*(48), E3314-E3323.

Said, C., Sebe, N., & Todorov, A. (2009). Structural resemblance to emotional expressions predicts evaluation of emotionally neutral faces. *Emotion, 9*(4), 509-514.

Sallis, H., Davey Smith, G., & Munafo, M. R. (2018). Genetics of biologically based psychological differences. *Philosophical Transactions of the Royal Society B,* 373: 10.1098/rstb.2017.0162

Schmider, E., Ziegler, M., Danay, E. & Buehner, M. (2010). Is it really robust? *Methodology European Journal of Research Methods for the Behavioral and Social Sciences, 6*(4), 147-151.

Sherman, J. W., Allen, T. J. & Sacchi, D. L. M. (2012). Stereotype confirmation and disconfirmation. In B. Gowronski, & D. Strack (Eds.), *Cognitive consistency: A fundamental principle in social cognition* (pp. 390-423). New York, NY: Guilford Press.

Sherman, J. W., Gawronski, B. & Trope, Y. (Eds.) (2014). *Dual-process theories of the social mind.* New York: The Guilford Press.

Smith, L. E., Barker, E. T., Seltzer, M. M., Abbeduto, L. & Greenberg, J. S. (2012). Behavioral phenotype of fragile X syndrome in adolescence and adulthood. *American Journal of Intellectual Developmental Disabilities, 117*(1), 1-17.

Snyder, M., Tanke, E. D. & Berscheid, E. (1977). Social perception and interpersonal behaviour: On the self-fulfilling nature of social stereotypes. *Journal of Personal and Social Psychology, 35*(9), 656-666.

Staniland L. (2011) Public perceptions of disabled people. *Office for Disability Issues*. Retrieved November 2017 from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/325989/ppdp.pdf

Strauss, R. P., Ramsey, B. L., Edwards, T. C., Topolski, T. D., Kapp-Simon, K. A., … & Patrick, D. L. (2007). Stigma experiences in youth with facial differences: a multi-site study of adolescents and their mothers. *Orthodontics & Craniofacial Research, 10,* 96-103.

Sutherland, C. A. M., Oldmeadow, J. A., Santos, I. M., Towler, J., Burt, D. M., & Young, A. W. (2013). Social inferences from faces: Ambient images generate a three-dimensional model. *Cognition, 127*, 105-118.

Tan, D. W., Gilani, S. Z., Maybery, M. T., Mian, A., Hunt, A., … & Whitehouse, A. J. O. (2017). Hypermasculinised facial morphology in boys and girls with autism spectrum disorder and its association with symptomatology. *Scientific Reports, 7,* doi:10.1038/s41598-017-09939-y.

The National Autistic Society (2017). Autism profiles and diagnostic criteria. Retrieved March 2018 from: http://www.autism.org.uk/about/diagnosis/criteria-changes.aspx

Timimi, S. & McCabe, B. (2016). What have we learned from the science of autism? In: Runswick-Cole, K., Mallett, R., & Timimi, S. (Eds.). *Re-thinking autism: Diagnosis, identity and equality.* Philadelphia: Jessica Kingsley Publishers.

Tobiasen, J. M. (1987). Social judgments of facial deformity. *Cleft Palate Journal, 24*(4), 323-327.

Todorov, A., Mandisodza, A. N., Goren, A., Hall, C. C. (2005). Inferences of competence from faces predict election outcomes. *Science, 308*(5728), 1623–1626.

United Nations (2006). Convention on the rights of persons with disabilities (CRPD), Geneva. Retrieved March 2018 from: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/convention-on-the-rights-of-persons-with-disabilities-2.html

Vadillo, M. A., Street, C. N. H., Beesley, T. & Shanks, D. R. (2015). A simple algorithm for the offline recalibration of eye-tracking data through best-fitting linear transformation. *Behavioral Research Methods, 47*(4), 1365-1376.

Valuch, C., Pfluger, L. A., Wallner, B., Laeng, B. & Ansorge, U. (2015). Using eye tracking to test for individual differences in attention to attractive faces. *Frontiers in Psychology, 6*(42), 1-13.

Van Buggenhout, G. & Fryns, J-P. (2009). Angelman syndrome. *European Journal of Human Genetics, 17*(11), 1367-1373.

Van Schijndel, O., Litschel, R., Maal, T. J., Berge, S. J. & Tasman, A. J. (2015). Eye tracker based study: Perception of faces with a cleft lip and nose deformity. *Journal of Craniomaxillofacial Surgery, 43*(8), 1620-1625.

Verhulst, B. & Lodge, M. (2013). Reaction time measures in implicit attitudes research. In: Bruter. & Lodge, M. (eds) *Political Science Research Methods in Action. Research Methods Series.* Palgrave Macmillan: London.

Vernon, R. J. W., Sutherland, C. A. M., Young, A. W. & Hartley, T. (2014). Modelling first impressions from highly variable facial images. *Proceedings of the National Academy of sciences of the United States of America, 111*(32), 3353-3361.

Visootsak, J. & Sherman, S. (2007). Neuropsychiatric and behavioral aspects of trisomy 21. *Current Psychiatry Reports, 9*(2), 135-140.

Walker-Smith, G., Gale, A. & Findlay, J. (1977). Eye movement strategies involved in face perception. *Perception, 6*, 313-326.

Wilson, M. C., & Scior, K. (2014). Attitudes towards individuals with disabilities as measured by the implicit association test: A literature review. *Research in Developmental Disabilities, 35,* 294-321.

Wing, L. & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: Epidemiology and classification. *Journal of Autism and Developmental Disorders, 9*(1), 11-29.

Wishart, J. (1993). Learning the hard way: Avoidance strategies in young children with Down syndrome. *Down Syndrome Research and Practice, 1*(2), 47-55.

Yoo, H. (2015). Genetics of autism spectrum disorder Current status and possible clinical applications. *Experimental Neurobiology, 24*(4), 257-272.

Zebrowitz, L. A., Kendall-Tackett, K. A., & Fafel, J. (1991). The influence of children's facial maturity on parental expectations and punishments. *Journal of Experimental Child Psychology, 52*, 221-238.

Part C: Critical Appraisal

Finding clinical meaning in academic work.

Introduction

The following is a series of reflections upon the process of conducting the projects that have come together into this report. The information contained within it is based upon my note-taking and memory.

Why this area of research?

I began the clinical doctorate course without a clear idea of what I wanted to work on for my thesis. I felt acutely aware that I had not engaged in formal research since my undergraduate degree, which ended six years prior to the course, and thus did not feel confident in research methodology. I admit that as a result of this my priorities were practical moreso than ideological; I wanted a project that might be fairly contained so that I would be able to balance it effectively with clinical requirements of the course.

As a result, of the thesis topics pitched I was intrigued by one that highlighted differences in how facial appearance has been shown to affect social judgments, and the ramifications these have been shown to have for the people judged. I hoped this would be the containable project that would enable me to develop my research skills whilst also educating me about unconscious biases. Having worked in intellectual disability services before, I was interested in exploring how this type of research might pertain to goups of people who are already prone to social disadvantage and especially subject to the machinations of social power wielded by people around them. It also struck me that facial appearance is arguably more important today than ever, with profile pictures and social media relying upon facial appearance often being the sole visual representation of a person (Vernon *et al.*, 2014). As such this project also seemed like it might provide a potential vehical to offering an insight into something that could benefit clinical populations in the real world.

The research proposal

"Craig's doing an undergrad project" – a fellow student

A key consideration at this stage was the balance between how 'clinical' and how 'academic' the research would become. Research is a core component of clinical psychology training (Davey, 2003) yet working on a thesis subject matter too far removed from direct clinical environments may have limited my development as a clinical, as opposed to a research psychologist. Thus, through the early planning processes I held the balance of clinical and academic focus as a key consideration and evaluative concept under which I assessed the usefulness of developing ideas.

The original research proposal that was submitted to the course was quite different to the project that emerged. I think this is because I was quite ambitious about what might be achieved, and how I might make research on this topic more useful for clinical staff. Initial areas of interest focused on more dynamic and expressive stimuli, owing to my impression that static stimuli are rarely encountered by clinicians, however there weren't resources available. The proposal included two major projects, the first an implicit association test procedure aiming to highlight subconscious attitudes, and the second an idea about finding out whether people who are more familiar with these syndromes may react differently to people who are not, based upon the idea that contact and prejudice are likely linked (Allport, 1954). I hoped that focusing on implicit biases, and what might affect them, might serve the function of highlighting to clinicians a problem that probably exists and would impact upon clinical responses and decision making.

Feedback on the proposal was received from peer and lay reviews. I found that those involved in the peer review shared some of my concerns regarding clinical relevance. It was highlighted that framing the project as an attempt to highlight implicit biases and to contribute to social circumstances of affected people would be of sufficient clinical relevance.

The lay review, however, did not present any such qualms, and was encouraging in its feedback that people attending services would be helped by a project that identified and explored how anybody might have different subjective experiences of treatment from the same provider. Another consideration came from the peer reviewers about the ambition of the project, it was discussed as potentially too ambitious and the second project was highlighted as probably needing to be removed. This, however, would remove the more obviously 'clinical' part of the project.

Ethical considerations were also important at this stage. There were some concerns about the images used. Although the images that we had to use were not of any real person, they were nonetheless representative of conditions that real people experience, and what is more they were images representing children. Although it is likely true that each of us make this kind of social judgment on a daily basis, being asked to disclose our opinions can be exposing and uncomfortable. This is particularly true when the subjects of the judgments represent vulnerable groups, such as those diagnosed with disabling conditions or children. I thus included in my plans an intent to debrief participants thoroughly so as to mitigate the impact of this issue, which went on to produce benefits in interpreting the results I did not expect and emphasised the importance of communication skills throughout research. I felt ultimately that the potential benefit to people affected by these conditions and the anonymity of participants balanced the ethical considerations.

A final consideration at the planning stage was that I do not and have not personally known people diagnosed with any of the genetic neurodevelopment syndromes discussed in the research. I was aware, therefore, that this project placed me in an unusual position of taking an interest in and becoming well informed about something that I knew nothing of experientially. This situation contributed to a feeling of me 'doing to' with this project, rather than 'doing with' or even 'doing for.' This was a source of tension between this project and my

development as a clinican, where I in every case tried ‘do with’ and thus helped me to better understand and reflect upon my stance towards service users as a clinical psychologist.

The Literature Review process

The early experience with the literature review was addled by repeated failed attempts to get a project off the ground. I hoped initially to find a topic centred upon the impact of atypical facial appearance upon the experiences of other groups, in anticipation that this would help me to better understand aspects that could be relevant to my project regarding people with genetic neurodevelopmental syndromes. Eventually, attempts were abandoned and owing to time pressures an ‘off the shelf’ project was selected. Again, however, I wondered about the balance of the clinical and the academic in the project, and by the fact that I had not met anybody with CHARGE syndrome, and would again be ‘doing to’ this group.

I found, however, that there was a similar thread between the two projects. Most notably, the use it might have for helping to inform clinicians about the potential influences there might be upon reciprocal interactions that could contribute to affected people having different experiences to others. The scale of the project enabled me to discuss a broad spectrum of behaviour of people with the condition and many papers highlighted how each facet can cause difficulties for individuals and their families or carers. It became apparent to me that it would be helpful to offer information that would help to elucidate the reasons why people with this condition might act as they do, and that in doing so I would be in part advocating for better understanding of this group.

The literature review as it materialised did, however, have some limitations that affected this last goal. For example, despite my efforts I had to conclude that there remained a frustrating lack of clarity in the behavioural phenotype described. This was because CHARGE is a highly variable condition, and there was a dearth of research that directly compared affected

people to people with similar difficulties due to other genetic syndromes or physical disabilities, most notably deaf-blindness. I did not feel confident to make allusions as to what impact genetic and environmental factors might have had upon behavioural outcomes. Another limitation was the observation that the research into people with CHARGE focused exclusively upon deficits observed in affected people. I did not find research that explained the atypicalities in terms of positive ways in which people might be experienced. This again raised for me the disparity between my developing stance towards people as part of clinical work, and that which I felt I was adopting in the pursuit of the research goals of clinical psychologist. I felt that this limited the possibility of the research to fully advocate for affected persons, describing them essentially in terms of degree or type of undesirability, when I thought some aspects of the results showed promise for a more nuanced and optimistic discussion of difference.

The research process

Difficulties in implementing the original ideas led to changes in the course the research project took. Implicit association tests proved too strict a format and could not accommodate a range of implicit judgments that might add colour to the understanding of how people would be treated. They would only be able to reliably identify whether observers had more ostensibly positive or negative reactions to certain faces, and I felt this was insufficiently useful, I felt, for clinicians. I sought to keep the core goals of the research the same, to identify biases in implicit attitudes and to find out what factors might influence or be influenced by them. Social judgments were in of themselves observed to be unconsciously held (e.g. Greenwald & Banaji, 1995) and thus would thus fit the remit, and a project was designed to simply ask participants about their judgments. I would attempt to display the consciousness of these judgments via informed and uninformed experimental conditions.

The second strand of the research developed into an intention to test whether the types of judgments made tally with differences in how people might make judgments and decisions, or how they might alter behavioural intentions to certain situations, based on faces alone. I felt that this second strand was important as it promised the most clinical validity and connected the first strand of the project to the real world, which it pertains to describe influences for. Unfortunately, the limitations of time within the clinical doctorate did, as anticipated in peer review, eventually result in this being dropped within the last month prior to submission. Owing to the capacity for this part of the project to link the research more neatly with clinical work, I found myself arguing for this strand to be continued even when it became obvious that it was not practical.

Data collection and analysis

Data collection felt like an artificial process, as it involved using a computer lab that was as disconnected from a clinical environment as it is possible to be. This re-emphasised for me how important it would be to try to make this project in some way useful for real people. I again found, however, that when discussing the project with participants during debrief, it was not difficult to produce a clinical justification for the project. Debriefing participants came to be a fairly robust experience, and I learnt several things about their experience of the experiment that aided me in interpreting the data, even forming its own small section of the results. Many appeared enthused by the potential to clarify unconscious biases amongst people encountering individuals with diagnoses or genetic neurodevelopmental syndromes or autism spectrum disorders. One participant talked of working regularly on inpatient wards with some of the patient groups. She told me that research such as this would be extremely valuable to her, as she recognises different behavioural features amongst the people she works with and felt constantly aware of her own shifting feelings in response to individuals, and even concerned that she might be responding in a ‘wrong’ way, but lacking in means with

which to understand her experiences. As well as aiding the research and helping me to understand its benefit to clinical practice, I felt the process of providing substantial debrief helped to offer participants some potential benefit to taking part in the project, which was otherwise just one in a series of experiments they are pushed into doing.

As this was a quantitative study, I anticipated that the process of collecting and analysing data would be challenging. As it transpired, I underestimated just how complex and time-consuming this would turn out to be. This was due to several reasons. During data collection, several issues with satisfactorily setting up the eye-tracking machine led to repeated delays and to several participants' data either being wholy or partially removed from the study and replaced. During data analysis, it became apparent that owing to the complexity of the results each aspect of the data would have to be analysed separately, and that parametric assumptions had been violated for the vast majority of individual analyses. Resolving this latter problem, whilst also trying to retain the capacity fo identify interaction effects, led to an extremely labour-intensive analysis strategy that resulting in a huge volume of individual analyses and data outputs. Each had to analysed and formatted for presentation in the report methodically. The time constraints these placed me under were significant, and likely resulted in the planned second part of the project having to be dropped.

Interpretation

"Where there are limitations, they don't have to be damning" – supervisor feedback

I think, owing to my reservations about the clinical applicability of the work, and therefore wanting to be cautious about how I interpreted what I had found in terms of real world ramifications and applications, early drafts of the research report were quite heavily focused on limitations. On reviewing this with my supervisor, it became quite apparent that this meant space was lost in the report for asserting what the evidence generated did show. I think this issue reflected my lingering dissatisfaction with a project that had not materialised

as clinical in direction. This was an important moment in my estimation of the report as a whole. In turning towards the implications of the research and arguing for them, I found it much easier to convince myself of its clinical merits. That the report offered humble but definite steps towards a growing understanding of how people from these disadvantaged groups may be influenced by and come to present to clinical services, and the implications these may have for their lives more broadly. In addition, I felt that my clinical perspective added to my interpretation of the results, for example in observing that ongoing research continues to focus upon the negatives of people with these conditions. Thus, I feel I have a greater appreciation of not only how research may influence clinical practice, but of how working clinically may inform research.

Final thoughts

Completing the two projects contained in this thesis ultimately achieved the rather basic goal I had set out with. I have attained a set of skills in conducting research and literature reviews that I will be able to draw upon in future practice as a clinical psychologist, and done this whilst balancing other requirements of the course. I think the projects have added a substantial amount more to my development as a clinician, however, than just these valuable skills. I feel more aware of the myriad reasons why research might be done, and of the messages that are conveyed by adopting one approach over another. I feel a greater appreciation of the need to confidently assert conclusions of research, as well as to express the important limitations that readers should bear in mind when considering clinical significance.

I feel like this project as a whole has developed into one which contributes to how clinical staff can understand how they work with people with these conditions. I think the case is made for reflecting carefully upon how staff and carers experience people and how those experiences might impact upon atttiudes and behaviour. I think that equipping people in this

fashion may help them to become more responsible for their actions (Holroyd, 2015). I also think that significant contributions have been made to the understanding of the behavioural profile of people with CHARGE syndrome, and that this consolidation of knowledge will assist in the understanding and treatment of affected people. Finally, I think useful reflections are offered on the messages conveyed by the practice of developing behavioural phenotypes, and encourage future researches to bear these in mind.

Although now I still have not come into direct contact with people affected by these conditions, I feel I now have a greater respect for the challenges faced by people from these groups, and a greater sense of responsibility as a clinician for attending to how I and my colleagues understand and interact with them. I hope that these projects convey these lessons, and that in doing so they make a significant contribution to the practice of clinical psychologists working in this field.

References

Allport, G. W. (1954). The nature of prejudice. Perseus Booke: Cambridge, MA.

Davey, G, (2003). Doing clinical psychology research: What is interesting isn't always useful. *The Psychologist, 16*(8), 412-417.

Greenwald, A. G. & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review, 102*(1), 4-27.

Holroyd, J. (2015). Implicit bias, awareness and imperfect cognitions. *Consciousness and Cognition, 33*, 511-523.

Vernon, R. J. W., Sutherland, C. A. M., Young, A. W. & Hartley, T. (2014). Modelling first impressions from highly variable facial images. *Proceedings of the National Academy of sciences of the United States of America, 111*(32), 3353-3361.

Appendices

Appendix A Guidelines to authors for journal targeted for literature review

Target journal: Journal of Intellectual Disability Research

Information retrieved on 23/03/2018 from:
https://onlinelibrary.wiley.com/page/journal/13652788/homepage/forauthors.html

Author Guidelines
Thank you for your interest in *Journal of Intellectual Disability Research.* Please read the complete Author Guidelines carefully prior to submission, including the section on copyright.
Note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a scientific meeting or symposium.
Content of Author Guidelines:
1. Editorial and Content Considerations
2. Ethical Guidelines
3. Manuscript Types Accepted
4. Preparation of Your Manuscript
5. Submitting Your Manuscript
6. Copyright, Licencing and Online Open
7. Post Acceptance
8. Post Publication
Quick links: JIDR Submission Site, Wiley's Resources for Journal Authors
Relevant Documents Colour Work Agreement Form
1. EDITORIAL AND CONTENT CONSIDERATIONS
Journal of Intellectual Disability Research is devoted exclusively to the scientific study of intellectual disability and publishes papers reporting original observations in this field. The subject matter is broad and includes, but is not restricted to, findings from biological, educational, genetic, medical, psychiatric, psychological and sociological studies, and ethical, philosophical, and legal contributions that increase knowledge on the treatment and prevention of intellectual disability and of associated impairments and disabilities, and/or inform public policy and practice.
The journal publishes Full Reports, Brief Reports and Systematic Reviews. Mental Health Special Editions are published quarterly. Narrative reviews and hypothesis papers are encouraged but authors should discuss the focus of their review with the Editor in Chief prior to submission to ensure it is appropriate for the journal. Submissions for Book Reviews are also welcomed. Case studies are **not**published by JIDR.
Journal of Intellectual Disability Research will feature four Annotation articles each year covering a variety of topics of relevance to the main aims of the journal or topics. Senior researchers, academics and clinicians of recognised standing in their field will be invited to write an Annotation for the journal covering an area that will be negotiated with the Editor in Chief, Prof. Chris Oliver, on behalf of the Editorial Team.
Peer Review Process
The acceptance criteria for all papers are the quality and originality of the research and its significance to our readership. Except where otherwise stated, manuscripts are double-blind peer reviewed by two anonymous reviewers and the editor.
Journal of Intellectual Disability Research attempts to keep the review process as short as possible to enable rapid publication of new scientific data. In order to facilitate this process, submitting authors are asked to suggest the names and current e-mail addresses of two potential reviewers whom you consider capable of reviewing your manuscript. In addition to your choice the journal editor will choose one or two reviewers as well. Suggestions will be requested via the submission system.
Authors who wish to appeal the decision on their submitted paper may do so by e-mailing the Editorial Office with a detailed explanation for why they find reasons to appeal the decision.
Plagiarism detection
• The journal employs a plagiarism detection system. By submitting your manuscript to this journal you accept that your manuscript may be screened for plagiarism against previously published works.
• Individual authors and researchers can now check their work for plagiarism before submission - please click here for details.

2. ETHICAL GUIDELINES

Journal of Intellectual Disability Research adheres to the ethical guidelines for publication and research summarised below.

Authorship and Acknowledgements

Authorship: Authors submitting a paper do so on the understanding that the manuscript has been read and approved by all authors and that all authors agree to the submission of the manuscript to the journal. ALL named authors must have made an active contribution to the conception and design and/or analysis and interpretation of the data and/or the drafting of the paper and ALL must have critically reviewed its content and have approved the final version submitted for publication. Participation solely in the acquisition of funding or the collection of data does not justify authorship and, except in the case of complex large-scale or multi-centre research.

Journal of Intellectual Disability Research adheres to the definition of authorship set up by The International Committee of Medical Journal Editors (ICMJE). According to the ICMJE authorship criteria should be based on 1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, 2) drafting the article or revising it critically for important intellectual content and 3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3.

It is a requirement that all authors have been accredited as appropriate upon submission of the manuscript. Contributors who do not qualify as authors should be mentioned under Acknowledgements.

Acknowledgements: Under Acknowledgements please specify contributors to the article other than the authors accredited. Please also include specifications of the source of funding for the study and any potential conflict of interests if appropriate. Suppliers of materials should be named and their location (town, state/county, country) included.

Ethical Approvals

Experimental Subjects

Experimentation involving human subjects will only be published if such research has been conducted in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki (version, 2002 www.wma.net/e/policy/b3.htm) and the additional requirements, if any, of the country where the research has been carried out. Manuscripts must be accompanied by a statement that the research was undertaken with the understanding and written consent of each participant and according to the above mentioned principles. A statement regarding the fact that the study has been independently reviewed and approved by an ethical board should also be included. Editors reserve the right to reject papers if there are doubts as to whether appropriate procedures have been used.

All studies using human participants or animal subjects should include an explicit statement in the Material and Methods section identifying the review and ethics committee approval for each study, if applicable. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used.

Ethics of investigation: Papers not in agreement with the guidelines of the Helsinki Declaration as revised in 1975 will not be accepted for publication.

Clinical Trials

Clinical trials should be reported using the CONSORT guidelines available at www.consort-statement.org. A CONSORT checklist should also be included in the submission material (http://www.consort-statement.org/mod_product/uploads/CONSORT 2001 checklist.doc).

Manuscripts reporting results from a clinical trial must provide the registration number and name of the clinical trial. Clinical trials can be registered in any of the following free, public clinical trials registries: www.clinicaltrials.gov, clinicaltrials-dev.ifpma.org/, isrctn.org/. The clinical trial registration number and name of the trial register will be published with the paper.

Conflict of Interest

Authors are required to disclose any possible conflict of interest. These include financial (for example patent, ownership, stock ownership, consultancies, speaker's fee). Author's conflict of interest (or information specifying the absence of conflicts of interest) will be published under a separate heading entitled 'Conflict of Interests'.

Journal of Intellectual Disability Research requires that sources of institutional, private and corporate financial support for the work within the manuscript must be fully acknowledged, and any potential

conflicts of interest noted. Please include this information under the separate headings of 'Source of Funding' and 'Conflict of Interest' at the end of your manuscript.
If the author does not include a conflict of interest statement in the manuscript then the following statement will be included by default: “No conflicts of interest have been declared”.

Source of Funding

Authors are required to specify the source of funding for their research when submitting a paper. Suppliers of materials should be named and their location (town, state/county, country) included. The information will be disclosed in the published article.

Publication Ethics

The journal is a member of, and subscribes to the principles of the Committee on Publication Ethics (COPE). Wiley's Ethics guidelines can also be found at http://exchanges.wiley.com/ethicsguidelines

3. MANUSCRIPT TYPES ACCEPTED

Original Research Articles

The main text should proceed through sections of Abstract, Background, Methods, Results, and Discussion. Reports of up to 4,500 words are suitable for major studies and presentation of related research projects or longitudinal enquiry of major theoretical and/or empirical conditions. Please note that articles exceeding 4,500 words will be unsubmitted immediately from the review process and the authors will be asked to reduce the length of the article.
Authors submitting articles should be guided by the following checklists prior to submission:
For observational studies: http://www.strobe-statement.org/?id=available-checklists
For diagnostic studies: (http://www.stard-statement.org/checklist_maintext.htm)

Qualitative Studies

Qualitative Studies are only considered if they have strong theoretical underpinnings and use an established method of data synthesis.

Systematic Reviews

The maximum word length for systematic reviews is 4,500 words. Authors submitting a systematic review are encouraged to assess the quality of their article against the PRISMA checklist prior to submission (http://www.prisma-statement.org/2.1.2 - PRISMA 2009 Checklist.pdf) or MOOSE guideline (insert link to MOOSE PdF). Further details on systematic reviews can be obtained from Prof. Richard Hastings (Editor); email: R.Hastings@warwick.ac.uk

Brief Reports

Brief Reports of up to 1,500 words are encouraged especially for replication studies, methodological research and technical contributions.

Annotation Articles

Annotation Articles should be no more than 5,500 words long including tables and figures and should not have been previously published or currently under review with another journal. The normal instructions to authors apply. The date for submission of the article should be negotiated with the Editor in Chief. An honorarium of £400 in total shall be paid to the authors(s) when the article is accepted for publication.
Three main types of Annotations will be commissioned: 1. Authoritative reviews of empirical and theoretical literature. 2. Articles proposing a novel or modified theory or model. 3. Articles detailing a critical evaluation and summary of literature pertaining to the treatment of a specific disorder.

Hypothesis Papers

A Hypothesis Paper can be up to 2,500 words and no more than twenty key references. It aims to outline a significant advance in thinking that is testable and which challenges previously held concepts and theoretical perspectives. Hypothesis papers should be discussed with the Editor in Chief prior to submission.
*Please note JIDR does not publish **Case studies.***

4. PREPARATION OF THE MANUSCRIPT

Author Services

Prior to submission, we encourage you to browse the ‘Author Resources’ section of the Wiley ‘Author Services’ website: http://olabout.wiley.com/WileyCDA/Section/id-827998.html. This site includes useful information covering such topics as copyright matters, ethics and electronic artwork guidelines.

Writing for Search Engine Optimization

Optimize the search engine results for your paper, so people can find, read and ultimately cite your work. Simply read our best practice SEO tips – including information on making your title and abstract SEO-friendly, and choosing appropriate keywords.

Pre-submission English-language editing
Authors for whom English is a second language may choose to have their manuscript professionally edited before submission to improve the English. Visit our site to learn about the options. All services are paid for and arranged by the author. Please note using the Wiley English Language Editing Service does not guarantee that your paper will be accepted by this journal.
Spelling
• Spelling should conform to The Concise Oxford Dictionary of Current English.
• A high proportion of papers are submitted with the term 'behavior' as opposed to 'behaviour'; please use 'behaviour'.
• Where applicable the journal standard is to use words ending in –ise as opposed to –ize. For example, use 'analyse' 'standardise' as opposed to 'analyze' and 'standardize'
Units of measurements, symbols and abbreviations should conform with those in Units, Symbols and Abbreviations (1977) published and supplied by the Royal Society of Medicine. This specifies the use of SI units.
Terminology
It is important that the term 'intellectual disabilities' is used when preparing manuscripts. Please note that 'intellectual disability', as used in the journal, includes those conditions labelled mental deficiency, mental handicap, learning disability and mental retardation in some counties. The term 'person', 'people' or 'participant(s)' should be used as opposed to 'patient(s)'.
Optimising your paper on social media
If your paper is accepted for publication we would like to present three, headline style summary statements on our facebook and twitter feed. When you submit your article you will be asked to enter up to three short headlines (key statements) capture the importance of your paper.
MANUSCRIPT STRUCTURE
The manuscript should be submitted in separate files: title page; main text file; figures.
Title page
A 'Title Page' must be submitted as part of the submission process as a 'Supplementary File Not for Review. The title page should contain:
(i) a short informative title that contains the major key words. The title should not contain abbreviations (see Wiley's best practice SEO tips;
(ii) the full names of the authors;
(iii) the author's institutional affiliations at which the work was carried out;
(iv) the full postal and email address, plus telephone number, of the author to whom correspondence about the manuscript should be sent;
(v) acknowledgements;
(vi) conflict of interest statement.
The present address of any author, if different from that where the work was carried out, should be supplied in a footnote.
Acknowledgements
Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. See section on Authorship for more detail. Financial and material support should also be mentioned Thanks to anonymous reviewers are not appropriate.
Main text
As papers are double-blind peer reviewed the main text file should not include any information that might identify the authors.
The main text of the manuscript should be presented in the following order: (i) structured abstract and key words (ii) text, (iii) references, (vi) endnotes, (vii) tables (each table complete with title and footnotes), and (ix) figure legends. Figures should be supplied as separate files. Footnotes to the text are not allowed and any such material should be incorporated as endnotes.
Abstract
For full and brief reports, and reviews, a structured summary should be included at the beginning of each article, incorporating the following headings: Background, Method, Results, and Conclusions. These should outline the questions investigated, the design, essential findings, and the main conclusions of the study.
Keywords

The author should also provide up to six keywords. Please think carefully about the keywords you choose as this will impact on the discoverability of your paper during literature searches (https://authorservices.wiley.com/bauthor/seo.asp)

References

• The journal follows the Harvard reference style.
• References in text with more than two authors should be abbreviated to (Brown et al. 1977).
• Where more than six authors are listed for a reference please use the first six then 'et al.'
• Authors are encouraged to include the DOI (digital object identifier) for any references to material published online. See www.doi.org/ for more information. If an author cites anything which does not have a DOI they run the risk of the cited material not being traceable.
• Authors are responsible for the accuracy of their references.

The reference list should be in alphabetical order thus:

Giblett E.R. (1969) Genetic Markers in Human Blood. Blackwell Scientific Publications, Oxford.

Moss T.J. & Austin G.E. (1980) Preatherosclerotic lesions in Down's syndrome. *Journal of Mental Deficiency Research* **24**, 137- 41.

Seltzer M. M. & Krauss M.W. (1994) Aging parents with co-resident adult children: the impact of lifelong caregiving. In: *Life Course Perspectives on Adulthood and Old Age* (eds M. M. Seltzer, M.W. Krauss & M. P. Janicki), pp. 3–18. American Association on Mental Retardation, Washington, DC.

Endnotes

Endnotes should be placed as a list at the end of the paper only, not at the foot of each page. They should be numbered in the list and referred to in the text with consecutive, superscript Arabic numerals. Keep endnotes brief; they should contain only short comments tangential to the main argument of the paper.

Tables

Tables should include only essential data. Each table must be typewritten on a separate sheet and should be numbered consecutively with Arabic numerals, e.g. Table 1, Table 2, etc., and give a short caption.

Figure Legends

Figure Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

Figures

All illustrations (line drawings and photographs) are classified as figures. Figures should be numbered using Arabic numerals, and cited in consecutive order in the text. Each figure should be supplied as a separate file, with the figure number incorporated in the file name.

Preparing Figures. Although we encourage authors to send us the highest-quality figures possible, for peer-review purposes we are happy to accept a wide variety of formats, sizes, and resolutions. Click here for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

Colour Figure Charges: It is the policy of *Journal of Intellectual Disability Research* for authors to pay the full cost for the reproduction of their colour artwork. Therefore, please note if there is colour artwork in your manuscript when it is accepted for publication, John Wiley & Sons Pte Ltd require you to complete and return a Colour Work Agreement Form before your paper can be published. Any article received by John Wiley & Sons with colour work will not be published until the form has been returned. If you are unable to download the form, please contact the Production Editor (jir@wiley.com)

Supporting Information

Supporting information is information that is not essential to the article but that provides greater depth and background. It is hosted online, and appears without editing or typesetting. It may include tables, figures, videos, datasets, etc. Click here for Wiley's FAQs on supporting information.

Please note that the provision of supporting information is not encouraged as a general rule. It will be assessed critically by reviewers and editors and will only be accepted if it is essential.

5. SUBMISSION OF MANUSCRIPTS

Manuscripts should be submitted electronically via the online submission site http://mc.manuscriptcentral.com/jidr. Further assistance can be obtained from Dr Jane Waite at the Editorial Office of JIDR, Cerebra Centre for Neurodevelopmental Disorders, University of Birmingham, Edgbaston, Birmingham, B15 2TT; Tel: 0121 414 7206; email jidr-admin@contacts.bham.ac.uk

• Launch your web browser and go to the journal's online submission site: http://mc.manuscriptcentral.com/jidr
• Log-in or click the 'Create Account' option if you are a first-time user.
• If you are creating a new account.
- After clicking on 'Create Account', enter your name and e-mail information and click 'Next'. Your e-mail information is very important.
- Enter your institution and address information as appropriate, and then click 'Next.'
- Enter a user ID and password of your choice (we recommend using your e-mail address as your user ID), and then select your area of expertise. Click 'Finish'.
• Log-in and select 'Author Centre'.

Submitting Your Manuscript

After you have logged in, click the 'Submit a Manuscript' link in the menu bar.
Enter data and answer questions as appropriate. You may copy and paste directly from your manuscript and you may upload your pre-prepared covering letter.
Click the 'Next' button on each screen to save your work and advance to the next screen.
You are required to upload your files.
- Click on the 'Browse' button and locate the file on your computer.
- Select the designation of each file in the drop-down menu next to the Browse button.
- When you have selected all files you wish to upload, click the 'Upload Files' button.

Review your submission (in HTML and PDF format) before sending to the Journal. Click the 'Submit' button when you are finished reviewing.

Manuscript Files Accepted

Manuscripts should be uploaded as Word (.doc) or Rich Text Format (.rft) files (not write-protected) plus separate figure files. GIF, JPEG, PICT or Bitmap files are acceptable for submission, but only high-resolution TIF or EPS files are suitable for printing. The files will be automatically converted to HTML and PDF on upload and will be used for the review process.

Blinded Review

To allow double-blinded review, please submit (upload) your main manuscript and title page as separate files.
Please upload:
- Your manuscript without title page under the file designation 'main document'
- Figure files under the file designation 'figures'
- The title page should be uploaded under the file designation 'title page'.

All documents uploaded under the file designation 'title page' will not be viewable in the HTML and PDF format you are asked to review at the end of the submission process. The files viewable in the HTML and PDF format are the files available to the reviewer in the review process.

Suggest a Reviewer

Journal of Intellectual Disability Research attempts to keep the review process as short as possible to enable rapid publication of new scientific data. In order to facilitate this process, please suggest the names and current e-mail addresses of 2 potential reviewers whom you consider capable of reviewing your manuscript. In addition to your choice the journal editor will choose one or two reviewers as well.

Suspension of Submission Mid-way in the Submission Process

You may suspend a submission at any phase before clicking the 'Submit' button and save it to submit later. The manuscript can then be located under 'Unsubmitted Manuscripts' and you can click on 'Continue Submission' to continue your submission when you choose to.

E-mail Confirmation of Submission

After submission you will receive an e-mail to confirm receipt of your manuscript. If you do not receive the confirmation e-mail after 24 hours, please check your e-mail address carefully in the system. If the e-mail address is correct please contact your IT department. The error may be caused by spam filtering software on your e-mail server. Also, the e-mails should be received if the IT department adds our e-mail server (uranus.scholarone.com) to their whitelist.

Manuscript Status

You can access ScholarOne Manuscripts any time to check your 'Author Center' for the status of your manuscript. The journal will inform you by e-mail once a decision has been made.

Submission of Revised Manuscripts

Revised manuscripts must be uploaded within three months of authors being notified of conditional acceptance pending satisfactory revision. Locate your manuscript under 'Manuscripts with Decisions' and click on 'Submit a Revision' to submit your revised manuscript. Please remember to delete any old files uploaded when you upload your revised manuscript. Please also remember to upload your manuscript document separate from your title page.

6. COPYRIGHT, LICENCING AND ONLINE OPEN

Accepted papers will be passed to Wiley's production team for publication. The author identified as the formal corresponding author for the paper will receive an email prompting them to login into Wiley's Author Services, where via the Wiley Author Licensing Service (WALS) they will be asked to complete an electronic license agreement on behalf of all authors on the paper.

Authors may choose to publish under the terms of the journal's standard copyright transfer agreement (CTA), or under open access terms made available via Wiley OnlineOpen.

Standard Copyright Transfer Agreement: FAQs about the terms and conditions of the standard CTA in place for the journal, including standard terms regarding archiving of the accepted version of the paper, are available at: Copyright Terms and Conditions FAQs. Note that in signing the journal's licence agreement authors agree that consent to reproduce figures from another source has been obtained.

OnlineOpen – Wiley's Open Access Option: OnlineOpen is available to authors of articles who wish to make their article freely available to all on Wiley Online Library under a Creative Commons license. With OnlineOpen, the author, the author's funding agency, or the author's institution pays a fee to ensure that the article is made open access. Authors of OnlineOpen articles are permitted to post the final, published PDF of their article on their personal website, and in an institutional repository or other free public server immediately after publication. All OnlineOpen articles are treated in the same way as any other article. They go through the journal's standard peer-review process and will be accepted or rejected based on their own merit.

OnlineOpen licenses. If the OnlineOpen option is selected the corresponding author will have a choice of the following Creative Commons License Open Access Agreements (OAA):

Creative Commons Attribution License (CC BY) OAA

Creative Commons Attribution Non-Commercial License (CC BY NC) OAA

Creative Commons Attribution Non-Commercial -NoDerivs License (CC BY NC ND) OAA

To preview the terms and conditions of these open access agreements please visit the Copyright Terms and Conditions FAQs.

If you select the OnlineOpen option and your research is funded by The Wellcome Trust and members of the Research Councils UK (RCUK) you will be given the opportunity to publish your article under a CC-BY license supporting you in complying with Wellcome Trust and Research Councils UK requirements. For more information on this policy and the journal's compliant self-archiving policy please visit: http://www.wiley.com/go/funderstatement.

7. POST ACCEPTANCE

Before your accepted article is published online, it goes through Wiley's production process. Wiley does everything possible to publish your article quickly and to the highest possible standard, as well as taking you through what to expect at each stage of the process.

Accepted article received in production

Your article is received at the publisher for production to begin. You (corresponding authors) receive an email asking you to login or register with Author Services. At this point, navigate to the "Amend My Details" page and choose whether you wish to:

• Publish your article open access with Wiley's OnlineOpen option

• Transfer the copyright of your article (if you do not publish open access)

• Track the publication status of your article (request to receive an e-mail alert at any, or all of the tracked stages of production)

• Nominate up to ten colleagues to receive a publication alert and free online access to your article (once published).

• Update your article with your ORCID iD.

Your publication checklist:

• Provide accurate proofreading and clearly mark any corrections as soon as possible.

• When prompted, ensure you acknowledge any funding support.

• Choose and arrange payment for open access as required.

• Sign a copyright license.

Copyediting and Typesetting

Wiley copyedit your article for style, grammar and nomenclature. Wiley also typeset your article, to make it look great.

Proofing and corrections

After copyediting and typesetting the article goes back to you. This is your chance to give your article a last look before it is published.

• A link to article proofs is provided via email.

• Accurately proofread your article and clearly mark any corrections online as soon as possible.

Please note that you are responsible for all statements made in your work, including changes made during the editorial process and thus you must check your proofs carefully.

Early View

The journal offers rapid speed to publication via Wiley's Early View service. Early View (Online Version of Record) articles are published on Wiley Online Library before inclusion in an issue. Note there may be a delay after corrections are received before your article appears online, as Editors also need to review proofs. Once your article is published on Early View no further changes to your article are possible. Your Early View article is fully citable and carries an online publication date and DOI for citations.

8. POST PUBLICATION

Access and sharing

When your article is published online:

• You receive an email alert (if requested).

• You can share your published article through social media.

• As the author, you retain free access (after accepting the Terms & Conditions of use, you can view your article).

• The corresponding author and co-authors can nominate up to ten colleagues to receive a publication alert and free online access to your article.

You can now order print copies of your article (instructions are sent at proofing stage).

Now is the time to start promoting your article. Find out how to do that *here.*

Measuring the Impact of your Work

Wiley also helps you measure the impact of your research through our specialist partnerships with Kudos and Altmetric.

Video Abstracts

A video abstract can be a quick way to make the message of your research accessible to a much larger audience. Wiley and its partner Research Square offer a service of professionally produced video abstracts, available to authors of articles accepted in this journal. You can learn more about it at www.wileyauthors.com/videoabstracts. If you have any questions, please direct them to videoabstracts@wiley.com.

Appendix B Specific rationales for database selection

PsycINFO

Description: Comprehensive database for psychology and related subjects

Rationale: High likelihood of retrieving articles relevant to behaviour

Medline

Description: Comprehensive database indexing biomedical literature.

Rationale: High volume of articles relating to people with CHARGE syndrome

EMBASE

Description: Comprehensive database indexing biomedical literature.

Rationale: High volume of articles relating to people with CHARGE syndrome

Appendix C Search terms and results by database searched

Table 28 PSYCInfo search

#	Search Term	# of Results
1	TI coloboma OR AB coloboma	63
2	TI heart anomaly OR AB heart anomaly	45
3	TI choanal atresia OR AB choanal atresia	11
4	TI retardation OR AB retardation	19085
5	TI (“genital and ear anomalies”)OR AB (“genital and ear anomalies”)	4
6	S1 AND S2 AND S3 AND S4 AN S5	1
7	TI charge association* OR AB charge association*	52
8	TI charge syndrome* OR AB charge syndrome*	78
9	TI hall-hittner OR AB hall-hittner	0
10	TI HHS OR AB HHS	203
11	TI CHD7 OR AB CHD7	14
12	TI SEMA3E OR AB SEMA3E	6
13	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12	339
14	TI behavio* OR AB behavio*	833194
15	TI psych* OR AB psych*	1053204
16	TI emotion* OR AB emotion*	264789
17	TI cognit* OR AB cognit*	396483
18	TI phenotyp* OR AB phenotyp*	31280
19	TI abilit* OR AB abilit*	252384
20	TI learning OR AB learning	320150
21	TI IQ OR AB IQ	25399
22	TI Intell* OR AB Intell*	131620
23	TI retardation OR AB retardation	19085
24	TI processing OR AB processing	146356
25	TI development* OR AB development*	632841
26	TI language OR AB language	175192
27	TI linguistic OR AB linguistic	41411
28	TI communicat* OR AB communicat*	176808
29	TI speech OR AB speech	67922
30	TI verbal OR AB verbal	87656
31	TI motor OR AB motor	112547
32	TI psychomotor OR AB psychomotor	10791
33	TI autis* OR AB autis*	42384
34	TI ASD* OR AB ASD*	13552
35	TI repetiti* OR AB repetiti*	33154
36	TI ritual* OR AB ritual*	10444
37	TI stereotyp* OR AB stereotyp*	35690
38	TI social OR AB social	651189
39	TI sociability OR AB sociability	3703
40	TI anxi* OR AB anxi*	180996
41	TI mood OR AB mood	64676
42	TI depressi* OR AB depressi*	248774
43	TI affect* OR AB affect*	417048
44	TI sensory OR AB sensory	64570
45	TI sleep OR AB sleep	57545
46	TI memory OR AB memory	187470

47	TI executive function* OR AB executive function*	21096
48	TI function* OR AB function*	564067
49	TI adaptive OR AB adaptive	44482
50	TI maladaptive OR AB maladaptive	13197
51	TI self-injur* OR AB self-injur*	5199
52	TI self-harm OR AB self-harm	4073
53	TI personalit* OR AB personalit*	172987
54	S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53	3370715
55	S13 AND S54	251
Exclusion criteria applied		
Limit to: Publication Year: 1979-2018		249
Limit to: English language		236

Table 29 MEDLINE search

#	Search Term	# of Results
1	coloboma.tw.	2064
2	heart anomaly.tw.	151
3	choanal atresia.tw.	1109
4	retardation.tw.	61662
5	“genital and ear anomalies”.tw.	33
6	S1 AND S2 AND S3 AND S4 AN S5.tw.	4
7	charge association*.tw.	250
8	charge syndrome*.tw.	417
9	hall-hittner.tw.	2
10	HHS.tw.	3138
11	CHD7.tw.	325
12	SEMA3E.tw.	93
13	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12	4042
14	behavio*.tw.	1079504
15	psych*.tw.	743067
16	AB emotion*.tw.	166723
17	cognit*.tw.	330281
18	phenotyp*.tw.	513775
19	abilit*.tw.	822837
20	learning.tw.	235207
21	IQ.tw.	19757
22	Intell*.tw.	75671
23	retardation.tw.	61662
24	processing.tw.	322665
25	development*.tw.	2124272
26	language.tw.	123849
27	linguistic.tw.	16839
28	communicat*.tw.	249932
29	speech.tw.	71544
30	verbal.tw.	58587
31	motor.tw.	287249

32	psychomotor.tw.	19487
33	autis*.tw.	39560
34	ASD*.tw.	17041
35	repetiti*.tw.	99092
36	ritual*.tw.	4952
37	stereotyp*.tw.	23237
38	social.tw.	438036
39	sociability.tw.	1865
40	anxi*.tw.	178096
41	mood.tw.	65683
42	depressi*.tw.	343890
43	affect*.tw.	1648115
44	sensory.tw.	164591
45	sleep.tw.	142228
46	memory.tw.	217988
47	executive function*.tw.	20626
48	function*.tw.	3304639
49	adaptive.tw.	131720
50	maladaptive.tw.	10572
51	self-injur*.tw.	3929
52	self-harm.tw.	4300
53	personalit*.tw.	70893
54	S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53	9179635
55	S13 AND S54	1739
Exclusion criteria applied		
Limit to: Publication Year: 1979-2018		1737
Limit to: English language		1657
Limit to: Journal article		1628

Table 30 EMBASE search

#	Search Term	# of Results
1	coloboma.tw.	2294
2	heart anomaly.tw.	199
3	choanal atresia.tw.	1196
4	retardation.tw.	73723
5	“genital and ear anomalies”.tw.	36
6	S1 AND S2 AND S3 AND S4 AN S5.tw.	3
7	charge association*.tw.	278
8	charge syndrome*.tw.	571
9	hall-hittner.tw.	2
10	HHS.tw.	3857
11	CHD7.tw.	428
12	SEMA3E.tw.	132
13	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12	4975
14	behavio*.tw.	1189762
15	psych*.tw.	954803

16	AB emotion*.tw.	209511
17	cognit*.tw.	427297
18	phenotyp*.tw.	622129
19	abilit*.tw.	948931
20	learning.tw.	286816
21	IQ.tw.	25524
22	Intell*.tw.	90101
23	retardation.tw.	73723
24	processing.tw.	360047
25	development*.tw.	2517168
26	language.tw.	144179
27	linguistic.tw.	18300
28	communicat*.tw.	301389
29	speech.tw.	83965
30	verbal.tw.	73437
31	motor.tw.	353568
32	psychomotor.tw.	25280
33	autis*.tw.	47333
34	ASD*.tw.	22647
35	repetiti*.tw.	111479
36	ritual*.tw.	5946
37	stereotyp*.tw.	26478
38	social.tw.	514463
39	sociability.tw.	2277
40	anxi*.tw.	238218
41	mood.tw.	89019
42	depressi*.tw.	437660
43	affect*.tw.	1959197
44	sensory.tw.	189064
45	sleep.tw.	201268
46	memory.tw.	261673
47	executive function*.tw.	28602
48	function*.tw.	3849416
49	adaptive.tw.	147546
50	maladaptive.tw.	13121
51	self-injur*.tw.	4639
52	self-harm.tw.	5121
53	personalit*.tw.	86639
54	S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53	10624110
55	S13 AND S54	2320
Exclusion criteria applied		
Limit to: yr=”1979 -Current”		2312
Limit to: English language		2208
Limit to: (article and journal)		1421

Appendix D Articles reporting ≤ 10 participants or case studies/series of case studies

Table 31 Low N studies omitted from analysis

Authors	Year	# of pps	Gender	Age	Diagnosis	ID	Cognitive impairment	Developmental delay	Executive Dysfunction	ASD	ADHD/hyperactivity	OCD/repetitive	Social difficulties	Anxiety	Distress	Sleep difficulties	Hearing impairment	Feeding difficulties	Speech impairment	Sight impairment	Challenging behaviour	Self-injurious behaviour	Avoidant behaviour	Cranial nerves	Altered consciousness	Involuntary movements	Epileptic seizures	Body spatial disorders	Disordered. balance	Spasms
Lehman *et al.*		1	F	4y	G	X	X	X		X							X	X	X	X										
Costa Cardoso *et al.*		1	F	7y	C	X	X	X									X		X											
Chakraborty & Chakraborty		1	M	17y	C	X	X				X							X		X										
Bloomfield *et al.*		1	F	Baby	C												X			X										
Hudson & Blake		1	M	33y	G	X		X									X	X	X	X										
Hudson *et al.*		1	F	17y	G	X		X									X	X		X										
Nicholas		1	F	12y	C	X	X		X				X				X			X										
Searle *et al.*		1	M	33y	C	X	X	X	X		X		X	X			X		X		X									
Baas *et al.*		1	M	12y	C	X	X	X									X		X											
Bernstein & Denno.		1	F	19y	C	X	X	X	X			X	X		X	X	X			X	X	X	X							
Curatolo *et al.*		1	F	Birth +	C	X	X	X									X			X										X
Pisano *et al.*		1	f	15y	C			X		X							X	X			X	X								
Hsu *et al.*		1	M	Birth +	C	X	X	X	x	X			x						x											
Hartshorne *et al.*		2	M	26y	C	X		X				X					X	X	X	X									X	
			F	31y	C			X						X		X	X													
Goldson *et al.*		2	M	Birth +	C		X	X									X		X											
			F	19y	C		X	X									X	X	X	X										
Fernell *et al.*		3	M	From	C		X			X							X		X											
			M	birth	C		X	X		X			X				X	X	X											
			F		C		X	X		X							X		X											
Lauger *et al.*		3	M	8	?	X		X				X					X	X	X	X	X			X	X	X				
			F	17	?	X	X	X		X		X				X	X		X	X	X	X		X						
			F	17	?	X		X	X			X	X			X	X	X	X	X	X	X				X				
Byoung-Sun & Sei Yeul Oh		3	M	1m	?	X		X										X												
			F	28m	G	X		X											X											
			F	10m	G	X		X												X										

Peltokorpi & Huttunen		3	F	1y	C	X		X									X	X	X	X										
			M	8y	C	X		X									X		X	X										
			F	3y	C	X		X									X		X	X										
Meinzen-Derr *et al.*		4	M	28m -	C	X	X	X										X	X											
			F	71m	C	X	X	X										X	X	X										
			M		C	X	X	X										X	X	X										
			F		C	X	X	X										X	X	X										
Admiraal & Huygen		5	F	3y -	?	X		X									X	X	X	X										
			F	26y	?	X		X									X		X									X		
			F		?	X		X									X	X	X	X										
			F		?	X		X									X		X	X								X		
			M		?	X		X									X		X	X										
Bergman *et al.*		7	M	11m -	G												X	X												
			M	22y	G												X	X		X										
			M		G												X	X		X										
			M		C	X		X									X			X										
			M		C	X		X									X	X		X										
			M		C	X		X									X	X		X										
			F		G	X		X									X	X		X										
Bruce *et al.*		6	M	6y -	C												X		X	X										
			M	18y	C												X		X	X										
			M		C												X		X	X										
			M		U												X		X	X										
			M		U												X		X	X										
			F		C												X		X	X										
Dobbelsteyn *et al.*		5	M	4y - 9y	G												X	X		X										
			M		G												X	X												
			F		G												X	X		X	X									
			F		G												X	X		X	X									
			F		G												X	X		X										
Lassere *et al.*		8	M	7y -	C	X	X	X									X											X	X	
			M	13y	C	X	X	X									X												X	
			M		C	X	X	X									X			X									X	
			M		C	X	X	X									X			X								X	X	
			M		C	X	X	X									X			X								X	X	
			M		C	X	X	X									X			X								X	X	
			M		C	X	X	X									X			X								X	X	
			F		C	X	X	X									X			X								X	X	
Hudson *et al.*		5	M	8y -	C			X				X				X		X		X										
			M	18y	C			X										X	X	X	X										
			F		G			X							X			X		X											
			F		C			X										X		X											

			F		G			X										X		X	X	X							
Toshihisa *et al.*		5	M	3y -	?	X	X	X									X											X		
			F	23y	?			X																				X	X	
			F		?			X									X													
			F		?	X	X	X									X	X												
			F		?			X									X	X												
Wiznitzer *et al.*		5	M	4.2y	?								1														1			
			M		?																									
			F		?																									
			F		?																									
			F		?																									
Smith *et al.*	20	13	F	3y2m	?			X					X				X													
	05		M	3y5m	?			X																						
			M	4y4m	?			X			X		X				X			X	X									
			M	5y7m	?			X					X				X			X										
			F	4y6m	?			X					X				X			X										
			M	4y4m	?			X					X				X			X										
			F	5y4m	?			X					X				X			X										
			M	5y10m	?			X					X				X			X										
			F	9y1m	?			X		X			X				X			X										
			M	12y1m	?			X			X		X				X			X	X									
			M	17y3m	?			-					X				X													
			F	23y7m	?			-			-						X			X	-									
			M	24y2m	?			-		X	-		X				X			X	-									

Appendix E Data extraction table

Table 32 Data extraction table

Author(s)	Date	n	Ages of CHARGE participants	Details about pps	Assessments	Comparison groups	Key relevant findings	Notes	Quality ratings	SI	CS	AC	GC
Abadie *et al.*	2000	17	2m-5y	Diagnosed 4 major /3 major and 3 minor	Physical assessment Parent questionnaire	Normal population using Brunet-LeÂsine scale.	1. Can't crawl w/o resting head on floor 2. Walking only: familiar place, flat/regular floor, outdoors 1yr late 3. DQ 44-50	Included	0.50				
Abi Daoud *et al.*	2002	30	13y-30y	None	Interview & questionnaire	None		Not included Quality rating too low	0.08				
Bernstein & Denno	2005	29	3y-21y	Physical features described	Compulsive Behavior Checklist	*Presumably normative data for the CBC*	1. 11.2 RBs pp 2. 72% 1+hours p/day in RPs 3. 72% interfered with social activities/relationships 4. 83% interfered with routine 5. 48% persevered following redirection 6. 34% responded to redirection with aggression 7. IQ: Average 3/29; Mild ID 8/29; Mod ID 11/29; Sev ID 7/29	Included *Also case study – added to low N*	0.33				
Blake & Brown	1993	39	18m-20y	Parents	Questionnaire	None		Not included Quality rating too low	0.25				

Blake *et al.*	2005	30	13y-30y	Physical features described	45 minute structured interview	None reported	1. walking 4.1yrs (SD=3.3). 2. 53% Socialising; 43% OCD; 37% Anxiety; 33% Tourettes; 33% PDD/Autism; 13% Conduct; 13% Depression; 10% ADHD; 7% Eating. 3. 53% Aggressiveness; 50% Self-abuse; 50% Sleep; 40% Tactile defensiveness 4. toileting 5.5yrs (SD=3.1); 5. Independence: 18/30, 16/30 dressing/toilet, 13/30 washing, 9/30 getting to work/school, 9/30 cleaning, 4/30 shopping, 0/30 cooking, 1 1/30 finances	Included	0.42				
Dammeyer	2012	17	0y-15y	Physical features described.	Questionnaire	Children with Usher Syndrome	1. Language delay – 3/17 severe; 11/17 Moderate; (3/17) none/little 2. Language– 9/17 Sign; 5/17 Oral; 1/17 Tactile; 2/17 pre-verbal 3. IQ – 2/17 IQ<50; 3/17 IQ=50-69; 12/17 IQ>69 4. Sleep– 8/17 'Lot'; 7/17 'Some'; 2/17 'No/few' 5. walking 38m	Included	0.50				
Deuce *et al.*	2012	44	1y-15y	Children diagnosed	Questionnaire	None	1. Sleep 6/44 2. Behaviour 5/44 3. OCD 4/44 4. ASD,2/44 5. Fearlessness 2/44	Included	0.42				
Dobbelsteyn *et al.*	2008	39	6m – 16y7m	Parents of	2 questionnaires	None	1. Swallowing difficulty 35/39	Included	0.58			
					Paediatric Assessment Scale for Severe Feeding Problems	None	Vomiting/gagging during/after feeding 29/37 at 1y, 17/28 1st grade, 1/5 7th grade	Included	0.50			
Forward *et al.*	2007	30	13y – 34y	Caregivers of people with CHARGE	Questionnaire	None	1. Adolescent more active when one-to-one care available.	Included	0.42			

					Habitual Activity Estimation Scale	HAES control data	2. 3-18y fewer active hours weekdays and weekdays (*P* = 0.001) 3. No difference for adolescents and older on weekdays.		0.50	
Graham *et al.*	2005	14	6 – 21 years	Boys only	Reiss Profile of Fundamental Goals and Motivation Sensitivities Achenbach Child Behavior Checklist (CBCL); Aberrant Behavior Checklist (ABC)	Age-matched boys: 20 DS; 17 PWP; 16 WS	1. CBCL CS v PWS - fewer internalising (p < 0.05), less withdrawn (p<0.5), fewer somatic (p<0.5) CS v WS & DS – more withdrawn (p<0.5), similar externalising [– PWS more aggressive (p < 0.001)] CS v WS & PWS – less anxious CS low risk maladaptive/aggression 2. ABC (means) Irritability, agitation = 9; Lethargy, social withdrawal = 6.71 (mod. high); Stereotypic behaviours = 5.21 (mod. high); Hyperactivity = 8.93; Inappropriate speech = 2.00. Boys with CHARGE highest irritability/hyperactivity, moderately high social withdrawal/stereotypic behaviours. 3. Reiss CS v DS & PWS & WS – lower social contact (p<0.01), higher maintaining order (p < 0.001), less help others (p < 0.5) CS v DS & WS – more frustration (p<0.001) CS v PWS & DS – less seek attention (p<0.01) CS v PWS – higher activity (p<0.5) 4. more likely to behave resembling ASD: socially	Included	0.66	

							withdrawn; low interest in social contact; reduced seeking of attention from others; hyperactivity; a need to maintain order 5. not as socially impaired as autism 6. Language not abnormal 7. Frustrated but not aggressive, few stereotypic behaviours/preoccupations. No restricted activities/interests." 8. due to dual sensory impairment rather than primary ASD						
Haibach & Lieberman	2013	21	6y – 12 y	None	Pediatric Balance Scale (PBS)	31 age, gender, sighted matched controls w/o CHARGE	1. ABC lower scores (p<0.001), correlated with PBS (r=0.56). 29 confidence balance 0/10. 2. more comfortable in familiar settings (M=8.95, SD=1.91) 3. walking 41.65m (SD=17.35)	Included	2-6 0.50				
		29	6y – 12 y	None	Self-efficacy of balance survey based on Activities-Specific Balance Confidence Scale (ABC)	31 age, gender, sighted matched controls w/o CHARGE	1. PBS CS performed significantly worse than control (p<0.05), 57% at med-high risk of falls	Included	0.58				
Hartshorne *et al.*	2016	53	13y-39y	participants and/or caretakers.	Questionnaire Impact of Childhood Neurologic Disability Scale; CDC Health-Related Quality-Of-Life (HRQOL) measure.	General US population data.	1. Walking 3.4y (SD=3.0) 2. Communication: sign 21/53, verbal 20/53, Sign/verbal 6/53, Gestures 4/53, Pictures 1/53. 3. Sleep 31/53, Aggression 27/53, Tac defensiveness 27/53, OCD 26/53, Self-injurious 25/53, Anxiety 24/53, ADHD 14/53,ASD 14/53, Tics 9/53, Conduct 7/53, Depression 4/53.	Included *2 case histories – sent to Amna*	0.42				

							4. HRQOL – Fair 8/53, Good 21/53, very good 16/53, excellent 8/53; 25% health restricted activities 5. Independence: Toileting 36/53, Dressing 32/53, washing 27/53 – Mixed: cleaning – Low: Getting to school/work (none 31/53), cooking 23/53, shopping 27/53, finances 36/53 6. Limitations due to: Hearing 46/53, Vision 37/53, Balance 28/53, Anxiety 19/53, Emotions 19/53), Walking 18/53. Sleep 15/53					
Hartshorne & Cypher	2004	100	Under 1y – 30y	95% by parents, 4 by others, 1 by individual with Charge.	Web-based, survey	ASD people, deaf-blind people.	1. 15/25 autistic disorder, 9/10 ADHD, 1/13 OCD, 15/21 deaf-blind, and 1/2 tic behaviours common	Included	0.33			
					71 behaviours 5-point likert scale	ASD people, deaf-blind people.	2. ADHD highest (3.0/5), ASD (2.7/5), deaf-blind (2.6/5), tic (2.5/5), OCD (2.0/5). 3. Categories correlated (0.66 ASD & deaf-blind) 4. Older more behaviours in ASD (r =.26 p<.001) and OCD (r =.23 p<025). 5. Medical conditions correlated with ASD (r =.22; p<.025), tics (r =.21; p<.05). 6. Age & walking correlated with behaviours (r =.20; p<.05), deaf-blind behaviours (r =.26; p<.001). 7. Deaf-blind more behaviours (p =.004), and on ASD (p =.02), deaf-blind (p =.002), and tic (p =.01). 8. Swallowing 74/100 Diagnoses: ASD 6/100; ADHD 7/100; OCD 3/100; Tourettes 2/100	Included .	0.50			

Hartshorne *et al.*	2009	87	6y – 18y	89.7% by mothers.	Sleep Disturbances Scale for Children (SDSC) Developmental Behaviour Checklist 2nd Ed. (DBC) Malaise Inventory (carer well-being).	Scale norms	1. SDSC 50/87 caseness, mean 60. high for 'sleep', 'sleep-wake transition disorders', 'sleep breathing disorders' 2. DBC 43/87 clin scores. Centiles for self-absorbed (64th), communication (62nd), and social (56th). Lower for Disruptive/antisocial (46th) and anxiety (48th). 3. Correlation SDSC and DBC (r=0.276; p =0.01). SDSC and self-absorbed subtest on DBC associated (r=0.444; p<0.001). 4. Parent well-being ass with sleep disturbance (r=0.316; p =0.003) and DBC (r=0.435; p<0.001) 5. Deaf-blind higher on SDSC (p=0.001), as did ear infections (p=0.015).	Included	0.42				
Hartshorne *et al.*	2007	98	5y - 18y	92.9% by mother.	Behavior Rating Inventory of Executive Function – parent version (BRIEF) Autism Behavior Checklist (ABC)	Scale norms	1. Delayed motor 96/98, swallowing probs 73/98. 2. BRIEF scale means elevated at except 'Organisation of materials' 50%+ significant scores on Shift, Monitor, and Behavioral Regulation. 3. Walking 3.08y, crawling 1.64y. walking associated with BRI: r =.23; MI: r =.29; GEC: r =.27… all p<0.5 4. BRIEF correlated with ABC (p<.01) except 'Organisation of materials.' ABC predictor for significant score on BRIEF (RSquare .15).	Included All participants previously involved in Hartshorne *et al.* (2005)	0.33				

							5. Deafblindness related to higher BRI (p<.05).						
Hartshorne *et al.*	2005	160	Under 3y – 33y		Autism Behavior Checklist (ABC)	Scale norms – norms from ABC for people with autism, and people who are deafblind.	1. 99% delayed motor, 79% swallowing 2. ABC scores lower than ASD (p<0.000) and higher than deafblind (p<0.02) 3. SD greater than other groups 4. 27.5% classified as autism 5. Age not correlated with ABC (r=0.07) 6. Correlation age walking and ABC 0.36 (p=0.000) – later walking higher ABC scores. 7. Deafblind highest ABC (p=0.000).	Included	0.50				
Hudson *et al.*	2016	20	2y-32y	Parents, 15 CHD7 mutation, 1 didn't, 4 untested.	Qualitative Phone interview	None	1. Dev delay 20/20 2. Food packing 15/20 3. Food in cheeks 7/20 4. over-stuff 19/20 5. 2/20 stuffing interfered with interactions 6. 2/20 stuffing manipulative 7. 5/20 not mix liquids&solids 8. 6/20 finish/3/20 routine 9. 3/20 anger and aggression 10. 4/20 eats quickly	Included	0.33				
Husu *et al.*	2013	18	1y-15y	All CHD7 mutation positive	Patient record review	TD norms	1. Developmental delay 11/13 2. delayed motor 13/13	Included	0.66				
Issekutz *et al.*	2005	77	Children and adults	Clinical diagnosis	Canadian Pediatric Surveillance Program (CPSP) – questionnaire.	TD norms and ASD norms 4 major (26) criteria and 3 or fewer (51)	1. OCD 7/16, Hyperactivity 7/16, Sleep 5/16. (14/16) feeding, 62% (10/16) GER, 75% (12/16) behavioural difficulties, 11/16 swallowing, Vestibular 7/16.	Included *Similar to Smith et al 2005 (also based on CPSP)*	0.92				
Johansson *et al.*	2006	31, 25 assessed for ASD	1m-31y	None	WISC or Vineland	TD norms	1. 17/25 ASD 2. 5 Childhood ASD; 4 IQ<20. 3. 5 ASD-like; 7 Traits; 2 ADHD	Included	0.42				

					Autistic Behaviour Checklist Autism Diagnostic Interview		4. Self-injury corr ASD $p<.05$; Hyperact corr ASD $p<.05$); 22/28 ID corr ASD $p<.001$) 5. Balance 21/24; Attention 10/28; impulsive 3/28; hyperactivity 18/28; self-destructivity 15/28; routines 19/28; stereotyped movement 14/28; aggressive 19/28; sleep 8/28; tics 2/28; aural interest 4/28; sensitivity to noise 5/28; visual interest 11/28; pain insensitivity15/28. 6. Visual impairment correlated with ASD ($p<.05$) and ID ($p<.001$) 7. Hearing impairment corr ASD ($p<.05$), not LD.	*This data appears to duplicate the results of Strömland et al (2005)*					
Lieberman *et al.*	2012	26	6y-19y	Parents	Questionnaire	None		Not included Quality score too low	0.25				
MacDonald *et al.*	2017	69	1y-18y	Parents, 17 had gene-positive diagnoses, rest clinical	Paediatric Assessment Scale for Severe Feeding Problems (PASSFP) Gastrointestinal Symptoms Scale (PedsQL) open-ended questions	TD norms	1. PASSFP – type of feeding reflected feeding difficulties 2. PedsQL –swallowing suggested levels associated with GI disorders 3. 18/54 over-stuffing *4. Many had difficulties consuming foods of varied textures, temperature, and consistencies.*	Included	0.50				
Miller *et al.*	2004	31	??	Clinical assessment-based diagnosis	Childhood Autism Rating Scale (CARS)	Mobius Sequence, Goldenhar/HFM Syndrome	1. 5/31 autism disorder and 5/31 autistic-like 2. no unique set of systemic malformations	Included *Strömland et al 2005 report on the*	0.75				

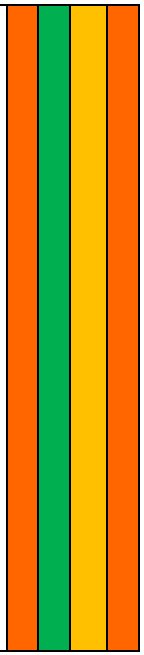
					Autistic Behaviour Checklist (ABC) Autism Diagnostic Interview-Revised (ADIR)			*same or similar data*					
Pagon *et al.*	1981	21	Not reported	Clinical assessment by specialist doctor	Clinical assessments	Comparable with TD norms	1. Swallowing 6/13 2. IQ score range 70 to 80 in 3 young adult males, to profound retardation in 4.	Included	0.58				
Raqbi *et al.*	2003	21	5y-12y	All met clinical criteria and were karyotyped, children with chromosomal anomalies excluded.	Neurological examination monthly during 1st year of life, 3months in 2nd,	None offered	1. bilateral coloboma resulting in low vision (p<.003), microcephaly (p<.02), and brain malformation (.002) predictive of poor intellect (severe neonatal medical conditions, long stays in hospital, and cardiac surgery were not). 2. psychomotor milestones 0-4yrs markedly delayed (hypotonia, poor arm use, diffs standing) (DQ=50)	Included	0.58				
					School performance and rehab requirements.	None offered	1. 5 IQ>70, 5 IQ 50-70. 6 IQ 35-49, 5 IQ < 35 2. 5 distractibility, impulsivity, inattention	Included	0.5				
Salem-Hartshorne & Jacob	2004	100	5y-15y	Parent-completed	CHARGE Parent Survey Adaptive Behaviour Evaluation Scale (ABES) by participants	Normative sample	1. ABES score = 73.7(SD=13.61), Range 55-110, Mode=55 2. Lowest Health 3.97, Self-Care 3.87, Home 3.83; Highest in Self-direction 6.52; Leisure 5.89, Social 5.07, Communication 5.06; Academics 4.74, Community use 4.51, Work 4.45. 3. ABES correlated with Walking age (r=.39, p<.01), Hearing (r=.23, p<.05), Medical	Included	0.42				

							involvement (r=.21, *p*<.05), Deaf-blind(r=.27, *p*<.05), not Vision (r=.17),						
Salem-Hartshorne & Jacob	2005	Two time points, 4yrs apart. 1st=100, 2nd=85	8y-20y	Parent-completed	CHARGE Parent Survey Adaptive Behaviour Evaluation Scale (ABES)	Normative sample	1. Time 1- ABES 71.9 SD=13.63 Time 2 –ABES 74.1 (T1/T2 r=.80). Range 55-107 50% (40/80) scored above 70, 13% (10/80) above 90 . 2. Age-adjusted scores declined over 4-years. 3. T2 correlations for Walking (r=.55 *p*<.01) and Medical involvement (r=.28 *p*<.01), not hearing/vision severity. 4. Age walking 3-5y 5. relationships of vision and medical involvement to adaptive behaviour because of effects on walking. 6. Lowest ABES scores in Home 3.13, Community use 3.21, and Academics 3.76; Highest self-direction 5.66, Leisure 5.55, and Communication 5.48. Social 4.69, Work 3.86, Health 4.08, Self-care 4.83.	Included *Time 1 (T1) scores are the same as those from Salem-Hartshorne & Jacob (2004)*	0.33				
Santoro *et al.*	2014	35	0-33.5y	All had CHD7 gene mutations 17 Nonsense, 12 Frameshift,, 2 Missense, 4 Splice site. 32 also clinical diagnosis Blake's criteria.	Progress Guide (Italian adaptation) .	Measure TD norms	1. Median lower in each domain. Greatest differences for oldest. 2. range of abilities up to 3 years variable. 3. median for development 50% except Feeding, Dressing, Toileting and Communication (poorer) 4. Washing best dev – 75%	Included .	0.66				
Souriau *et al.*	2005	71	6m-30y	Not explained	Questionnaire	None	1. Self-aggressive 28; Aggressive 27 2. Difficult to touch unstable sensory information.	Included	0.33				

							3. Difficulty walking on irregular surfaces associated vestibular 4. Hyperactivity 38/71. Association btw difficulty waiting and pleasure watching spinning (p<.001). 5. Need occupation corr enjoy objects spinning (p<.05). 6. Ass between throwing objects and difficulty social rules (p<.05). 7. Ass btw low understanding of social rules and touching people (p<.001). 8. Stability in info: affinity for jigsaw and need to put things away (p<.01). 9. Association btw depression and anxiety (p<.01). 10. Association btw self and others aggression (p<.01) 11. Corr btw isolating in group and with 1 person (p<.001) 12. Preference for 1:1 and being with adults linked (p<.01). 13. Diff with complex info					
Strömland *et al.*	2005	31	1m-31y	4 or more of 6 characteristics from Pagon et al 1981 or 3 with add. anomalies	Autistic Behaviour Checklist (ABC) Childhood Autism Rating Scale (CARS) Range of IQ tests	Norms on measures	15/26 no speech, 6 partly incomprehensible speech. 2. 21/24 balance. 23 developmental delay; 10 ASD (5 met criteria for childhood autism/austistic disorder, 5 for autistic-like condition/atypical autism); (of 15 patients mentioned) 5 IQ>70, 4 IQ50-69, 5 IQ<50; 10 profound deficit in adapt funct, 5 moderate/mild	Included *duplicate Johansson et al. 2005.*	0.58				
					Interview	None	20/31 feeding problems, 18/31 swallowing difficulties. 25/31 feeding/eating impairment.	Included	0.42				

Thelin & Fussner	2005	28	3y-27y	Parents	Questionnaire	None	1. 11 spoken, 6 sign,10 gesture, 1 cry/laugh/babble 2. 9/21 behav impacted dev; Well-adjusted 15/28, immaturity 24/28, attention 20/28, self-stimulation 17/28, noise sensitivity 15/28, aggressive 13/28, low communication 13/28, unstable/explosive 9/28, rocking 4/28	Included	0.42				
Trider *et al.*	2012	51	0y-14y	32 test positive for CHD7 gene mutation, 19 diagnosed using clinical criteria (few sig diffs found between groups)	Brouilette Score Questionnaire -Paediatric Sleep Questionnaire OSA-18 Quality of Life Questionnaire	Measure norms	PSQ (N=16) Snoring 2.88 (0.69 post-op); Inattention/ hyper 4.19 (4.12 post-op) OSA-18 suggested that sleep apnoea had a negative impact upon quality of life *(no specific data about emotional impact etc presented).*	Included	0.50				
Vervloed *et al.*	2006	27	1y7m-39y6m	of 15 genetically tested CHD7 mutations in 14, one deletion of 8q12, all clinical criteria (Blake and Pagon)	Temperament scale for the mentally retarded. Child Behaviour Checklist Hartshorne questionnaire Communication scale of the Vineland Structured interview based on Souriau questionnaire	Measure norms where relevant	1. Age corr with # of probs (r=.48 *p*=.012); esp intr=.4 *p*=.041) and anx/dep behavs (r=.46 *p*=.022) 2. Hospitalisation corr int: anx/dep (r=-.59 *p*=.002), anx/dep (CBCL; r=-.52 p=.007), withdrawn (r=-.56 *p*=.003), thought probs (r=-.54 *p*=.011), int (r=-.41 *p*=.037); and delinquency (r=-.49 *p*=.024). 3. Heart defects (N=19) and surgery (N=12) ass w/ behav problems. 4. cerebral abnormalities more withdrawn, reacted more intense on stimuli, more negative mood. difficult temperament *p*=.013) 5. Ear infection (17) ass w/ dev delay and low written lang 6. Deafblindness ass w/ dev delay, low expressiveness, and communication. 7. Heart surgery ass w/ mood, approachability, poor	Included	0.58				

							temperament, withdrawal Pos temperament *p*=0.011) 8. Tube feeding probs ass w/ intense reactions to stimuli (+ temperament *p*=0.007)					
Vesseur *et al.*	2016	50	5m-48y;	All CHD7 mutation and Verloes' clinical criteria	Audiometric data, Bayley Scales of Infant Development (BSID-NL-II)	Measure norms where applicable	1. 18/47 moderate hearing 2. Hearing loss (r2=-.622 *p*=.006), cogn delay (r2=.493 *p*=.038) influenced receptive language development. 3. Hearing loss & expressive lang ass (r2=-.845 *p*=.001).	Included	0.66				
		41	1y-56y	"	WISC-RN and WISC-II-NL)	Measure norms	24/41 IQ<70; 8/41 IQ=70-85; 9/41 IQ=86-115.	Included	0.66				
		22	1y-25y	"	Reynell Developmental Language Scales	Measure norms	Language quotients one SD below norm.	Included	0.66				
Wachtel *et al.*	2007	87	6y-18y	Clinical diagnosis. 78 by mothers.	Developmental Behaviour Checklist, Second Edition	Measure norms	31/87 at least one diagnosis; average 1.78, range 1-5: - **ADHD** 11/78 - **Anxiety** 17/87 (Anxiety 5, OCD 15, Perseverations 1) - **Pervasive dev dis** 14/87 (Autism 8, Aspergers 2, PDD 11) - **Disruptive** 2/78 (ODD 1, Rage behave 1) - **Stereotypic** dis 1/78 (self injury 1) - **Mood** 1/78 (mood dis 1, depression 1, bipolar 1). - **Psychotic** 1/78 (hallucinations 1) diagnosed more severe on DBC (*p*<.05-.001). older walking & disruption linked to more medications (*p*<.01) (*p*<.05).	Included .	0.42				
Wulffaert *et al.*	2009	22	1.7y-22.2y	Parent report	Nijmegen Parenting Stress Index-Short	Measure norm	1. Depression (*p*=.01), autism (*p*=.04), self-absorption (*p*=.04), and disruptive (*p*=.04) correlated positively with parenting stress. (total behav *p*=.05).	Included	0.58				

					Developmental Behaviour Checklist Dutch Vineland Screener 0-12		2. Adaptive functioning range 0.2y-8.6y (M=4.5 SD=3.24). 3. [IQ < 50 = 11/20, IQ 50-70 = 4/20, IQ > 70 = 5/20 4. 6/22 behaviour problems 5. DBC-P means(SD): Hyperactivity .82(.47), ASD .56(.40), self-absorbed .47(.36), disruptive/antisocial .46(.27), social relating .41(.41), depression .39(.25), anxiety .31(.26), communication.30(.23). 6. DBC-P: - 51-60%: aloof, in own world, non-speech noises, att-seeking, sleeps litte, disrupted sleep, stubborn, disobedient /uncooperative, underreacts to pain. - 61-70%: over-excited, poor attention, temper, irritable, noisy/boisterous. - 86%: impatience			

Appendix F Data tables for meta analyses

Table 33 Eating and swallow

Study name	N	Cases	Qi
Strömland *et al.* (2005)	31	25	0.44
Issekutz *et al.* (2013)	16	14	0.78
Pagon *et al.* (1981)	13	6	0.67
Hartshorne & Cypher (2004)	100	74	0.44
Hartshorne *et al*. (2007)[2]	98	73	0.33
Hartshorne *et al.* (2005)	160	127	0.44
Husu *et al.* (2013)	15	12	0.89
Dobbelsteyn *et al.* (2008)	39	35	0.56

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.7746	0.7359	0.8111	11.8470
Random effects	0.7757	0.7187	0.8280	11.8470
Quality effects	0.7724	0.7090	0.8301	11.8470
Fixed effects, heterogeneity	0.7746	0.7153	0.8303	11.8470

Table 34 IQ

Study name	N	Cases	Qi
Bernstein & Denno (2005)	29	26	0.44
Dammeyer (2012)	17	5	0.56
Johansson *et al.* (2006)	28	22	0.44
Raqbi *et al.* (2003)	21	16	0.67
Strömland *et al.* (2005)	14	9	0.67
Vesseur *et al.* (2016)	41	24	0.78
Wulffaert *et al.* (2009)	20	15	0.67

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.6916	0.6206	0.7584	21.8419
Random effects	0.6859	0.5425	0.8137	21.8419
Quality effects	0.6748	0.5227	0.8108	21.8419
Fixed effects, heterogeneity	0.6916	0.5475	0.8250	21.8419

Table 35 Mode of spoken language

Study name	N	Cases	Qi
Strömland *et al.* (2005)	31	25	0.44
Issekutz *et al.* (2013)	16	14	0.78
Pagon *et al.* (1981)	13	6	0.67
Hartshorne *et al*. (2007)[2]	98	73	0.33
Hartshorne *et al.* (2005)	160	127	0.44
Husu *et al.* (2013)	15	12	0.89
Dobbelsteyn *et al.* (2008)	39	35	0.56

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.7842	0.7411	0.8245	10.9306
Random effects	0.7844	0.7158	0.8459	10.9306
Quality effects	0.7795	0.7051	0.8459	10.9306
Fixed effects, heterogeneity	0.7842	0.7107	0.8522	10.9306

Table 36 ASD diagnosis

Study name	N	Cases	Qi
Deuce *et al*. (2012)	44	2	0.56
Hartshorne & Cypher (2004)	100	6	0.44
Wachtel *et al.* (2007)	87	14	0.44
Johansson *et al.* (2006)	25	5	0.44
Strömland *et al.* (2005)[2]	25	5	0.67
Blake *et al.* (2005)	30	7	0.44
Hartshorne *et al.* (2016)	53	14	0.44
Hartshorne *et al*. (2005)	160	44	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.1787	0.1472	0.2126	32.6517
Random effects	0.1720	0.1035	0.2531	32.6517
Quality effects	0.1726	0.1017	0.2571	32.6517
Fixed effects, heterogeneity	0.1787	0.0982	0.2682	32.6517

Table 37 Sleep difficulties

Study name	N	Cases	Qi
Deuce *et al.* (2012)	44	6	0.56
Issekutz *et al.* (2013)	16	5	0.78
Johansson *et al.* (2006)	28	8	0.44
Dammeyer (2012)	17	8	0.56
Blake *et al.* (2005)	30	15	0.44
Hartshorne *et al.* (2016)	53	31	0.44
Hartshorne *et al.* (2009)	87	20	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.3327	0.2784	0.3893	32.3868
Random effects	0.3501	0.2185	0.4940	32.3868
Quality effects	0.3315	0.1995	0.4779	32.3868
Fixed effects, heterogeneity	0.3327	0.1873	0.4876	32.3868

Table 38 Anxiety

Study name	N	Cases	Qi
Souriau *et al.* (2005)	71	22	0.44
Blake *et al*. (2005)	30	11	0.44
Hartshorne *et al.* (2016)	53	24	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.3707	0.2962	0.4484	2.6040
Random effects	0.3726	0.2862	0.4631	2.6040
Quality effects	0.3704	0.2840	0.4611	2.6040
Fixed effects, heterogeneity	0.3707	0.2840	0.4611	2.6040

Table 39 Low Mood

Study name	N	Cases	Qi
Souriau *et al.* (2005)	71	17	0.44
Blake *et al*. (2005)	30	4	0.44
Hartshorne *et al.* (2016)	53	4	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.1598	0.1060	0.2220	6.1782
Random effects	0.1469	0.0577	0.2647	6.1782
Quality effects	0.1547	0.0613	0.2773	6.1782
Fixed effects, heterogeneity	0.1598	0.0613	0.2773	6.1782

Table 40 ADHD diagnosis

Study name	N	Qi
Hartshorne & Cypher (2004)	100	7	0.44
Blake *et al*. (2005)	30	3	0.44
Wachtel *et al*. (2007)	87	11	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.0987	0.0623	0.1422	1.7037
Random effects	0.0987	0.0623	0.1422	1.7037
Quality effects	0.0987	0.0623	0.1422	1.7037
Fixed effects, heterogeneity	0.0987	0.0623	0.1422	1.7037

Table 41 ADHD symptomatology

Study name	N	Cases	Qi
Raqbi *et al.* (2003)	21	5	0.67
Johansson *et al.* (2006)	28	18	0.44
Thelin and Fussner (2005)	28	20	0.44
Issekutz *et al.* (2005)	16	7	0.78
Souriau *et al.* (2005)	71	43	0.44
Wulffaert *et al*. (2009)	22	19	0.67

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.6037	0.5328	0.6725	21.9351
Random effects	0.5942	0.4343	0.7449	21.9351
Quality effects	0.5857	0.4224	0.7403	21.9351
Fixed effects, heterogeneity	0.6037	0.4293	0.7707	21.9351

Table 42 Self-Injury

Study name	N	Cases	Qi
Souriau *et al.* (2005)	71	28	0.44
Hartshorne *et al.* (2016)	53	25	0.44
Blake *et al*. (2005)	30	15	0.44
Johansson *et al*. (2006)	28	15	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.4563	0.3847	0.5289	2.0576
Random effects	0.4563	0.3847	0.5289	2.0576
Quality effects	0.4563	0.3847	0.5289	2.0576
Fixed effects, heterogeneity	0.4563	0.3847	0.5289	2.0576

Table 43 Aggressiveness to others

Study name	N	Cases	Qi
Souriau *et al.* (2005)	71	27	0.44
Thelin & Fussner (2005)	28	13	0.44
Hartshorne *et al.* (2016)	53	27	0.44
Blake *et al*. (2005)	30	16	0.44
Johansson *et al*. (2006)	28	19	0.44

Method	Prevalence	LCI	HCI	Q
Fixed effects	0.4858	0.4186	0.5532	7.7121
Random effects	0.5001	0.4036	0.5966	7.7121
Quality effects	0.4857	0.3876	0.5844	7.7121
Fixed effects, heterogeneity	0.4858	0.3876	0.5844	7.7121

Appendix G Trainee's statement of epistemological position

All research is conducted under an epistemological position, whether this is implicitly held or explicitly reported. Epistemology refers to the means with which one might consider it possible to achieve knowledge, and the broader utility of that knowledge. Within the field of psychology, one might draw a rough line between postpositivist or realist positions, and those that assert that such a position is untenable or otherwise problematic (Creswell, 2009). The postpositivist position is that while we may aspire to absolute truth, we cannot be certain when studying humans. Thus, causes are considered to probably determine outcomes. Alternative positions hold that the aspiration of absolute truth is unrealistic, and that the best we can aspire to is descriptions of subjective meaning making. Quantitative methods tend to lend themselves towards postpositivist epistemologies, whilst qualitative designs favour alternatives (Creswell, 2009).

The epistemological position adopted for the purpose of this research project is a postpositivist position. This position was adopted because the aim is to make objective observations of how people react to certain stimuli, and to draw generalisable conclusions from those observations. The implicit assumption here is that the conclusions drawn may constitute a knowledge that has been drawn from a real, objective reality and that this knowledge pertains to that reality, which we all have access to and which we all share. There are necessarily limitations to this assertion. Most notably that only the data drawn constitute actual recordings of reality, and that the explorations of this data have been constructed by the author, using the language of wider research narratives in the broader literature, and so represents only one possible representation of this reality. Furthermore, the nature of the questions asked by this report and the choice of methods used to make observations have been informed by prior discourse on the issue and accepted standards.

Appendix H Participant demographic information

Table 44 Demographics for trait ratings (N=58)

	Informed	Uninformed
Number of participants	28	30
Participant age	18-24: 27 30-31: 1	18-24: 29 35-44: 1
Participant sex	Female: 27 Male: 4	Female: 29 Male: 3
Participant ethnicity	Asian/Asian British: 7 Asian Chinese: 1 Black British: 3 Black Other: 1 Mixed White & Black Caribbean: 3 Other White: 1 White British: 12	Asian Arab: 1 Asian/Asian British: 11 Asian Chinese: 1 Black British: 5 Mixed African & Arab: 1 Mixed White & Black Caribbean: 1 Mixed White & Black African: 1 Other White: 2 White British: 7

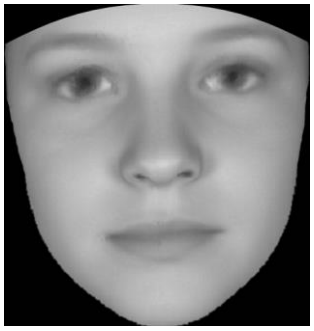
Table 45 Demographics for eye-tracking (N=48)

	Informed	Uninformed
Number of participants	24	24
Participant age	18-24: 23 30-31: 1	18-24: 24
Participant sex	Female: 21 Male: 3	Female: 22 Male: 2
Participant ethnicity	Asian/Asian British: 7 Asian Chinese: 1 Black British: 2 Black Other: 1 Mixed White & Black Caribbean: 3 Other White: 1 White British: 9	Asian/Asian British: 9 Asian Chinese: 1 Black British: 5 Mixed White & Black Caribbean: 1 Mixed White & Black African: 1 Other White: 2 White British: 5

Appendix I Face images and interest areas

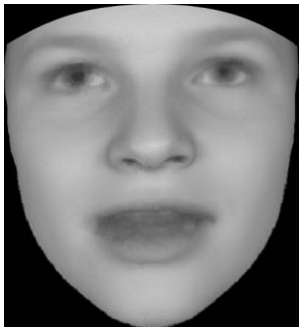
Typically developing images (12-years-old)

Male

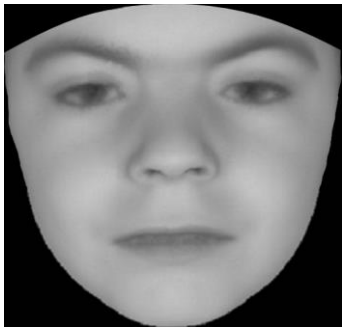


Female

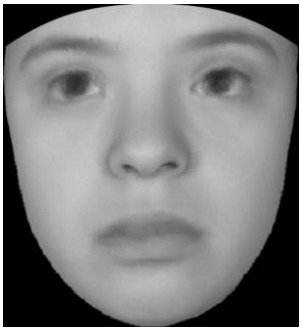
Genetic neurodevelopmental syndrome images (12-years-old)



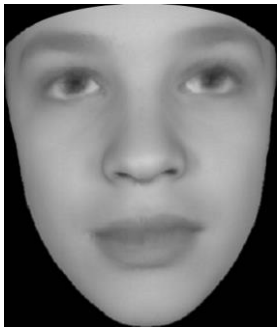
Angelman Syndrome



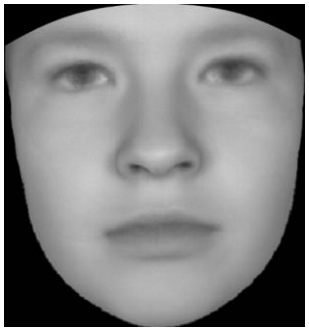
Cornelia de Lange Syndrome



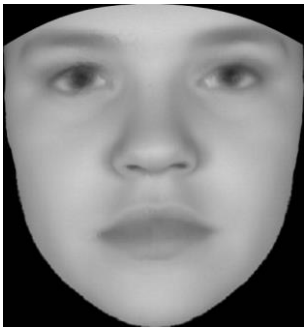
Down Syndrome



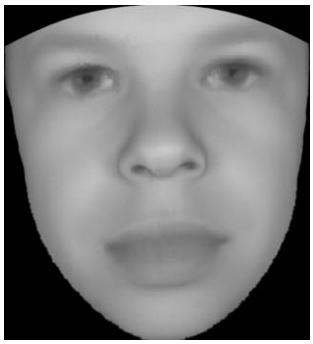
Fragile-X Syndrome



Prader-Willi Syndrome

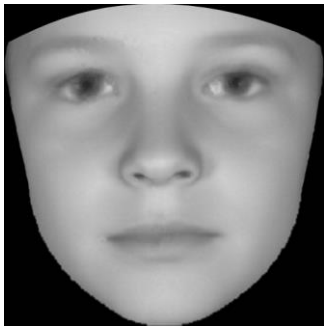


Smith-Magenis Syndrome

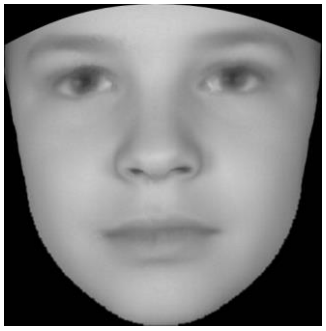


Williams Syndrome

ASD experiment (9-years-old)

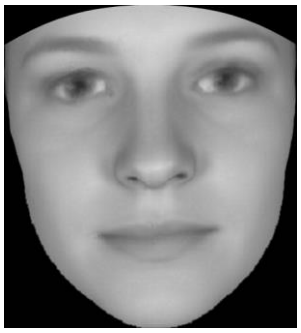


Typically developing



Autism Spectrum Disorder

Distractor images

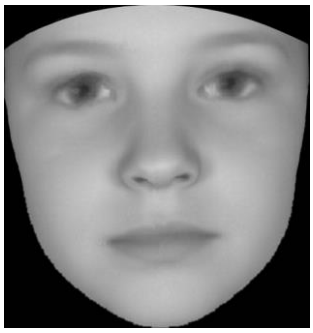


Female (20-years-old)

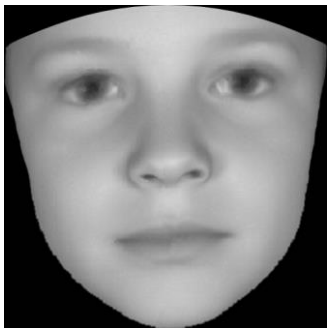
Male (20-years-old)

Female (16-years-old)

Male (16-years-old)

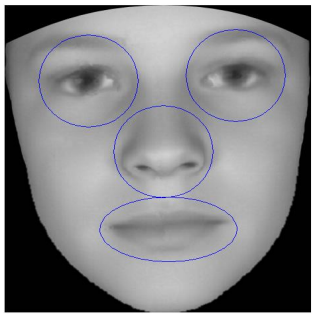


Female (8-years-old)

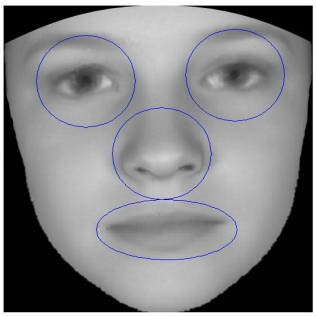


Male (80-years-old)

Typically developing images (12-years-old)

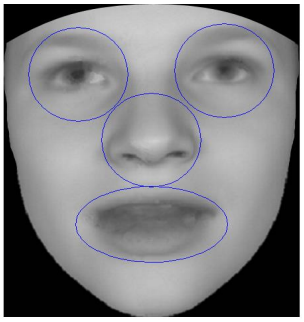


Male

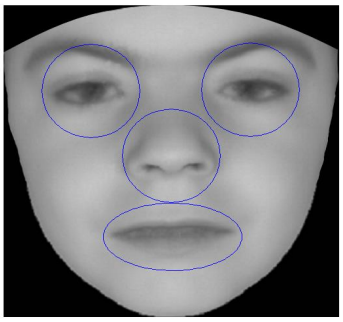


Female

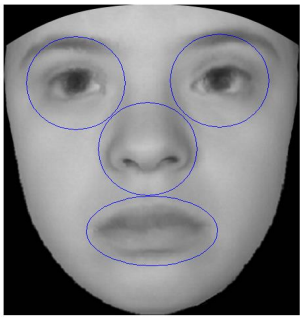
Genetic neurodevelopmental syndrome images (12-years-old)



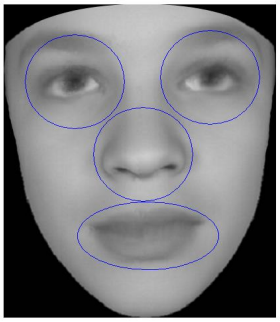
Angelman Syndrome



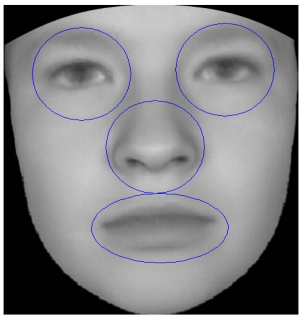
Cornelia de Lange Syndrome



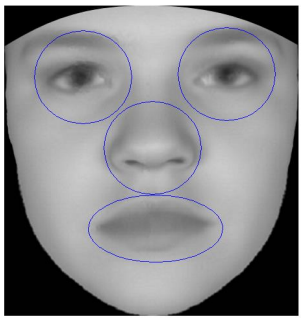
Down syndrome



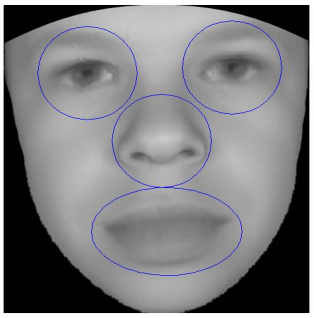
Fragile-X Syndrome



Prader-Willi Syndrome

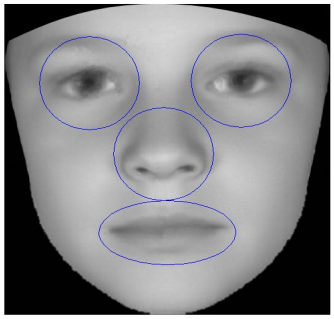


Smith-Magenis Syndrome

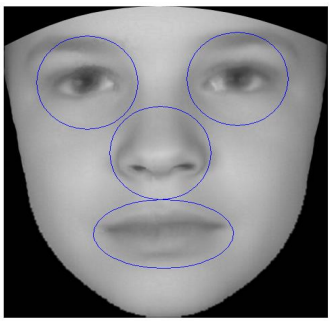


Williams Syndrome

ASD experiment (9-years-old)



Typically developing



Autism Spectrum Disorder

Appendix J Participant consent form

Participant Consent Form

BACKGROUND INFORMATION
Title: How does different facial morphology affect how faces are perceived by others?
Researchers: Craig Griffiths, Trainee Clinical Psychologist at the University of Leicester School of Psychology. This project is supervised by Dr Alice Welham, Clinical Lecturer.
Purpose of data collection: Doctoral research

Details of Participation: This is an eye-tracking experiment that will involve you looking naturally at a series of faces and then answering some questions about the faces using the mouse. To do this experiment you will be asked to sit at a desk with your head on a chin rest. It would be helpful if you could keep your head fairly still throughout.
To start, it is important that we take some time to set up the equipment so that it can accurately track where you look. This is likely to take up to ten minutes and involve you looking at different spots on the screen. Sometimes glasses, contact lenses, and dark make-up can interfere with the equipment, to do the experiment you may need to remove them.
Once the eye-tracker is set up, the experiment itself should not take longer than 30 minutes.

CONSENT STATEMENT

1. I understand that my participation is voluntary and that I may withdraw from the research at any time, without giving a reason, up until the data has been combined in an analysis and it will no longer be possible to identify individuals. It is anticipated that data analysis will begin after 1st May 2017 so it may not be possible to withdraw data from that date. Should you wish to withdraw your data from the research you may do so by emailing cg277@leicester.ac.uk, giving your name and date of birth.
2. I am aware of what my participation will involve.
3. My data are to be held confidentially and only Craig Griffiths and Alice Welham will have access to them.
4. My data will be kept electronically for a period of at least five years after the appearance of any associated publications. Any aggregate data (e.g. spreadsheets) will be kept in electronic form for up to one year, after which time they will be deleted.
5. In accordance with the requirements of some scientific journals and organisations, my coded data may be shared with other competent researchers. My coded data may also be used in other related studies. My name and other identifying details will not be shared with anyone.
6. The overall findings may be submitted for publication in a scientific journal, or presented at scientific conferences.
7. This study will take approximately 18 months to complete in total.
8. I will be able to obtain general information about the results of this research by contacting the researcher via email after July 2018

I am giving my consent for data to be used for the outlined purposes of the present study. All questions that I have about the research have been satisfactorily answered.

I agree to participate.
Participant's signature: _____ Date: _____

Participant's name (please print): _____

If you have further questions about this study, you may contact Craig Griffiths at cg277@leicester.ac.uk This study was reviewed by the University of Leicester Psychology Research Ethics Committee (PREC). You may contact the Chair of
PREC Professor Panos Vostanis at pv11@le.ac.uk if you have any questions or concerns regarding the ethics of this project.

Appendix K Informed and uninformed participant information sheets

Informed

Procedure and Brief

This eye-tracking experiment is interested in the judgments we make when we look at other human faces. While using the eye-tracker, you will be asked to look at two separate presentations of computer-modelled face images. The faces vary in several ways, such as age and sex. Several of the images represent the faces of people with a range of genetic conditions, the rest represent the faces of typically developing people.

In the first part of the experiment you will be asked to simply look at the face images. Each image is shown for a set amount of time so you need not do anything but look at the faces. The equipment will record what you look at, in what order you look at different features, and how long you look for. Please just look at the faces naturally.

In the second part of the experiment you will be asked to rate face images according to personality traits and other attributes. You will need to use the mouse for this part of the experiment. The eye-tracking equipment will continue to monitor what you look at, in what order, and for how long, whilst you complete this part of the task.

As the eye-tracking equipment is very sensitive to light, darkness, and colour, several experimental conditions must be carefully monitored and maintained:

1. You will need to keep your chin upon the headrest and your head still during the face image presentations. Once the machine has been calibrated, please keep skill until the first presentation is over. The machine is set to recalibrate before starting the second presentation, so you may relax in between.
2. The lab will have to be in darkness during the experiment. Please let the experimenter know if you are uncomfortable with completing the test in the dark.
3. Dark eye make-up could disrupt the eye-tracker. During calibration (when the machine is calibrated to follow you eye movements) it may fail if make-up is worn. Unfortunately, this would require that eye make-up be removed in order for the test to proceed. Please ask the experimenter for eye make-up remover if you do not have any.
4. The equipment is sensitive to the presence of glasses and contact lenses, which may prevent the equipment from working. This would show up during calibration if it is a problem. If your visual aids disrupt calibration, and you are confident you will be able to see the presentation in detail without visual aids, these may be removed and the test can continue. If not, it will not be possible to proceed with the experiment.

Uninformed

Procedure and Brief

This eye-tracking experiment is interested in the judgments we make when we look at other human faces. While using the eye-tracker, you will be asked to look at two separate presentations of computer-modelled face images. The faces vary in several ways, such as age and sex.

In the first part of the experiment you will be asked to simply look at the face images. Each image is shown for a set amount of time so you need not do anything but look at the faces. The equipment will record what you look at, in what order you look at different features, and how long you look for. Please just look at the faces naturally.

In the second part of the experiment you will be asked to rate face images according to personality traits and other attributes. You will need to use the mouse for this part of the experiment. The eye-tracking equipment will continue to monitor what you look at, in what order, and for how long, whilst you complete this part of the task.

As the eye-tracking equipment is very sensitive to light, darkness, and colour, several experimental conditions must be carefully monitored and maintained:

1. You will need to keep your chin upon the headrest and your head still during the face image presentations. Once the machine has been calibrated, please keep skill until the first presentation is over. The machine is set to recalibrate before starting the second presentation, so you may relax in between.
2. The lab will have to be in darkness during the experiment. Please let the experimenter know if you are uncomfortable with completing the test in the dark.
3. Dark eye make-up could disrupt the eye-tracker. During calibration (when the machine is calibrated to follow you eye movements) it may fail if make-up is worn. Unfortunately, this would require that eye make-up be removed in order for the test to proceed. Please ask the experimenter for eye make-up remover if you do not have any.
4. The equipment is sensitive to the presence of glasses and contact lenses, which may prevent the equipment from working. This would show up during calibration if it is a problem. If your visual aids disrupt calibration, and you are confident you will be able to see the presentation in detail without visual aids, these may be removed and the test can continue. If not, it will not be possible to proceed with the experiment.

Appendix L Computer procedure diagram

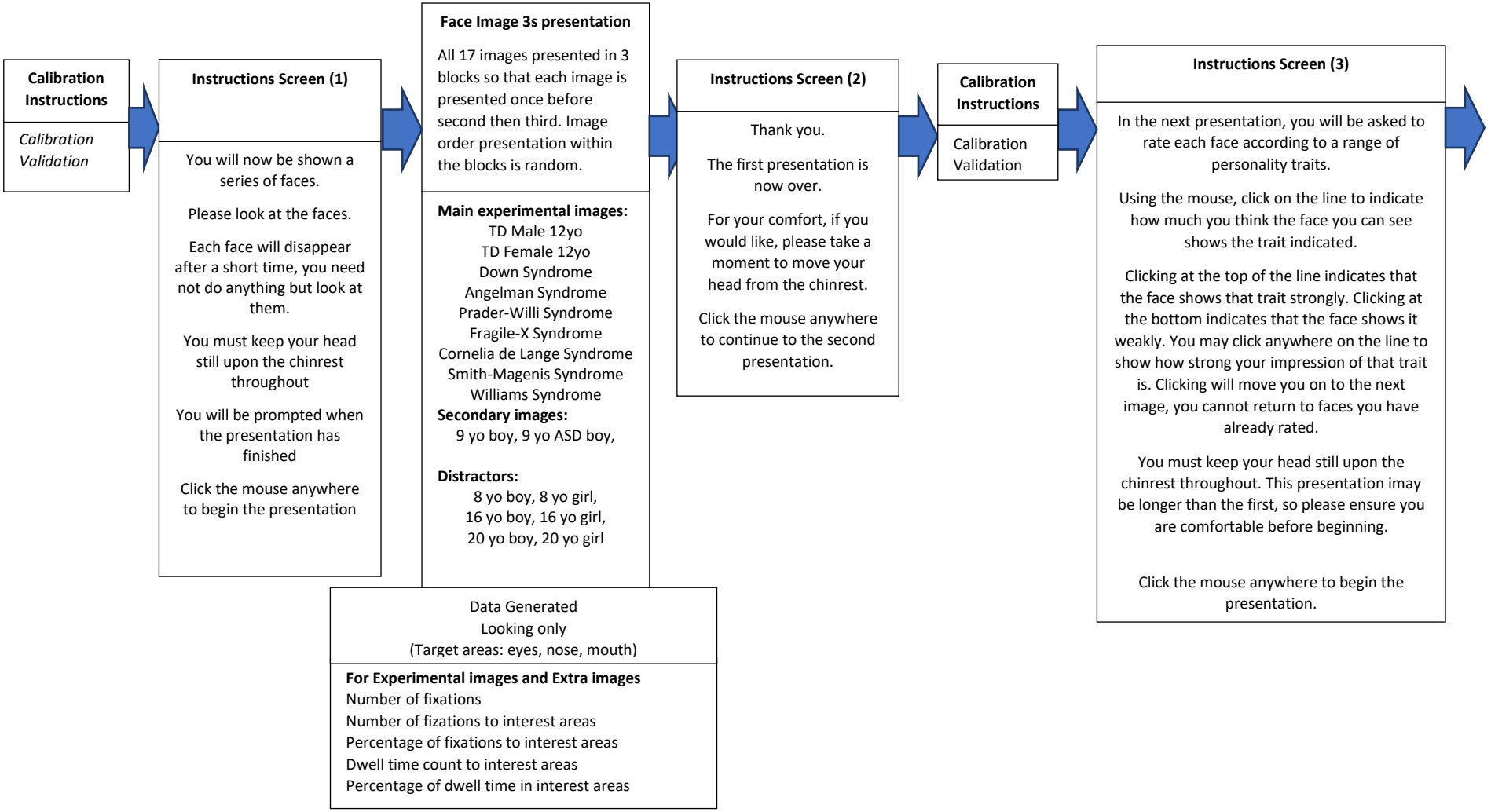


Figure 23 Computer procedure diagram 1

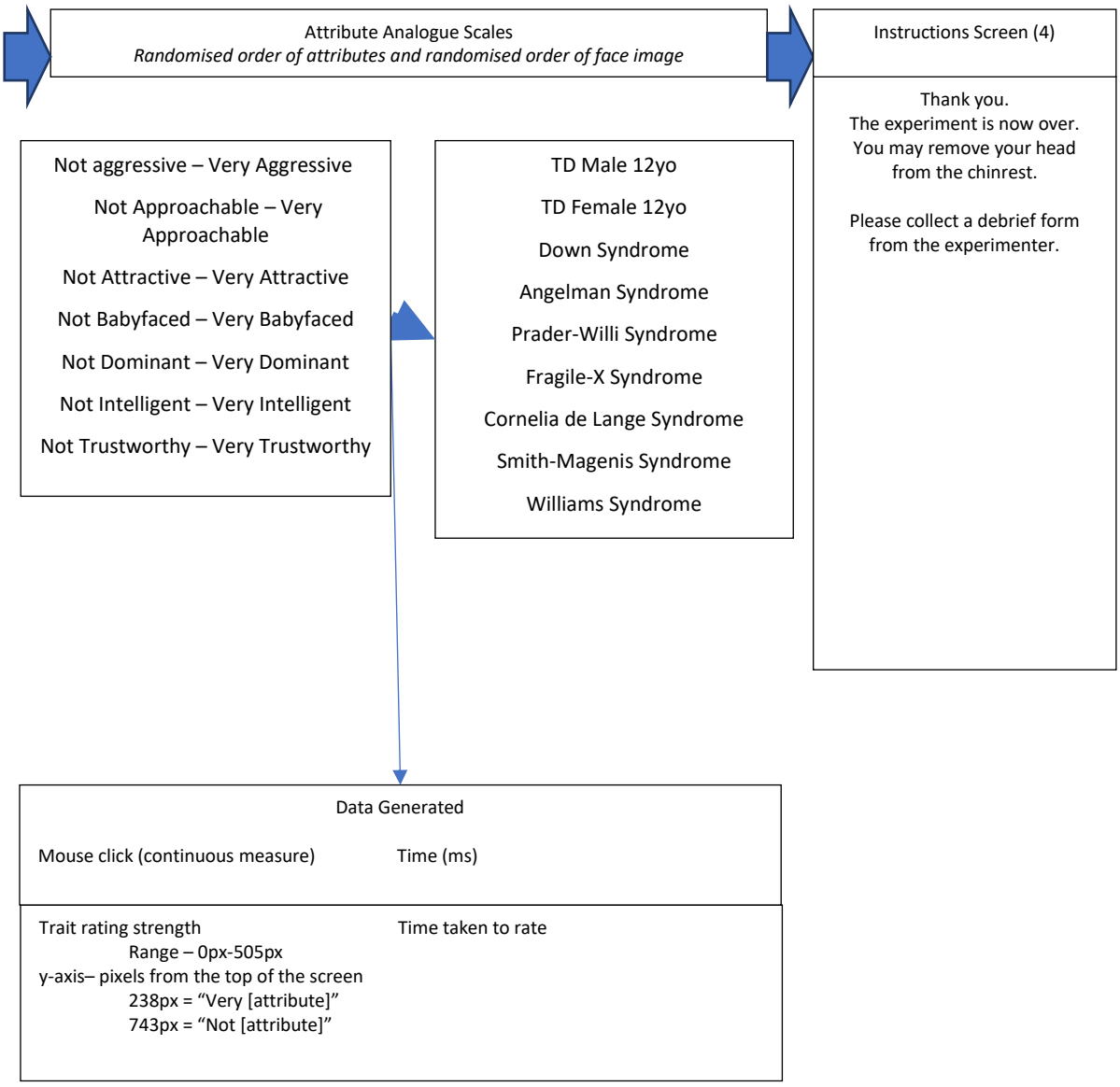


Figure 24 Computer procedure diagram 2

Appendix M Participant debrief form

Participant Information Sheet

What are the aims of the study?

We know from previous research that people make judgments about people based on what their faces look like. For example, faces with smaller eyes and stronger jawlines are judged as more dominant, and faces with bigger smiles are judged as more trustworthy (see, e.g. Vernon et al., 2014). This study aims to identify whether and in what ways people might make these types of judgments about people who have genetic disorders that reliably alter facial appearance. By looking at eye-tracking data, we hope to see whether people look at these face types differently, and whether this corresponds with different judgments. This might offer some insight into whether different judgments are automatic and unconscious, or if they are controllable (and potentially subject to social biases).

It is hoped that the information gathered in this project will help us to draw some conclusions that are relevant to the social treatment of people with genetic disorders including issues of discrimination.

Questions

- How can I contact the researcher if I have any further questions or if, for any reason, I wish to withdraw my data once I have left?

  Please email: cg277@le.ac.uk
- Can I obtain a summary of the results of the study? What form will this summary take?

  To obtain details of the results contact the researcher at cg277@le.ac.uk
- This study has raised personal issues that I am not comfortable discussing with the researcher now – what should I do? Support network details included below.

  If you feel you have been adversely affected by taking part in this study, and would like to speak to an independent support service you are advised to seek help from:

  The University of Leicester Student Counselling Service, 161 Welford Road.

  Telephone: + 44 (0) 116 223 1780

  E-mail: counselling@le.ac.uk

  Web: http://www2.le.ac.uk/offices/ssds/counselling
- I have concerns about this study, or the way in which it was conducted – who should I contact?

  In the first instance you should contact the supervisor of the project using the contact information provided above.

  Dr Alice Welham

  E-mail: akw12@leicester.ac.uk

  Clinical Lecturer

If your concerns are not dealt with then you can contact the Chair of the Psychology Research Ethics Sub-Committee in confidence by writing to:

Professor Panos Vostanis

E-mail: pv11@le.ac.uk

Chair of the Psychology Research Ethics Sub-Committee

School of Psychology

- Please feel free to ask the researcher any questions you might have prior to leaving the laboratory.

Appendix N Letters of ethical approval from the ethics committee

University Ethics Sub-Committee for Psychology

21/03/2017
Ethics Reference: [redacted]
TO:
Name of Researcher Applicant: Craig Griffiths
Department: [redacted]
Research Project Title: How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others?

Dear Craig Griffiths,
RE: Ethics review of Research Study application
The University Ethics Sub-Committee for Psychology has reviewed and discussed the above application.

1. Ethical opinion
The Sub-Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2. Summary of ethics review discussion
The Committee noted the following issues:
This application is approved.

3. General conditions of the ethical approval
The ethics approval is subject to the following general conditions being met prior to the start of the project:
As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.
If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4. Reporting requirements after ethical approval
You are expected to notify the Sub-Committee about:

- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5. Use of application information
Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Sub-Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.
Yours sincerely,
[redacted]
Chair

University Ethics Sub-Committee for Psychology

21/03/2017
Ethics Reference: [redacted]
TO:
Name of Researcher Applicant: Craig Griffiths
Department: [redacted]
Research Project Title: How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others?

Dear Craig Griffiths,
RE: Ethics review of Research Study application
The University Ethics Sub-Committee for Psychology has reviewed and discussed the above application.

1. Ethical opinion
The Sub-Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2. Summary of ethics review discussion
The Committee noted the following issues:
The amendment does not pose any additional ethical issues

3. General conditions of the ethical approval
The ethics approval is subject to the following general conditions being met prior to the start of the project:
As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.
If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4. Reporting requirements after ethical approval
You are expected to notify the Sub-Committee about:

- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5. Use of application information
Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Sub-Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.
Yours sincerely,

[redacted]
Chair

University Ethics Sub-Committee for Psychology

09/03/2018

Ethics Reference: [redacted]

TO:

Name of Researcher Applicant: Craig Griffiths

Department: [redacted]

Research Project Title: How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others? (Part 2)

Dear Craig Griffiths,

RE: Ethics review of Research Study application

The University Ethics Sub-Committee for Psychology has reviewed and discussed the above application.

1. Ethical opinion

The Sub-Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2. Summary of ethics review discussion

The Committee noted the following issues:

Ethical issues are appropriately addressed.

3. General conditions of the ethical approval

The ethics approval is subject to the following general conditions being met prior to the start of the project:

As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.

If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4. Reporting requirements after ethical approval

You are expected to notify the Sub-Committee about:

- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5. Use of application information

Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Sub-Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.

Yours sincerely,

[redacted]

Chair

09/03/2018
Ethics Reference: [redacted]
TO:
Name of Researcher Applicant: Craig Griffiths
Department: [redacted]
Research Project Title: How does the different facial morphology of children with a range of genetic neurodevelopmental syndromes affect how they are perceived by others? (Part 2)

Dear Craig Griffiths,
RE: Ethics review of Research Study application
The University Ethics Sub-Committee for Psychology has reviewed and discussed the above application.

1. Ethical opinion
The Sub-Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2. Summary of ethics review discussion
The Committee noted the following issues:
The amendment does not pose any ethics issues.

3. General conditions of the ethical approval
The ethics approval is subject to the following general conditions being met prior to the start of the project:
As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.
If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4. Reporting requirements after ethical approval
You are expected to notify the Sub-Committee about:

- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5. Use of application information
Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Sub-Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.
Yours sincerely,

[redacted]
Chair

Appendix O Chronology of research process

December 2015	Decision upon research project
January – April 2016	Development of research project & research contracting
May 2016	Submission of Research Proposal to DClinPsy
September 2016	Peer review of research project
November 2016	Lay review of research project
March 2017	Ethics approval for Part 1
July 2017	Ethics amendment approval for Part 1
September 2017	Ethics amendment approval for Part 1
October 2017 - November 2017	Data collection round 1
January 2018	Data collection round 2
February 2018	Data collection round 3
March 2018	Analysis of Part 1 data Write-up of Part 1 Development of Part 2 Ethics approval for Part 2 Ethics amendment approval for Part 2
April 2018	Decision to discontinue Part 2 Critical Appraial Further write-up and consolidation into a single report

Appendix P Output tables for TD male vs TD female comparisons

Table 46 TDm vs TDf - Trait ratings - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TD Female * Aggressiveness	97.66	58	78.249	10.275
	TD Male * Aggressiveness	136.52	58	90.854	11.930
Pair 2	TD Female * Approachability	387.69	58	68.185	8.953
	TD Male * Approachability	372.24	58	71.064	9.331
Pair 3	TD Female * Attractiveness	326.34	58	91.875	12.064
	TD Male * Attractiveness	314.53	58	92.784	12.183
Pair 4	TD Female * Babyfacedness	345.34	58	108.846	14.292
	TD Male * Babyfacedness	327.71	58	110.720	14.538
Pair 5	TD Female * Dominance	174.97	58	100.065	13.139
	TD Male * Dominance	202.28	58	96.508	12.672
Pair 6	TD Female * Intelligence	349.88	58	72.326	9.497
	TD Male * Intelligence	353.90	58	72.789	9.558
Pair 7	TD Female * Trustworthiness	370.83	58	83.854	11.011
	TD Male * Trustworthiness	365.02	58	64.101	8.417

Table 47 TDm vs TDf - Trait ratings - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
Typically Developing Female * Aggressiveness	Uninformed	.164	30	.038	.877	30	.002
	Informed	.190	28	.011	.901	28	.012
Typically Developing Female * Approachability	Uninformed	.092	30	.200*	.977	30	.741
	Informed	.206	28	.004	.929	28	.057
Typically Developing Female * Attractiveness	Uninformed	.217	30	.001	.820	30	.000
	Informed	.132	28	.200*	.937	28	.092
Typically Developing Female * Babyfacedness	Uninformed	.169	30	.028	.899	30	.008
	Informed	.155	28	.085	.927	28	.053
Typically Developing Female * Dominance	Uninformed	.124	30	.200*	.958	30	.282
	Informed	.173	28	.031	.929	28	.057
Typically Developing Female * Intelligence	Uninformed	.086	30	.200*	.976	30	.699
	Informed	.150	28	.105	.939	28	.103
Typically Developing Female * Trustworthiness	Uninformed	.209	30	.002	.882	30	.003
	Informed	.091	28	.200*	.961	28	.371
Typically Developing Male * Aggressiveness	Uninformed	.172	30	.024	.927	30	.042
	Informed	.147	28	.125	.940	28	.111
Typically Developing Male * Approachability	Uninformed	.102	30	.200*	.955	30	.227
	Informed	.155	28	.084	.866	28	.002
Typically Developing Male * Attractiveness	Uninformed	.222	30	.001	.845	30	.000
	Informed	.150	28	.108	.883	28	.005
Typically Developing Male * Babyfacedness	Uninformed	.207	30	.002	.887	30	.004
	Informed	.125	28	.200*	.953	28	.241
Typically Developing Male * Dominance	Uninformed	.072	30	.200*	.982	30	.865
	Informed	.182	28	.018	.904	28	.014
Typically Developing Male * Intelligence	Uninformed	.110	30	.200*	.962	30	.340
	Informed	.083	28	.200*	.979	28	.833

Typically Developing Male * Trustworthiness	Uninformed	.110	30	.200*	.943	30	.107
	Informed	.099	28	.200*	.980	28	.850

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 48 TDm vs TDf - Trait ratings - t-test

	Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference Lower	Upper			
TD Female * Aggressiveness - TD Male * Aggressiveness	-38.862	76.898	10.097	-59.081	-18.643	-3.849	57	.000
TD Female * Approachability - TD Male * Approachability	15.448	57.973	7.612	.205	30.692	2.029	57	.047
TD Female * Attractiveness - TD Male * Attractiveness	11.810	47.899	6.289	-.784	24.405	1.878	57	.066
TD Female * Babyfacedness - TD Male * Babyfacedness	17.638	82.548	10.839	-4.067	39.343	1.627	57	.109
TD Female * Dominance - TD Male * Dominance	-27.310	81.435	10.693	-48.722	-5.898	-2.554	57	.013
TD Female * Intelligence - TD Male * Intelligence	-4.017	73.900	9.704	-23.448	15.414	-.414	57	.680
TD Female * Trustworthiness - TD Male * Trustworthiness	5.810	74.810	9.823	-13.860	25.481	.592	57	.557

Table 49 TDm vs TDf - Rating time - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TD Female * Aggressiveness	3244.64	58	1290.444	169.444
	TD Male * Aggressiveness	3155.43	58	1479.930	194.324
Pair 2	TD Female * Approachability	2785.74	58	937.289	123.072
	TD Male * Approachability	3395.64	58	2887.008	379.083
Pair 3	TD Female * Attractiveness	3585.07	58	2259.021	296.624
	TD Male * Attractiveness	3426.60	58	1977.802	259.698
Pair 4	TD Female * Babyfacedness	3186.88	58	1638.214	215.108
	TD Male * Babyfacedness	3502.86	58	1663.234	218.393
Pair 5	TD Female * Dominance	3100.79	58	1493.667	196.128
	TD Male * Dominance	3355.67	58	1302.953	171.086
Pair 6	TD Female * Intelligence	3375.81	58	1972.636	259.020
	TD Male * Intelligence	3480.17	58	1645.831	216.108
Pair 7	TD Female * Trustworthiness	3071.36	58	1479.015	194.204
	TD Male * Trustworthiness	3124.40	58	1579.522	207.401

Table 50 TDm vs TDf - Rating time - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
Typically Developing Female * Aggressiveness	Informed	.117	30	.200*	.932	30	.056
	Uninformed	.132	28	.200*	.918	28	.031
Typically Developing Female * Approachability	Informed	.142	30	.127	.927	30	.040
	Uninformed	.154	28	.086	.934	28	.080
	Informed	.249	30	.000	.834	30	.000

Typically Developing Female * Attractiveness	Uninformed	.212	28	.002	.797	28	.000
Typically Developing Female * Babyfacedness	Informed	.136	30	.165	.882	30	.003
	Uninformed	.165	28	.048	.842	28	.001
Typically Developing Female * Dominance	Informed	.174	30	.021	.856	30	.001
	Uninformed	.162	28	.058	.836	28	.000
Typically Developing Female * Intelligence	Informed	.161	30	.047	.896	30	.007
	Uninformed	.219	28	.001	.720	28	.000
Typically Developing Female * Trustworthiness	Informed	.165	30	.037	.905	30	.011
	Uninformed	.165	28	.049	.839	28	.001
Typically Developing Male * Aggressiveness	Informed	.144	30	.114	.817	30	.000
	Uninformed	.129	28	.200*	.900	28	.011
Typically Developing Male * Approachability	Informed	.344	30	.000	.471	30	.000
	Uninformed	.191	28	.010	.820	28	.000
Typically Developing Male * Attractiveness	Informed	.162	30	.043	.880	30	.003
	Uninformed	.259	28	.000	.799	28	.000
Typically Developing Male * Babyfacedness	Informed	.142	30	.127	.921	30	.028
	Uninformed	.194	28	.009	.835	28	.000
Typically Developing Male * Dominance	Informed	.122	30	.200*	.948	30	.150
	Uninformed	.143	28	.149	.944	28	.142
Typically Developing Male * Intelligence	Informed	.133	30	.182	.899	30	.008
	Uninformed	.116	28	.200*	.925	28	.045
Typically Developing Male * Trustworthiness	Informed	.184	30	.011	.834	30	.000
	1	.173	28	.032	.899	28	.011

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 51 TDm vs TDf - Rating time - t-test

	Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference Lower	Upper			
TD Female * Aggressiveness - TD Male * Aggressiveness	89.207	1131.041	148.513	-208.185	386.599	.601	57	.550
TD Female * Approachability - TD Male * Approachability	-609.897	2811.311	369.143	-1349.093	129.300	-1.652	57	.104
TD Female * Attractiveness - TD Male * Attractiveness	158.466	1783.701	234.211	-310.535	627.466	.677	57	.501
TD Female * Babyfacedness - TD Male * Babyfacedness	-315.983	1740.029	228.477	-773.500	141.535	-1.383	57	.172
TD Female * Dominance - TD Male * Dominance	-254.879	1635.604	214.765	-684.939	175.181	-1.187	57	.240
TD Female * Intelligence - TD Male * Intelligence	-104.362	1814.287	238.228	-581.404	372.680	-.438	57	.663
TD Female * Trustworthiness - TD Male * Trustworthiness	-53.034	1333.671	175.120	-403.705	297.636	-.303	57	.763

Table 52 TDm vs TDf - Total fixation count - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TDf	8.1948	48	2.01641	.29104
	TDm	8.2846	48	1.95460	.28212

Table 53 TDm vs TDf - Total fixation count - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
TDf	Uninformed	.101	24	.200*	.955	24	.348
	Informed	.123	24	.200*	.946	24	.225
TDm	Uninformed	.177	24	.049	.923	24	.068
	Informed	.134	24	.200*	.957	24	.386

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 54 TDm vs TDf - Total fixation count - t-test

		Std.	Std. Error	95% CI of the Difference				
	Mean	Deviation	Mean	Lower	Upper			
TDf - TDm	-.08979	1.64559	.23752	-.56762	.38804	-.378	47	.707

Table 55 TDm vs TDf - Fixation count - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TDm_E	1.604167	48	.8425904	.1216175
	TDf_E	1.600694	48	.8126799	.1173002
Pair 2	TDm_N	2.861111	48	1.0469664	.1511166
	TDf_N	2.847222	48	1.1129123	.1606350
Pair 3	TDm_M	.868056	48	.8215179	.1185759
	TDf_M	.930556	48	.7340368	.1059491

Table 56 TDm vs TDf - Fixation count - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
TDm_E	Uninformed	.149	24	.179	.937	24	.138
	Informed	.144	24	.200*	.951	24	.291
TDm_N	Uninformed	.102	24	.200*	.973	24	.732
	Informed	.153	24	.150	.948	24	.249
TDm_M	Uninformed	.155	24	.139	.817	24	.001
	Informed	.167	24	.083	.902	24	.023
TDf_E	Uninformed	.138	24	.200*	.954	24	.327
	Informed	.161	24	.110	.947	24	.234
TDf_N	Uninformed	.173	24	.061	.937	24	.136
	Informed	.219	24	.004	.886	24	.011
TDf_M	Uninformed	.224	24	.003	.901	24	.023
	Informed	.141	24	.200*	.927	24	.084

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 57 TDm vs TDf - Fixation Count - t-test

		Std.	Std. Error	95% CI of the Difference				
	Mean	Deviation	Mean	Lower	Upper			
TDm_E - TDf_E	.0034722	.5879901	.0848691	-.1672623	.1742068	.041	47	.968
TDm_N - TDf_N	.0138889	.9892049	.1427794	-.2733463	.3011241	.097	47	.923
TDm_M - TDf_M	-.0625000	.7799383	.1125744	-.2889705	.1639705	-.555	47	.581

Table 58 TDm vs TDf - Fixation percent - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TDm_E	.183500	48	.0822014	.0118647
	TDf_E	.190848	48	.0889572	.0128399
Pair 2	TDm_N	.368457	48	.1502260	.0216833
	TDf_N	.372265	48	.1510944	.0218086
Pair 3	TDm_M	.107621	48	.1073317	.0154920
	TDf_M	.106856	48	.0833982	.0120375

Table 59 TDm vs TDf - Fixation percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
TDm_E	Uninformed	.096	24	.200*	.965	24	.557
	Informed	.156	24	.136	.904	24	.026
TDm_N	Uninformed	.165	24	.089	.964	24	.531
	Informed	.220	24	.004	.790	24	.000
TDm_M	Uninformed	.157	24	.132	.839	24	.001
	Informed	.180	24	.043	.818	24	.001
TDf_E	Uninformed	.101	24	.200*	.963	24	.506
	Informed	.198	24	.016	.905	24	.028
TDf_N	Uninformed	.099	24	.200*	.970	24	.661
	Informed	.213	24	.006	.850	24	.002
TDf_M	Uninformed	.169	24	.073	.937	24	.137
	Informed	.141	24	.200*	.930	24	.099

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 60 TDm vs TDf - Fixation percent - t-test

	Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference Lower	Upper			
TDm_E - TDf_E	-.0073479	.0626737	.0090462	-.0255465	.0108506	-.812	47	.421
TDm_N - TDf_N	-.0038076	.1133601	.0163621	-.0367240	.0291087	-.233	47	.817
TDm_M - TDf_M	.0007653	.1156425	.0166916	-.0328138	.0343443	.046	47	.964

Table 61 TDm vs TDf - Dwell counts - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TDm_E	539.743056	48	262.0095237	37.8178173
	TDf_E	565.402778	48	284.3397392	41.0409062
Pair 2	TDm_N	941.854167	48	492.6428123	71.1068651
	TDf_N	979.854167	48	534.5373507	77.1538208
Pair 3	TDm_M	344.548611	48	332.2309679	47.9534097
	TDf_M	295.791667	48	246.7177025	35.6106330

Table 62 TDm vs TDf - Dwell counts - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
TDm_E	Uninformed	.102	24	.200*	.971	24	.701
	Informed	.168	24	.079	.925	24	.075
TDm_N	Uninformed	.143	24	.200*	.947	24	.230
	Informed	.254	24	.000	.742	24	.000

TDm_M	Uninformed	.149	24	.184	.857	24	.003
	Informed	.163	24	.097	.864	24	.004
TDf_E	Uninformed	.112	24	.200*	.973	24	.753
	Informed	.186	24	.031	.906	24	.029
TDf_N	Uninformed	.137	24	.200*	.949	24	.255
	Informed	.212	24	.007	.793	24	.000
TDf_M	Uninformed	.150	24	.175	.921	24	.061
	Informed	.126	24	.200*	.922	24	.066

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 63 TDm vs TDf - Dwell counts - t-test

	Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference Lower	Upper			
TDm_E - TDf_E	-25.6597222	192.4097773	27.7719592	-81.5296977	30.2102532	-.924	47	.360
TDm_N - TDf_N	-38.0000000	348.2065431	50.2592854	-139.1086406	63.1086405	-.756	47	.453
TDm_M - TDf_M	48.7569444	322.9359167	46.6117846	-45.0138711	142.5277600	1.046	47	.301

Table 64 TDm vs TDf - Dwell percent - Descriptive statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TDm_E	.198473	48	.0950292	.0137163
	TDf_E	.207870	48	.1031869	.0148938
Pair 2	TDm_N	.344153	48	.1710629	.0246908
	TDf_N	.354113	48	.1822381	.0263038
Pair 3	TDm_M	.126222	48	.1194121	.0172356
	TDf_M	.107775	48	.0891839	.0128726

Table 65 TDm vs TDf - Dwell percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
TDm_E	Uninformed	.098	24	.200*	.974	24	.755
	Informed	.161	24	.109	.917	24	.051
TDm_N	Uninformed	.167	24	.081	.948	24	.247
	Informed	.235	24	.001	.782	24	.000
TDm_M	Uninformed	.160	24	.115	.861	24	.004
	Informed	.172	24	.064	.878	24	.008
TDf_E	Uninformed	.102	24	.200*	.988	24	.990
	Informed	.177	24	.049	.915	24	.046
TDf_N	Uninformed	.170	24	.073	.948	24	.250
	Informed	.187	24	.030	.815	24	.001
TDf_M	Uninformed	.157	24	.127	.919	24	.056
	Informed	.129	24	.200*	.919	24	.057

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 66 TDm vs TDf - Dwell percent - t-test

	Mean	Std. Deviation	Std. Error Mean	95% CI of the Difference Lower	Upper			
TDm_E - TDf_E	-.0093972	.0696947	.0100596	-.0296344	.0108400	-.934	47	.355
TDm_N - TDf_N	-.0099590	.1237052	.0178553	-.0458793	.0259612	-.558	47	.580
TDm_M - TDf_M	.0184465	.1147382	.0165610	-.0148700	.0517630	1.114	47	.271

Appendix Q GNS - Experiment data tables – Trait ratings

Table 67 GNS – Trait ratings - Normality tests

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
Angelman Syndrome * Aggressiveness	Uninformed	.168	30	.030	.894	30	.006
	Informed	.168	28	.042	.917	28	.028
Angelman Syndrome * Approachability	Uninformed	.134	30	.176	.972	30	.582
	Informed	.143	28	.150	.922	28	.039
Angelman Syndrome * Attractiveness	Uninformed	.116	30	.200*	.950	30	.169
	Informed	.138	28	.188	.946	28	.161
Angelman Syndrome * Babyfacedness	Uninformed	.151	30	.078	.926	30	.040
	Informed	.106	28	.200*	.965	28	.466
Angelman Syndrome * Dominance	Uninformed	.128	30	.200*	.951	30	.175
	Informed	.109	28	.200*	.952	28	.220
Angelman Syndrome * Intelligence	Uninformed	.141	30	.130	.946	30	.129
	Informed	.143	28	.151	.942	28	.127
Angelman Syndrome * Trustworthiness	Uninformed	.179	30	.015	.938	30	.082
	Informed	.111	28	.200*	.961	28	.363
Cornelia de Lange Syndrome * Aggressiveness	Uninformed	.195	30	.005	.918	30	.024
	Informed	.167	28	.044	.938	28	.099
Cornelia de Lange Syndrome * Approachability	Uninformed	.128	30	.200*	.899	30	.008
	Informed	.139	28	.179	.878	28	.004
Cornelia de Lange Syndrome * Attractiveness	Uninformed	.134	30	.180	.894	30	.006
	Informed	.080	28	.200*	.971	28	.605
Cornelia de Lange Syndrome * Babyfacedness	Uninformed	.121	30	.200*	.940	30	.090
	Informed	.141	28	.166	.924	28	.044
Cornelia de Lange Syndrome * Dominance	Uninformed	.225	30	.000	.852	30	.001
	Informed	.196	28	.007	.879	28	.004
Cornelia de Lange Syndrome * Intelligence	Uninformed	.103	30	.200*	.941	30	.099
	Informed	.188	28	.013	.918	28	.031
Cornelia de Lange Syndrome * Trustworthiness	Uninformed	.122	30	.200*	.951	30	.184
	Informed	.089	28	.200*	.969	28	.543
Down Syndrome * Aggressiveness	Uninformed	.098	30	.200*	.963	30	.374
	Informed	.099	28	.200*	.965	28	.453
Down Syndrome * Approachability	Uninformed	.087	30	.200*	.974	30	.653
	Informed	.118	28	.200*	.972	28	.636
Down Syndrome * Attractiveness	Uninformed	.073	30	.200*	.986	30	.959
	Informed	.088	28	.200*	.977	28	.784
Down Syndrome * Babyfacedness	Uninformed	.111	30	.200*	.962	30	.349
	Informed	.073	28	.200*	.972	28	.623
Down Syndrome * Dominance	Uninformed	.144	30	.113	.941	30	.098
	Informed	.129	28	.200*	.928	28	.055
Down Syndrome * Intelligence	Uninformed	.098	30	.200*	.970	30	.528
	Informed	.089	28	.200*	.978	28	.795
Down Syndrome * Trustworthiness	Uninformed	.084	30	.200*	.989	30	.988
	Informed	.123	28	.200*	.958	28	.305

Fragile-X Syndrome * Aggressiveness	Uninformed	.127	30	.200*	.944	30	.119
	Informed	.080	28	.200*	.970	28	.586
Fragile-X Syndrome * Approachability	Uninformed	.091	30	.200*	.971	30	.565
	Informed	.112	28	.200*	.968	28	.530
Fragile-X Syndrome * Attractiveness	Uninformed	.101	30	.200*	.976	30	.715
	Informed	.132	28	.200*	.961	28	.372
Fragile-X Syndrome * Babyfacedness	Uninformed	.110	30	.200*	.962	30	.357
	Informed	.140	28	.171	.951	28	.210
Fragile-X Syndrome * Dominance	Uninformed	.113	30	.200*	.981	30	.847
	Informed	.127	28	.200*	.948	28	.173
Fragile-X Syndrome * Intelligence	Uninformed	.113	30	.200*	.955	30	.227
	Informed	.122	28	.200*	.955	28	.257
Fragile-X Syndrome * Trustworthiness	Uninformed	.115	30	.200*	.976	30	.705
	Informed	.114	28	.200*	.969	28	.558
Prader-Willi Syndrome * Aggressiveness	Uninformed	.114	30	.200*	.968	30	.499
	Informed	.184	28	.017	.940	28	.112
Prader-Willi Syndrome * Approachability	Uninformed	.062	30	.200*	.995	30	1.000
	Informed	.094	28	.200*	.970	28	.572
Prader-Willi Syndrome * Attractiveness	Uninformed	.086	30	.200*	.980	30	.835
	Informed	.123	28	.200*	.958	28	.307
Prader-Willi Syndrome * Babyfacedness	Uninformed	.151	30	.081	.960	30	.309
	Informed	.154	28	.088	.919	28	.032
Prader-Willi Syndrome * Dominance	Uninformed	.151	30	.080	.920	30	.027
	Informed	.097	28	.200*	.966	28	.482
Prader-Willi Syndrome * Intelligence	Uninformed	.072	30	.200*	.979	30	.800
	Informed	.111	28	.200*	.955	28	.258
Prader-Willi Syndrome * Trustworthiness	Uninformed	.082	30	.200*	.976	30	.704
	Informed	.094	28	.200*	.982	28	.886
Smith-Magenis Syndrome * Aggressiveness	Uninformed	.103	30	.200*	.967	30	.463
	Informed	.105	28	.200*	.971	28	.610
Smith-Magenis Syndrome * Approachability	Uninformed	.121	30	.200*	.953	30	.201
	Informed	.113	28	.200*	.965	28	.454
Smith-Magenis Syndrome * Attractiveness	Uninformed	.120	30	.200*	.962	30	.348
	Informed	.098	28	.200*	.970	28	.579
Smith-Magenis Syndrome * Babyfacedness	Uninformed	.124	30	.200*	.968	30	.481
	Informed	.108	28	.200*	.966	28	.481
Smith-Magenis Syndrome * Dominance	Uninformed	.203	30	.003	.923	30	.031
	Informed	.147	28	.126	.899	28	.011
Smith-Magenis Syndrome * Intelligence	Uninformed	.086	30	.200*	.957	30	.261
	Informed	.169	28	.040	.936	28	.086
Smith-Magenis Syndrome * Trustworthiness	Uninformed	.157	30	.057	.948	30	.149
	Informed	.145	28	.134	.945	28	.149
Williams Syndrome * Aggressiveness	Uninformed	.135	30	.174	.945	30	.123
	Informed	.114	28	.200*	.945	28	.148
Williams Syndrome * Approachability	Uninformed	.139	30	.142	.944	30	.117
	Informed	.102	28	.200*	.958	28	.307
Williams Syndrome * Attractiveness	Uninformed	.125	30	.200*	.951	30	.183
	Informed	.156	28	.079	.954	28	.245

Williams Syndrome * Babyfacedness	Uninformed	.085	30	.200*	.960	30	.306
	Informed	.121	28	.200*	.948	28	.177
Williams Syndrome * Dominance	Uninformed	.127	30	.200*	.945	30	.120
	Informed	.087	28	.200*	.966	28	.483
Williams Syndrome * Intelligence	Uninformed	.096	30	.200*	.973	30	.610
	Informed	.130	28	.200*	.955	28	.269
Williams Syndrome * Trustworthiness	Uninformed	.112	30	.200*	.985	30	.931
	Informed	.101	28	.200*	.979	28	.837
Typically Developing Female * Aggressiveness	Uninformed	.164	30	.038	.877	30	.002
	Informed	.190	28	.011	.901	28	.012
Typically Developing Female * Approachability	Uninformed	.092	30	.200*	.977	30	.741
	Informed	.206	28	.004	.929	28	.057
Typically Developing Female * Attractiveness	Uninformed	.217	30	.001	.820	30	.000
	Informed	.132	28	.200*	.937	28	.092
Typically Developing Female * Babyfacedness	Uninformed	.169	30	.028	.899	30	.008
	Informed	.155	28	.085	.927	28	.053
Typically Developing Female * Dominance	Uninformed	.124	30	.200*	.958	30	.282
	Informed	.173	28	.031	.929	28	.057
Typically Developing Female * Intelligence	Uninformed	.086	30	.200*	.976	30	.699
	Informed	.150	28	.105	.939	28	.103
Typically Developing Female * Trustworthiness	Uninformed	.209	30	.002	.882	30	.003
	Informed	.091	28	.200*	.961	28	.371
Typically Developing Male * Aggressiveness	Uninformed	.172	30	.024	.927	30	.042
	Informed	.147	28	.125	.940	28	.111
Typically Developing Male * Approachability	Uninformed	.102	30	.200*	.955	30	.227
	Informed	.155	28	.084	.866	28	.002
Typically Developing Male * Attractiveness	Uninformed	.222	30	.001	.845	30	.000
	Informed	.150	28	.108	.883	28	.005
Typically Developing Male * Babyfacedness	Uninformed	.207	30	.002	.887	30	.004
	Informed	.125	28	.200*	.953	28	.241
Typically Developing Male * Dominance	Uninformed	.072	30	.200*	.982	30	.865
	Informed	.182	28	.018	.904	28	.014
Typically Developing Male * Intelligence	Uninformed	.110	30	.200*	.962	30	.340
	Informed	.083	28	.200*	.979	28	.833
Typically Developing Male * Trustworthiness	Uninformed	.110	30	.200*	.943	30	.107
	Informed	.099	28	.200*	.980	28	.850

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 68 GNS - Trait ratings - Aggressiveness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Aggressiveness	58	2	400	201.38	127.483
Cornelia de Lange Syndrome * Aggressiveness	58	128	499	360.03	99.542
Down Syndrome * Aggressiveness	58	11	435	178.86	107.289
Fragile-X Syndrome * Aggressiveness	58	8	459	159.05	101.101
Prader-Willi Syndrome * Aggressiveness	58	34	491	271.81	102.521
Smith-Magenis Syndrome * Aggressiveness	58	43	452	237.31	92.414
Williams Syndrome * Aggressiveness	58	20	449	238.21	122.501

Typically Developing Female * Aggressiveness	58	4	372	97.66	78.249
Typically Developing Male * Aggressiveness	58	2	364	136.52	90.854
Valid N (listwise)	58				

Table 69 GNS - Trait ratings - Aggressiveness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.250	73.628	35	.000	.765	.884	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 70 GNS - Trait ratings - Aggressiveness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	2858236.001	8	357279.500	48.090	.000
	Greenhouse-Geisser	2858236.001	6.119	467136.071	48.090	.000
	Huynh-Feldt	2858236.001	7.074	404024.960	48.090	.000
	Lower-bound	2858236.001	1.000	2858236.001	48.090	.000
face_type * I_OR_U	Sphericity Assumed	159179.158	8	19897.395	2.678	.007
	Greenhouse-Geisser	159179.158	6.119	26015.461	2.678	.014
	Huynh-Feldt	159179.158	7.074	22500.715	2.678	.010
	Lower-bound	159179.158	1.000	159179.158	2.678	.107
Error(face_type)	Sphericity Assumed	3328378.348	448	7429.416		
	Greenhouse-Geisser	3328378.348	342.644	9713.818		
	Huynh-Feldt	3328378.348	396.167	8401.460		
	Lower-bound	3328378.348	56.000	59435.328		

Table 71 GNS - Trait ratings - Aggressiveness - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Aggressiveness	4.46
Cornelia de Lange Syndrome * Aggressiveness	8.13
Down Syndrome * Aggressiveness	4.33
Fragile-X Syndrome * Aggressiveness	4.12
Prader-Willi Syndrome * Aggressiveness	6.95
Smith-Magenis Syndrome * Aggressiveness	5.83
Williams Syndrome * Aggressiveness	5.66
Typically Developing Female * Aggressiveness	2.22

Typically Developing Male * Aggressiveness	3.31

Test Statistics[a]

N	58
Chi-Square	207.761
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 72 GNS – Trait ratings - Aggressiveness - Within subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	229780.576	1	229780.576	13.587	.001
	Level 2 vs. Level 9	2876578.552	1	2876578.552	147.983	.000
	Level 3 vs. Level 9	98863.662	1	98863.662	5.179	.027
	Level 4 vs. Level 9	26232.810	1	26232.810	1.824	.182
	Level 5 vs. Level 9	1047226.414	1	1047226.414	71.136	.000
	Level 6 vs. Level 9	580607.622	1	580607.622	44.538	.000
	Level 7 vs. Level 9	578014.519	1	578014.519	31.966	.000
	Level 8 vs. Level 9	88533.189	1	88533.189	14.823	.000
face_type * I_OR_U	Level 1 vs. Level 9	172618.851	1	172618.851	10.207	.002
	Level 2 vs. Level 9	22708.552	1	22708.552	1.168	.284
	Level 3 vs. Level 9	52100.696	1	52100.696	2.729	.104
	Level 4 vs. Level 9	76701.086	1	76701.086	5.333	.025
	Level 5 vs. Level 9	34533.586	1	34533.586	2.346	.131
	Level 6 vs. Level 9	22607.622	1	22607.622	1.734	.193
	Level 7 vs. Level 9	158126.519	1	158126.519	8.745	.005
	Level 8 vs. Level 9	2594.982	1	2594.982	.434	.512
Error(face_type)	Level 1 vs. Level 9	947036.045	56	16911.358		
	Level 2 vs. Level 9	1088559.931	56	19438.570		
	Level 3 vs. Level 9	1069000.407	56	19089.293		
	Level 4 vs. Level 9	805391.345	56	14381.988		
	Level 5 vs. Level 9	824400.431	56	14721.436		
	Level 6 vs. Level 9	730023.895	56	13036.141		
	Level 7 vs. Level 9	1012591.895	56	18081.998		
	Level 8 vs. Level 9	334463.914	56	5972.570		

Table 73 Trait ratings - Aggressiveness - Between subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2525948.809	1	2525948.809	639.508	.000
I_OR_U	1379.608	1	1379.608	.349	.557
Error	221190.420	56	3949.829		

Table 74 GNS - Trait ratings - Aggressiveness - Wilcoxon test statistics

	TDm*Agg - AS*Agg	TDm*Agg-CDLS*Agg	TDm*Agg - DS*Agg	TDm*Agg-FXS*Agg	TDm*Agg-PWS*Agg	TDm*Agg-SMS*Agg	TDm*Agg -WS*Agg	TDm*Agg - TDf*Agg
Z	-3.126[b]	-6.310[b]	-2.152[b]	-1.161[b]	-6.058[b]	-5.232[b]	-4.572[b]	-3.550[c]

Asymp. Sig. (2-tailed)	.002	.000	.031	.245	.000	.000	.000	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 75 GNS - Trait ratings - Aggressiveness – Wilcoxon test ranks

		Ranks		
		N	Mean Rank	Sum of Ranks
Typically Developing Male * Aggressiveness - Angelman Syndrome * Aggressiveness	Negative Ranks	36[a]	33.89	1220.00
	Positive Ranks	21[b]	20.62	433.00
	Ties	1[c]		
	Total	58		
Typically Developing Male * Aggressiveness - Cornelia de Lange Syndrome * Aggressiveness	Negative Ranks	54[d]	30.94	1670.50
	Positive Ranks	4[e]	10.13	40.50
	Ties	0[f]		
	Total	58		
Typically Developing Male * Aggressiveness - Down Syndrome * Aggressiveness	Negative Ranks	39[g]	29.06	1133.50
	Positive Ranks	19[h]	30.39	577.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Aggressiveness - Fragile-X Syndrome * Aggressiveness	Negative Ranks	35[j]	28.73	1005.50
	Positive Ranks	23[k]	30.67	705.50
	Ties	0[l]		
	Total	58		
Typically Developing Male * Aggressiveness - Prader-Willi Syndrome * Aggressiveness	Negative Ranks	54[m]	30.33	1638.00
	Positive Ranks	4[n]	18.25	73.00
	Ties	0[o]		
	Total	58		
Typically Developing Male * Aggressiveness - Smith-Magenis Syndrome * Aggressiveness	Negative Ranks	47[p]	31.60	1485.00
	Positive Ranks	10[q]	16.80	168.00
	Ties	1[r]		
	Total	58		
Typically Developing Male * Aggressiveness - Williams Syndrome * Aggressiveness	Negative Ranks	47[s]	30.77	1446.00
	Positive Ranks	11[t]	24.09	265.00
	Ties	0[u]		
	Total	58		
Typically Developing Male * Aggressiveness - Typically Developing Female * Aggressiveness	Negative Ranks	17[v]	23.35	397.00
	Positive Ranks	41[w]	32.05	1314.00
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Aggressiveness < Angelman Syndrome * Aggressiveness
b. Typically Developing Male * Aggressiveness > Angelman Syndrome * Aggressiveness
c. Typically Developing Male * Aggressiveness = Angelman Syndrome * Aggressiveness
d. Typically Developing Male * Aggressiveness < Cornelia de Lange Syndrome * Aggressiveness
e. Typically Developing Male * Aggressiveness > Cornelia de Lange Syndrome * Aggressiveness
f. Typically Developing Male * Aggressiveness = Cornelia de Lange Syndrome * Aggressiveness
g. Typically Developing Male * Aggressiveness < Down Syndrome * Aggressiveness
h. Typically Developing Male * Aggressiveness > Down Syndrome * Aggressiveness
i. Typically Developing Male * Aggressiveness = Down Syndrome * Aggressiveness
j. Typically Developing Male * Aggressiveness < Fragile-X Syndrome * Aggressiveness
k. Typically Developing Male * Aggressiveness > Fragile-X Syndrome * Aggressiveness
l. Typically Developing Male * Aggressiveness = Fragile-X Syndrome * Aggressiveness
m. Typically Developing Male * Aggressiveness < Prader-Willi Syndrome * Aggressiveness
n. Typically Developing Male * Aggressiveness > Prader-Willi Syndrome * Aggressiveness
o. Typically Developing Male * Aggressiveness = Prader-Willi Syndrome * Aggressiveness
p. Typically Developing Male * Aggressiveness < Smith-Magenis Syndrome * Aggressiveness

q. Typically Developing Male * Aggressiveness > Smith-Magenis Syndrome * Aggressiveness
r. Typically Developing Male * Aggressiveness = Smith-Magenis Syndrome * Aggressiveness
s. Typically Developing Male * Aggressiveness < Williams Syndrome * Aggressiveness
t. Typically Developing Male * Aggressiveness > Williams Syndrome * Aggressiveness
u. Typically Developing Male * Aggressiveness = Williams Syndrome * Aggressiveness
v. Typically Developing Male * Aggressiveness < Typically Developing Female * Aggressiveness
w. Typically Developing Male * Aggressiveness > Typically Developing Female * Aggressiveness
x. Typically Developing Male * Aggressiveness = Typically Developing Female * Aggressiveness

Table 76 GNS - Trait ratings - Aggressiveness - Facetype x Information interaction ranks

		Ranks		
		N	Mean Rank	Sum of Ranks
Typically Developing Male * Aggressiveness - Angelman Syndrome * Aggressiveness	Negative Ranks	8[a]	7.50	60.00
	Positive Ranks	20[b]	17.30	346.00
	Ties	0[c]		
	Total	28		
Typically Developing Male * Aggressiveness - Cornelia de Lange Syndrome * Aggressiveness	Negative Ranks	13[d]	12.38	161.00
	Positive Ranks	15[e]	16.33	245.00
	Ties	0[f]		
	Total	28		
Typically Developing Male * Aggressiveness - Down Syndrome * Aggressiveness	Negative Ranks	8[g]	13.13	105.00
	Positive Ranks	20[h]	15.05	301.00
	Ties	0[i]		
	Total	28		
Typically Developing Male * Aggressiveness - Fragile-X Syndrome * Aggressiveness	Negative Ranks	6[j]	10.50	63.00
	Positive Ranks	22[k]	15.59	343.00
	Ties	0[l]		
	Total	28		
Typically Developing Male * Aggressiveness - Prader-Willi Syndrome * Aggressiveness	Negative Ranks	8[m]	14.00	112.00
	Positive Ranks	20[n]	14.70	294.00
	Ties	0[o]		
	Total	28		
Typically Developing Male * Aggressiveness - Smith-Magenis Syndrome * Aggressiveness	Negative Ranks	13[p]	10.38	135.00
	Positive Ranks	15[q]	18.07	271.00
	Ties	0[r]		
	Total	28		
Typically Developing Male * Aggressiveness - Williams Syndrome * Aggressiveness	Negative Ranks	6[s]	10.00	60.00
	Positive Ranks	22[t]	15.73	346.00
	Ties	0[u]		
	Total	28		
Typically Developing Male * Aggressiveness - Typically Developing Female * Aggressiveness	Negative Ranks	16[v]	11.06	177.00
	Positive Ranks	12[w]	19.08	229.00
	Ties	0[x]		
	Total	28		

a. Typically Developing Male * Aggressiveness < Angelman Syndrome * Aggressiveness
b. Typically Developing Male * Aggressiveness > Angelman Syndrome * Aggressiveness
c. Typically Developing Male * Aggressiveness = Angelman Syndrome * Aggressiveness
d. Typically Developing Male * Aggressiveness < Cornelia de Lange Syndrome * Aggressiveness
e. Typically Developing Male * Aggressiveness > Cornelia de Lange Syndrome * Aggressiveness
f. Typically Developing Male * Aggressiveness = Cornelia de Lange Syndrome * Aggressiveness
g. Typically Developing Male * Aggressiveness < Down Syndrome * Aggressiveness
h. Typically Developing Male * Aggressiveness > Down Syndrome * Aggressiveness
i. Typically Developing Male * Aggressiveness = Down Syndrome * Aggressiveness
j. Typically Developing Male * Aggressiveness < Fragile-X Syndrome * Aggressiveness
k. Typically Developing Male * Aggressiveness > Fragile-X Syndrome * Aggressiveness
l. Typically Developing Male * Aggressiveness = Fragile-X Syndrome * Aggressiveness
m. Typically Developing Male * Aggressiveness < Prader-Willi Syndrome * Aggressiveness
n. Typically Developing Male * Aggressiveness > Prader-Willi Syndrome * Aggressiveness
o. Typically Developing Male * Aggressiveness = Prader-Willi Syndrome * Aggressiveness

p. Typically Developing Male * Aggressiveness < Smith-Magenis Syndrome * Aggressiveness
q. Typically Developing Male * Aggressiveness > Smith-Magenis Syndrome * Aggressiveness
r. Typically Developing Male * Aggressiveness = Smith-Magenis Syndrome * Aggressiveness
s. Typically Developing Male * Aggressiveness < Williams Syndrome * Aggressiveness
t. Typically Developing Male * Aggressiveness > Williams Syndrome * Aggressiveness
u. Typically Developing Male * Aggressiveness = Williams Syndrome * Aggressiveness
v. Typically Developing Male * Aggressiveness < Typically Developing Female * Aggressiveness
w. Typically Developing Male * Aggressiveness > Typically Developing Female * Aggressiveness
x. Typically Developing Male * Aggressiveness = Typically Developing Female * Aggressiveness

Table 77 GNS - Trait ratings - Aggressiveness Facetype x Information interaction statistics

Test Statistics[a]								
	TDm * AS	TDm * CdLS	TDm * DS	TDm * FXS	TDm * PWS	TDm * SMS	TDm * WS	TDm * TDf
Z	-3.256[b]	-.956[b]	-2.232[b]	-3.188[b]	-2.072[b]	-1.548[b]	-3.256[b]	-.592[b]
Asymp. Sig. (2-tailed)	.001	.339	.026	.001	.038	.122	.001	.554

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Table 78 GNS - Trait ratings - Approachability - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Approachability	58	16	499	254.90	119.374
Cornelia de Lange Syndrome * Approachability	58	3	467	118.17	102.321
Down Syndrome * Approachability	58	19	495	242.12	107.389
Fragile-X Syndrome * Approachability	58	98	497	316.12	88.590
Prader-Willi Syndrome * Approachability	58	10	473	186.88	92.225
Smith-Magenis Syndrome * Approachability	58	47	489	243.24	96.589
Williams Syndrome * Approachability	58	60	492	242.69	108.400
Typically Developing Female * Approachability	58	162	500	387.69	68.185
Typically Developing Male * Approachability	58	105	502	372.24	71.064
Valid N (listwise)	58				

Table 79 GNS - Trait ratings - Approachability - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.180	91.223	35	.000	.736	.847	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 80 GNS - Trait ratings - Approachability - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	3361628.839	8	420203.605	64.490	.000
	Greenhouse-Geisser	3361628.839	5.891	570621.602	64.490	.000
	Huynh-Feldt	3361628.839	6.779	495888.459	64.490	.000
	Lower-bound	3361628.839	1.000	3361628.839	64.490	.000
	Sphericity Assumed	74594.150	8	9324.269	1.431	.181

face_type * I_OR_U	Greenhouse-Geisser	74594.150	5.891	12662.026	1.431	.203
	Huynh-Feldt	74594.150	6.779	11003.707	1.431	.193
	Lower-bound	74594.150	1.000	74594.150	1.431	.237
Error(face_type)	Sphericity Assumed	2919076.835	448	6515.797		
	Greenhouse-Geisser	2919076.835	329.906	8848.221		
	Huynh-Feldt	2919076.835	379.624	7689.387		
	Lower-bound	2919076.835	56.000	52126.372		

Table 81 GNS - Trait ratings - Approachability - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Approachability	5.03
Cornelia de Lange Syndrome * Approachability	1.61
Down Syndrome * Approachability	4.35
Fragile-X Syndrome * Approachability	6.56
Prader-Willi Syndrome * Approachability	3.16
Smith-Magenis Syndrome * Approachability	4.59
Williams Syndrome * Approachability	4.38
Typically Developing Female * Approachability	7.91
Typically Developing Male * Approachability	7.40

Test Statistics[a]

	58
Chi-Square	251.765
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 82 GNS - Trait ratings - Approachability - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	798060.958	1	798060.958	39.243	.000
	Level 2 vs. Level 9	3725646.345	1	3725646.345	256.822	.000
	Level 3 vs. Level 9	969357.823	1	969357.823	73.269	.000
	Level 4 vs. Level 9	181416.917	1	181416.917	18.789	.000
	Level 5 vs. Level 9	1975220.152	1	1975220.152	174.773	.000
	Level 6 vs. Level 9	965347.484	1	965347.484	91.745	.000
	Level 7 vs. Level 9	957458.136	1	957458.136	63.044	.000
	Level 8 vs. Level 9	13432.650	1	13432.650	3.976	.051
face_type * I_OR_U	Level 1 vs. Level 9	34.475	1	34.475	.002	.967
	Level 2 vs. Level 9	10824.000	1	10824.000	.746	.391
	Level 3 vs. Level 9	28492.581	1	28492.581	2.154	.148
	Level 4 vs. Level 9	1246.848	1	1246.848	.129	.721
	Level 5 vs. Level 9	24620.566	1	24620.566	2.178	.146
	Level 6 vs. Level 9	378.105	1	378.105	.036	.850
	Level 7 vs. Level 9	47962.964	1	47962.964	3.158	.081

	Level 8 vs. Level 9	2377.271	1	2377.271	.704	.405
Error(face_type)	Level 1 vs. Level 9	1138824.629	56	20336.154		
	Level 2 vs. Level 9	812377.724	56	14506.745		
	Level 3 vs. Level 9	740883.574	56	13230.064		
	Level 4 vs. Level 9	540693.307	56	9655.238		
	Level 5 vs. Level 9	632890.831	56	11301.622		
	Level 6 vs. Level 9	589237.895	56	10522.105		
	Level 7 vs. Level 9	850483.381	56	15187.203		
	Level 8 vs. Level 9	189195.074	56	3378.483		

Table 83 GNS - Trait ratings - Approachability - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4009281.143	1	4009281.143	1196.637	.000
I_OR_U	7849.695	1	7849.695	2.343	.131
Error	187625.550	56	3350.456		

Table 84 GNS - Trait ratings - Approachability - Wilcoxon test statistics

	TDm*App - AS*App	TDm*App - CDLS*App	TDm*App - DS*App	TDm*App - FXS*App	TDm*App - PWS*App	TDm*App - SMS*App	TDm*App - WS*App	TDm*App - TDf*App
Z	-4.998[b]	-6.624[b]	-5.962[b]	-3.679[b]	-6.585[b]	-6.159[b]	-5.888[b]	-2.575[c]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.010

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 85 GNS - Trait ratings - Approachability - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Approachability - Angelman Syndrome * Approachability	Negative Ranks	12[a]	16.46	197.50
	Positive Ranks	45[b]	32.34	1455.50
	Ties	1[c]		
	Total	58		
Typically Developing Male * Approachability - Cornelia de Lange Syndrome * Approachability	Negative Ranks	0[d]	.00	.00
	Positive Ranks	58[e]	29.50	1711.00
	Ties	0[f]		
	Total	58		
Typically Developing Male * Approachability - Down Syndrome * Approachability	Negative Ranks	7[g]	12.21	85.50
	Positive Ranks	51[h]	31.87	1625.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Approachability - Fragile-X Syndrome * Approachability	Negative Ranks	20[j]	18.18	363.50
	Positive Ranks	37[k]	34.85	1289.50
	Ties	1[l]		
	Total	58		
	Negative Ranks	1[m]	5.00	5.00
	Positive Ranks	57[n]	29.93	1706.00

Typically Developing Male * Approachability - Prader-Willi Syndrome * Approachability	Ties	0[o]		
	Total	58		
Typically Developing Male * Approachability - Smith-Magenis Syndrome * Approachability	Negative Ranks	7[p]	8.57	60.00
	Positive Ranks	51[q]	32.37	1651.00
	Ties	0[r]		
	Total	58		
Typically Developing Male * Approachability - Williams Syndrome * Approachability	Negative Ranks	7[s]	13.57	95.00
	Positive Ranks	51[t]	31.69	1616.00
	Ties	0[u]		
	Total	58		
Typically Developing Male * Approachability - Typically Developing Female * Approachability	Negative Ranks	38[v]	31.26	1188.00
	Positive Ranks	20[w]	26.15	523.00
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Approachability < Angelman Syndrome * Approachability
b. Typically Developing Male * Approachability > Angelman Syndrome * Approachability
c. Typically Developing Male * Approachability = Angelman Syndrome * Approachability
d. Typically Developing Male * Approachability < Cornelia de Lange Syndrome * Approachability
e. Typically Developing Male * Approachability > Cornelia de Lange Syndrome * Approachability
f. Typically Developing Male * Approachability = Cornelia de Lange Syndrome * Approachability
g. Typically Developing Male * Approachability < Down Syndrome * Approachability
h. Typically Developing Male * Approachability > Down Syndrome * Approachability
i. Typically Developing Male * Approachability = Down Syndrome * Approachability
j. Typically Developing Male * Approachability < Fragile-X Syndrome * Approachability
k. Typically Developing Male * Approachability > Fragile-X Syndrome * Approachability
l. Typically Developing Male * Approachability = Fragile-X Syndrome * Approachability
m. Typically Developing Male * Approachability < Prader-Willi Syndrome * Approachability
n. Typically Developing Male * Approachability > Prader-Willi Syndrome * Approachability
o. Typically Developing Male * Approachability = Prader-Willi Syndrome * Approachability
p. Typically Developing Male * Approachability < Smith-Magenis Syndrome * Approachability
q. Typically Developing Male * Approachability > Smith-Magenis Syndrome * Approachability
r. Typically Developing Male * Approachability = Smith-Magenis Syndrome * Approachability
s. Typically Developing Male * Approachability < Williams Syndrome * Approachability
t. Typically Developing Male * Approachability > Williams Syndrome * Approachability
u. Typically Developing Male * Approachability = Williams Syndrome * Approachability
v. Typically Developing Male * Approachability < Typically Developing Female * Approachability
w. Typically Developing Male * Approachability > Typically Developing Female * Approachability
x. Typically Developing Male * Approachability = Typically Developing Female * Approachability

Table 86 GNS - Trait ratings - Attractiveness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Attractiveness	58	7	344	167.24	90.496
Cornelia de Lange Syndrome * Attractiveness	58	2	366	110.47	82.848
Down Syndrome * Attractiveness	58	5	367	181.98	86.241
Fragile-X Syndrome * Attractiveness	58	3	396	204.45	99.471
Prader-Willi Syndrome * Attractiveness	58	11	364	201.84	82.516
Smith-Magenis Syndrome * Attractiveness	58	70	418	251.07	83.124
Williams Syndrome * Attractiveness	58	3	376	167.14	88.961
Typically Developing Female * Attractiveness	58	54	499	326.34	91.875
Typically Developing Male * Attractiveness	58	36	463	314.53	92.784
Valid N (listwise)	58				

Table 87 GNS - Trait ratings - Attractiveness - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.133	107.209	35	.000	.647	.733	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 88 GNS - Trait ratings - Attractiveness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	2329212.810	8	291151.601	65.229	.000
	Greenhouse-Geisser	2329212.810	5.172	450345.947	65.229	.000
	Huynh-Feldt	2329212.810	5.863	397306.833	65.229	.000
	Lower-bound	2329212.810	1.000	2329212.810	65.229	.000
face_type * I_OR_U	Sphericity Assumed	58226.534	8	7278.317	1.631	.114
	Greenhouse-Geisser	58226.534	5.172	11257.917	1.631	.149
	Huynh-Feldt	58226.534	5.863	9932.025	1.631	.140
	Lower-bound	58226.534	1.000	58226.534	1.631	.207
Error(face_type)	Sphericity Assumed	1999668.079	448	4463.545		
	Greenhouse-Geisser	1999668.079	289.635	6904.098		
	Huynh-Feldt	1999668.079	328.300	6090.974		
	Lower-bound	1999668.079	56.000	35708.359		

Table 89 GNS - Trait ratings - Attractiveness - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Attractiveness	3.66
Cornelia de Lange Syndrome * Attractiveness	1.75
Down Syndrome * Attractiveness	4.22
Fragile-X Syndrome * Attractiveness	4.84
Prader-Willi Syndrome * Attractiveness	4.53
Smith-Magenis Syndrome * Attractiveness	6.35
Williams Syndrome * Attractiveness	3.90
Typically Developing Female * Attractiveness	8.16
Typically Developing Male * Attractiveness	7.61

Test Statistics[a]

N	58
Chi-Square	255.964
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 90 GNS - Trait ratings - Attractiveness - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	1256458.889	1	1256458.889	86.669	.000
	Level 2 vs. Level 9	2396164.250	1	2396164.250	193.585	.000
	Level 3 vs. Level 9	1012542.595	1	1012542.595	101.017	.000

	Level 4 vs. Level 9	703988.079	1	703988.079	61.961	.000
	Level 5 vs. Level 9	740204.631	1	740204.631	91.166	.000
	Level 6 vs. Level 9	232979.713	1	232979.713	34.992	.000
	Level 7 vs. Level 9	1245634.998	1	1245634.998	113.458	.000
	Level 8 vs. Level 9	7841.669	1	7841.669	3.397	.071
face_type * I_OR_U	Level 1 vs. Level 9	22.889	1	22.889	.002	.968
	Level 2 vs. Level 9	23302.250	1	23302.250	1.883	.176
	Level 3 vs. Level 9	5824.871	1	5824.871	.581	.449
	Level 4 vs. Level 9	1106.424	1	1106.424	.097	.756
	Level 5 vs. Level 9	5874.769	1	5874.769	.724	.399
	Level 6 vs. Level 9	116.264	1	116.264	.017	.895
	Level 7 vs. Level 9	28202.722	1	28202.722	2.569	.115
	Level 8 vs. Level 9	1506.083	1	1506.083	.652	.423
Error(face_type)	Level 1 vs. Level 9	811847.129	56	14497.270		
	Level 2 vs. Level 9	693157.474	56	12377.812		
	Level 3 vs. Level 9	561317.474	56	10023.526		
	Level 4 vs. Level 9	636264.145	56	11361.860		
	Level 5 vs. Level 9	454679.645	56	8119.279		
	Level 6 vs. Level 9	372854.167	56	6658.110		
	Level 7 vs. Level 9	614815.157	56	10978.842		
	Level 8 vs. Level 9	129268.831	56	2308.372		

Table 91 GNS - Trait ratings - Attractiveness - Between subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2661152.814	1	2661152.814	701.739	.000
I_OR_U	9076.454	1	9076.454	2.393	.127
Error	212364.605	56	3792.225		

Table 92 GNS - Trait ratings - Attractiveness - Wilcoxon test statistics

	TDm*Att - AS*Att	TDm*Att-CDLS*Att	TDm*Att - DS*Att	TDm*Att-FXS*Att	TDm*Att-PWS*Att	TDm*Att-SMS*Att	TDm*Att - WS*Att	TDm*Att-TDf*Att
Z	-6.039[b]	-6.577[b]	-6.206[b]	-5.733[b]	-5.950[b]	-4.866[b]	-6.345[b]	-1.835[c]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.066

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 93 GNS - Trait ratings - Attractiveness - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Attractiveness - Angelman Syndrome * Attractiveness	Negative Ranks	5[a]	15.10	75.50
	Positive Ranks	53[b]	30.86	1635.50
	Ties	0[c]		
	Total	58		
Typically Developing Male * Attractiveness - Cornelia de Lange Syndrome * Attractiveness	Negative Ranks	1[d]	6.00	6.00
	Positive Ranks	57[e]	29.91	1705.00
	Ties	0[f]		
	Total	58		

Typically Developing Male * Attractiveness - Down Syndrome * Attractiveness	Negative Ranks	7[g]	7.71	54.00
	Positive Ranks	51[h]	32.49	1657.00
	Ties	0[i]		
	Total	58		
Typically Developing Male * Attractiveness - Fragile-X Syndrome * Attractiveness	Negative Ranks	8[j]	13.13	105.00
	Positive Ranks	49[k]	31.59	1548.00
	Ties	1[l]		
	Total	58		
Typically Developing Male * Attractiveness - Prader-Willi Syndrome * Attractiveness	Negative Ranks	5[m]	17.40	87.00
	Positive Ranks	53[n]	30.64	1624.00
	Ties	0[o]		
	Total	58		
Typically Developing Male * Attractiveness - Smith-Magenis Syndrome * Attractiveness	Negative Ranks	12[p]	18.92	227.00
	Positive Ranks	46[q]	32.26	1484.00
	Ties	0[r]		
	Total	58		
Typically Developing Male * Attractiveness - Williams Syndrome * Attractiveness	Negative Ranks	6[s]	6.00	36.00
	Positive Ranks	52[t]	32.21	1675.00
	Ties	0[u]		
	Total	58		
Typically Developing Male * Attractiveness - Typically Developing Female * Attractiveness	Negative Ranks	36[v]	30.35	1092.50
	Positive Ranks	22[w]	28.11	618.50
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Attractiveness < Angelman Syndrome * Attractiveness
b. Typically Developing Male * Attractiveness > Angelman Syndrome * Attractiveness
c. Typically Developing Male * Attractiveness = Angelman Syndrome * Attractiveness
d. Typically Developing Male * Attractiveness < Cornelia de Lange Syndrome * Attractiveness
e. Typically Developing Male * Attractiveness > Cornelia de Lange Syndrome * Attractiveness
f. Typically Developing Male * Attractiveness = Cornelia de Lange Syndrome * Attractiveness
g. Typically Developing Male * Attractiveness < Down Syndrome * Attractiveness
h. Typically Developing Male * Attractiveness > Down Syndrome * Attractiveness
i. Typically Developing Male * Attractiveness = Down Syndrome * Attractiveness
j. Typically Developing Male * Attractiveness < Fragile-X Syndrome * Attractiveness
k. Typically Developing Male * Attractiveness > Fragile-X Syndrome * Attractiveness
l. Typically Developing Male * Attractiveness = Fragile-X Syndrome * Attractiveness
m. Typically Developing Male * Attractiveness < Prader-Willi Syndrome * Attractiveness
n. Typically Developing Male * Attractiveness > Prader-Willi Syndrome * Attractiveness
o. Typically Developing Male * Attractiveness = Prader-Willi Syndrome * Attractiveness
p. Typically Developing Male * Attractiveness < Smith-Magenis Syndrome * Attractiveness
q. Typically Developing Male * Attractiveness > Smith-Magenis Syndrome * Attractiveness
r. Typically Developing Male * Attractiveness = Smith-Magenis Syndrome * Attractiveness
s. Typically Developing Male * Attractiveness < Williams Syndrome * Attractiveness
t. Typically Developing Male * Attractiveness > Williams Syndrome * Attractiveness
u. Typically Developing Male * Attractiveness = Williams Syndrome * Attractiveness
v. Typically Developing Male * Attractiveness < Typically Developing Female * Attractiveness
w. Typically Developing Male * Attractiveness > Typically Developing Female * Attractiveness
x. Typically Developing Male * Attractiveness = Typically Developing Female * Attractiveness

Table 94 GNS - Trait ratings - Babyfacedness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Babyfacedness	58	50	499	271.19	127.332
Cornelia de Lange Syndrome * Babyfacedness	58	7	501	210.05	142.761
Down Syndrome * Babyfacedness	58	26	501	305.38	119.185
Fragile-X Syndrome * Babyfacedness	58	14	441	204.12	117.141
Prader-Willi Syndrome * Babyfacedness	58	10	349	145.81	74.498
Smith-Magenis Syndrome * Babyfacedness	58	21	496	260.76	115.355
Williams Syndrome * Babyfacedness	58	26	495	242.74	119.792

Typically Developing Female * Babyfacedness	58	60	499	345.34	108.846
Typically Developing Male * Babyfacedness	58	54	485	327.71	110.720
Valid N (listwise)	58				

Table 95 GNS - Trait ratings - Babyfacedness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.113	116.023	35	.000	.684	.781	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 96 GNS - Trait ratings - Babyfacedness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1903892.149	8	237986.519	19.159	.000
	Greenhouse-Geisser	1903892.149	5.476	347692.022	19.159	.000
	Huynh-Feldt	1903892.149	6.246	304796.309	19.159	.000
	Lower-bound	1903892.149	1.000	1903892.149	19.159	.000
face_type * I_OR_U	Sphericity Assumed	63543.429	8	7942.929	.639	.745
	Greenhouse-Geisser	63543.429	5.476	11604.409	.639	.684
	Huynh-Feldt	63543.429	6.246	10172.741	.639	.705
	Lower-bound	63543.429	1.000	63543.429	.639	.427
Error(face_type)	Sphericity Assumed	5564972.651	448	12421.814		
	Greenhouse-Geisser	5564972.651	306.645	18147.942		
	Huynh-Feldt	5564972.651	349.801	15908.981		
	Lower-bound	5564972.651	56.000	99374.512		

Table 97 GNS - Trait ratings - Babyfacedness - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Babyfacedness	5.41
Cornelia de Lange Syndrome * Babyfacedness	4.19
Down Syndrome * Babyfacedness	6.10
Fragile-X Syndrome * Babyfacedness	3.56
Prader-Willi Syndrome * Babyfacedness	2.68
Smith-Magenis Syndrome * Babyfacedness	5.17
Williams Syndrome * Babyfacedness	4.65
Typically Developing Female * Babyfacedness	6.71
Typically Developing Male * Babyfacedness	6.53

Test Statistics[a]

N	58
Chi-Square	115.281
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 98 GNS - Trait ratings - Babyfacedness - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	180661.271	1	180661.271	5.977	.018
	Level 2 vs. Level 9	795602.102	1	795602.102	19.835	.000
	Level 3 vs. Level 9	28716.322	1	28716.322	1.219	.274
	Level 4 vs. Level 9	879563.056	1	879563.056	37.092	.000
	Level 5 vs. Level 9	1916699.119	1	1916699.119	127.600	.000
	Level 6 vs. Level 9	259932.290	1	259932.290	12.752	.001
	Level 7 vs. Level 9	406713.193	1	406713.193	12.863	.001
	Level 8 vs. Level 9	18345.050	1	18345.050	2.653	.109
face_type * I_OR_U	Level 1 vs. Level 9	22079.409	1	22079.409	.730	.396
	Level 2 vs. Level 9	10520.723	1	10520.723	.262	.611
	Level 3 vs. Level 9	195.219	1	195.219	.008	.928
	Level 4 vs. Level 9	6567.745	1	6567.745	.277	.601
	Level 5 vs. Level 9	.084	1	.084	.000	.998
	Level 6 vs. Level 9	64.014	1	64.014	.003	.956
	Level 7 vs. Level 9	67405.124	1	67405.124	2.132	.150
	Level 8 vs. Level 9	1205.601	1	1205.601	.174	.678
Error(face_type)	Level 1 vs. Level 9	1692685.074	56	30226.519		
	Level 2 vs. Level 9	2246186.381	56	40110.471		
	Level 3 vs. Level 9	1319213.557	56	23557.385		
	Level 4 vs. Level 9	1327946.324	56	23713.327		
	Level 5 vs. Level 9	841183.295	56	15021.130		
	Level 6 vs. Level 9	1141468.831	56	20383.372		
	Level 7 vs. Level 9	1770708.807	56	31619.800		
	Level 8 vs. Level 9	387205.795	56	6914.389		

Table 99 GNS - Trait ratings - Babyfacedness - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3832331.243	1	3832331.243	1485.787	.000
I_OR_U	1785.101	1	1785.101	.692	.409
Error	144442.373	56	2579.328		

Table 100 GNS - Trait ratings - Babyfacedness – Wilcoxon test statistics

	TDm*Bab - AS*Bab	TDm*Bab- CDLS*Bab	TDm*Bab - DS*Bab	TDm*Bab- FXS*Bab	TDm*Bab- PWS*Bab	TDm*Bab- SMS*Bab	TDm*Bab -WS*Bab	TDm*Bab - TDf*Bab
Z	-2.420[b]	-4.057[b]	-1.456[b]	-4.824[b]	-6.376[b]	-3.492[b]	-3.430[b]	-1.707[c]
Asymp. Sig. (2-tailed)	.016	.000	.145	.000	.000	.000	.001	.088

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 101 GNS - Trait ratings - Babyfacedness - Wilcoxon test ranks

	N	Mean Rank	Sum of Ranks
Negative Ranks	20[a]	27.15	543.00

Typically Developing Male * Babyfacedness - Angelman Syndrome * Babyfacedness	Positive Ranks	38[b]	30.74	1168.00
	Ties	0[c]		
	Total	58		
Typically Developing Male * Babyfacedness - Cornelia de Lange Syndrome * Babyfacedness	Negative Ranks	15[d]	22.10	331.50
	Positive Ranks	43[e]	32.08	1379.50
	Ties	0[f]		
	Total	58		
Typically Developing Male * Babyfacedness - Down Syndrome * Babyfacedness	Negative Ranks	23[g]	29.02	667.50
	Positive Ranks	35[h]	29.81	1043.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Babyfacedness - Fragile-X Syndrome * Babyfacedness	Negative Ranks	14[j]	16.61	232.50
	Positive Ranks	44[k]	33.60	1478.50
	Ties	0[l]		
	Total	58		
Typically Developing Male * Babyfacedness - Prader-Willi Syndrome * Babyfacedness	Negative Ranks	4[m]	6.00	24.00
	Positive Ranks	53[n]	30.74	1629.00
	Ties	1[o]		
	Total	58		
Typically Developing Male * Babyfacedness - Smith-Magenis Syndrome * Babyfacedness	Negative Ranks	16[p]	25.28	404.50
	Positive Ranks	42[q]	31.11	1306.50
	Ties	0[r]		
	Total	58		
Typically Developing Male * Babyfacedness - Williams Syndrome * Babyfacedness	Negative Ranks	17[s]	24.26	412.50
	Positive Ranks	41[t]	31.67	1298.50
	Ties	0[u]		
	Total	58		
Typically Developing Male * Babyfacedness - Typically Developing Female * Babyfacedness	Negative Ranks	34[v]	31.65	1076.00
	Positive Ranks	24[w]	26.46	635.00
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Babyfacedness < Angelman Syndrome * Babyfacedness
b. Typically Developing Male * Babyfacedness > Angelman Syndrome * Babyfacedness
c. Typically Developing Male * Babyfacedness = Angelman Syndrome * Babyfacedness
d. Typically Developing Male * Babyfacedness < Cornelia de Lange Syndrome * Babyfacedness
e. Typically Developing Male * Babyfacedness > Cornelia de Lange Syndrome * Babyfacedness
f. Typically Developing Male * Babyfacedness = Cornelia de Lange Syndrome * Babyfacedness
g. Typically Developing Male * Babyfacedness < Down Syndrome * Babyfacedness
h. Typically Developing Male * Babyfacedness > Down Syndrome * Babyfacedness
i. Typically Developing Male * Babyfacedness = Down Syndrome * Babyfacedness
j. Typically Developing Male * Babyfacedness < Fragile-X Syndrome * Babyfacedness
k. Typically Developing Male * Babyfacedness > Fragile-X Syndrome * Babyfacedness
l. Typically Developing Male * Babyfacedness = Fragile-X Syndrome * Babyfacedness
m. Typically Developing Male * Babyfacedness < Prader-Willi Syndrome * Babyfacedness
n. Typically Developing Male * Babyfacedness > Prader-Willi Syndrome * Babyfacedness
o. Typically Developing Male * Babyfacedness = Prader-Willi Syndrome * Babyfacedness
p. Typically Developing Male * Babyfacedness < Smith-Magenis Syndrome * Babyfacedness
q. Typically Developing Male * Babyfacedness > Smith-Magenis Syndrome * Babyfacedness
r. Typically Developing Male * Babyfacedness = Smith-Magenis Syndrome * Babyfacedness
s. Typically Developing Male * Babyfacedness < Williams Syndrome * Babyfacedness
t. Typically Developing Male * Babyfacedness > Williams Syndrome * Babyfacedness
u. Typically Developing Male * Babyfacedness = Williams Syndrome * Babyfacedness
v. Typically Developing Male * Babyfacedness < Typically Developing Female * Babyfacedness
w. Typically Developing Male * Babyfacedness > Typically Developing Female * Babyfacedness
x. Typically Developing Male * Babyfacedness = Typically Developing Female * Babyfacedness

Table 102 GNS - Trait ratings - Dominance - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation

Angelman Syndrome * Dominance	58	5	418	206.34	115.560
Cornelia de Lange Syndrome * Dominance	58	17	494	351.12	119.936
Down Syndrome * Dominance	58	5	420	179.17	118.775
Fragile-X Syndrome * Dominance	58	7	442	201.17	110.755
Prader-Willi Syndrome * Dominance	58	144	493	340.83	84.420
Smith-Magenis Syndrome * Dominance	58	37	500	313.16	95.061
Williams Syndrome * Dominance	58	65	491	276.72	110.729
Typically Developing Female * Dominance	58	8	403	174.97	100.065
Typically Developing Male * Dominance	58	12	383	202.28	96.508
Valid N (listwise)	58				

Table 103 GNS - Trait ratings - Dominance - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.177	91.988	35	.000	.732	.842	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 104 GNS - Trait ratings - Dominance - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	2344610.135	8	293076.267	29.007	.000
	Greenhouse-Geisser	2344610.135	5.855	400415.684	29.007	.000
	Huynh-Feldt	2344610.135	6.733	348234.692	29.007	.000
	Lower-bound	2344610.135	1.000	2344610.135	29.007	.000
face_type * I_OR_U	Sphericity Assumed	107834.725	8	13479.341	1.334	.224
	Greenhouse-Geisser	107834.725	5.855	18416.160	1.334	.242
	Huynh-Feldt	107834.725	6.733	16016.220	1.334	.235
	Lower-bound	107834.725	1.000	107834.725	1.334	.253
Error(face_type)	Sphericity Assumed	4526469.777	448	10103.727		
	Greenhouse-Geisser	4526469.777	327.905	13804.225		
	Huynh-Feldt	4526469.777	377.039	12005.299		
	Lower-bound	4526469.777	56.000	80829.817		

Table 105 GNS - Trait ratings - Dominance - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Dominance	4.03
Cornelia de Lange Syndrome * Dominance	7.11
Down Syndrome * Dominance	3.44
Fragile-X Syndrome * Dominance	3.99
Prader-Willi Syndrome * Dominance	7.10
Smith-Magenis Syndrome * Dominance	6.28

Williams Syndrome * Dominance	5.50
Typically Developing Female * Dominance	3.41
Typically Developing Male * Dominance	4.12

Test Statistics[a]

N	58
Chi-Square	142.870
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 106 GNS - Trait ratings - Dominance - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	548.198	1	548.198	.027	.870
	Level 2 vs. Level 9	1283744.001	1	1283744.001	47.544	.000
	Level 3 vs. Level 9	32226.219	1	32226.219	1.586	.213
	Level 4 vs. Level 9	128.695	1	128.695	.007	.933
	Level 5 vs. Level 9	1113617.676	1	1113617.676	60.549	.000
	Level 6 vs. Level 9	713569.255	1	713569.255	38.333	.000
	Level 7 vs. Level 9	313383.869	1	313383.869	11.310	.001
	Level 8 vs. Level 9	41188.046	1	41188.046	6.449	.014
face_type * I_OR_U	Level 1 vs. Level 9	48018.543	1	48018.543	2.384	.128
	Level 2 vs. Level 9	14.208	1	14.208	.001	.982
	Level 3 vs. Level 9	11331.322	1	11331.322	.558	.458
	Level 4 vs. Level 9	7297.798	1	7297.798	.402	.529
	Level 5 vs. Level 9	448.021	1	448.021	.024	.877
	Level 6 vs. Level 9	539.324	1	539.324	.029	.865
	Level 7 vs. Level 9	39312.145	1	39312.145	1.419	.239
	Level 8 vs. Level 9	20335.357	1	20335.357	3.184	.080
Error(face_type)	Level 1 vs. Level 9	1128065.181	56	20144.021		
	Level 2 vs. Level 9	1512077.395	56	27001.382		
	Level 3 vs. Level 9	1137680.057	56	20315.715		
	Level 4 vs. Level 9	1017365.581	56	18167.243		
	Level 5 vs. Level 9	1029960.324	56	18392.149		
	Level 6 vs. Level 9	1042428.831	56	18614.801		
	Level 7 vs. Level 9	1551668.200	56	27708.361		
	Level 8 vs. Level 9	357665.057	56	6386.876		

Table 107 GNS - Trait ratings - Dominance - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3596160.460	1	3596160.460	1633.401	.000
I_OR_U	6925.115	1	6925.115	3.145	.082
Error	123291.807	56	2201.639		

Table 108 GNS - Trait ratings - Dominance – Wilcoxon test statistics

	TDm*Dom -AS*Dom	TDm*Dom - CDLS*Dom	TDm*Dom -DS*Dom	TDm*Dom - FXS*Dom	TDm*Dom -PWS*Dom	TDm*Dom -SMS*Dom	TDm*Dom -WS*Dom	TDm*Dom -TDf*Dom
Z	-.310[b]	-5.122[b]	-1.316[c]	-.302[c]	-5.451[b]	-5.021[b]	-3.012[b]	-3.008[c]
Asymp. Sig. (2-tailed)	.757	.000	.188	.763	.000	.000	.003	.003

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 109 GNS - Trait ratings - Dominance – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Dominance - Angelman Syndrome * Dominance	Negative Ranks	29[a]	30.88	895.50
	Positive Ranks	29[b]	28.12	815.50
	Ties	0[c]		
	Total	58		
Typically Developing Male * Dominance - Cornelia de Lange Syndrome * Dominance	Negative Ranks	48[d]	31.60	1517.00
	Positive Ranks	10[e]	19.40	194.00
	Ties	0[f]		
	Total	58		
Typically Developing Male * Dominance - Down Syndrome * Dominance	Negative Ranks	24[g]	28.56	685.50
	Positive Ranks	34[h]	30.16	1025.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Dominance - Fragile-X Syndrome * Dominance	Negative Ranks	27[j]	30.24	816.50
	Positive Ranks	31[k]	28.85	894.50
	Ties	0[l]		
	Total	58		
Typically Developing Male * Dominance - Prader-Willi Syndrome * Dominance	Negative Ranks	50[m]	31.19	1559.50
	Positive Ranks	8[n]	18.94	151.50
	Ties	0[o]		
	Total	58		
Typically Developing Male * Dominance - Smith-Magenis Syndrome * Dominance	Negative Ranks	46[p]	32.70	1504.00
	Positive Ranks	12[q]	17.25	207.00
	Ties	0[r]		
	Total	58		
Typically Developing Male * Dominance - Williams Syndrome * Dominance	Negative Ranks	41[s]	30.35	1244.50
	Positive Ranks	17[t]	27.44	466.50
	Ties	0[u]		
	Total	58		
Typically Developing Male * Dominance - Typically Developing Female * Dominance	Negative Ranks	18[v]	25.94	467.00
	Positive Ranks	40[w]	31.10	1244.00
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Dominance < Angelman Syndrome * Dominance
b. Typically Developing Male * Dominance > Angelman Syndrome * Dominance
c. Typically Developing Male * Dominance = Angelman Syndrome * Dominance
d. Typically Developing Male * Dominance < Cornelia de Lange Syndrome * Dominance
e. Typically Developing Male * Dominance > Cornelia de Lange Syndrome * Dominance
f. Typically Developing Male * Dominance = Cornelia de Lange Syndrome * Dominance
g. Typically Developing Male * Dominance < Down Syndrome * Dominance

h. Typically Developing Male * Dominance > Down Syndrome * Dominance
i. Typically Developing Male * Dominance = Down Syndrome * Dominance
j. Typically Developing Male * Dominance < Fragile-X Syndrome * Dominance
k. Typically Developing Male * Dominance > Fragile-X Syndrome * Dominance
l. Typically Developing Male * Dominance = Fragile-X Syndrome * Dominance
m. Typically Developing Male * Dominance < Prader-Willi Syndrome * Dominance
n. Typically Developing Male * Dominance > Prader-Willi Syndrome * Dominance
o. Typically Developing Male * Dominance = Prader-Willi Syndrome * Dominance
p. Typically Developing Male * Dominance < Smith-Magenis Syndrome * Dominance
q. Typically Developing Male * Dominance > Smith-Magenis Syndrome * Dominance
r. Typically Developing Male * Dominance = Smith-Magenis Syndrome * Dominance
s. Typically Developing Male * Dominance < Williams Syndrome * Dominance
t. Typically Developing Male * Dominance > Williams Syndrome * Dominance
u. Typically Developing Male * Dominance = Williams Syndrome * Dominance
v. Typically Developing Male * Dominance < Typically Developing Female * Dominance
w. Typically Developing Male * Dominance > Typically Developing Female * Dominance
x. Typically Developing Male * Dominance = Typically Developing Female * Dominance

Table 110 GNS - Trait ratings - Intelligence - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Intelligence	58	2	380	173.90	107.692
Cornelia de Lange Syndrome * Intelligence	58	2	429	189.59	112.433
Down Syndrome * Intelligence	58	15	495	211.19	109.272
Fragile-X Syndrome * Intelligence	58	51	499	254.91	113.257
Prader-Willi Syndrome * Intelligence	58	21	467	237.53	106.807
Smith-Magenis Syndrome * Intelligence	58	129	378	264.98	69.301
Williams Syndrome * Intelligence	58	17	399	225.26	95.199
Typically Developing Female * Intelligence	58	195	485	349.88	72.326
Typically Developing Male * Intelligence	58	161	498	353.90	72.789
Valid N (listwise)	58				

Table 111 GNS - Trait ratings - Intelligence - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.195	86.963	35	.000	.747	.861	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 112 GNS - Trait ratings - Intelligence - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1895211.224	8	236901.403	31.065	.000
	Greenhouse-Geisser	1895211.224	5.973	317288.068	31.065	.000
	Huynh-Feldt	1895211.224	6.885	275260.108	31.065	.000
	Lower-bound	1895211.224	1.000	1895211.224	31.065	.000
face_type * I_OR_U	Sphericity Assumed	214665.431	8	26833.179	3.519	.001
	Greenhouse-Geisser	214665.431	5.973	35938.358	3.519	.002
	Huynh-Feldt	214665.431	6.885	31177.965	3.519	.001
	Lower-bound	214665.431	1.000	214665.431	3.519	.066
Error(face_type)	Sphericity Assumed	3416400.581	448	7625.894		

	Greenhouse-Geisser	3416400.581	334.497	10213.554		
	Huynh-Feldt	3416400.581	385.569	8860.667		
	Lower-bound	3416400.581	56.000	61007.153		

Table 113 GNS - Trait ratings - Intelligence - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Intelligence	3.12
Cornelia de Lange Syndrome * Intelligence	3.43
Down Syndrome * Intelligence	3.75
Fragile-X Syndrome * Intelligence	5.17
Prader-Willi Syndrome * Intelligence	4.69
Smith-Magenis Syndrome * Intelligence	5.31
Williams Syndrome * Intelligence	4.37
Typically Developing Female * Intelligence	7.45
Typically Developing Male * Intelligence	7.71

Test Statistics[a]

N	58
Chi-Square	166.449
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 114 GNS - Trait ratings - Intelligence - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	1880343.588	1	1880343.588	104.107	.000
	Level 2 vs. Level 9	1541486.250	1	1541486.250	91.202	.000
	Level 3 vs. Level 9	1177541.675	1	1177541.675	68.202	.000
	Level 4 vs. Level 9	580331.484	1	580331.484	37.692	.000
	Level 5 vs. Level 9	797284.067	1	797284.067	57.737	.000
	Level 6 vs. Level 9	453901.258	1	453901.258	71.637	.000
	Level 7 vs. Level 9	950095.688	1	950095.688	66.335	.000
	Level 8 vs. Level 9	666.872	1	666.872	.128	.722
face_type * I_OR_U	Level 1 vs. Level 9	1277.105	1	1277.105	.071	.791
	Level 2 vs. Level 9	68728.940	1	68728.940	4.066	.049
	Level 3 vs. Level 9	894.089	1	894.089	.052	.821
	Level 4 vs. Level 9	59524.588	1	59524.588	3.866	.054
	Level 5 vs. Level 9	44175.239	1	44175.239	3.199	.079
	Level 6 vs. Level 9	7683.602	1	7683.602	1.213	.276
	Level 7 vs. Level 9	16032.239	1	16032.239	1.119	.295
	Level 8 vs. Level 9	18993.768	1	18993.768	3.639	.062
Error(face_type)	Level 1 vs. Level 9	1011452.895	56	18061.659		
	Level 2 vs. Level 9	946505.474	56	16901.883		
	Level 3 vs. Level 9	966863.929	56	17265.427		
	Level 4 vs. Level 9	862218.395	56	15396.757		
	Level 5 vs. Level 9	773300.157	56	13808.931		
	Level 6 vs. Level 9	354822.967	56	6336.124		

	Level 7 vs. Level 9	802065.157	56	14322.592		
	Level 8 vs. Level 9	292293.214	56	5219.522		

Table 115 GNS - Trait ratings - Intelligence - Between subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3654965.797	1	3654965.797	1533.020	.000
I_OR_U	158.249	1	158.249	.066	.798
Error	133512.972	56	2384.160		

Table 116 GNS - Trait ratings - Intelligence – Wilcoxon test statistics

	Test Statistics[a]							
	TDm*Int - AS*Int	TDm*Int-CDLS*Int	TDm*Int - DS*Int	TDm*Int-FXS*Int	TDm*Int-PWS*Int	TDm*Int-SMS*Int	TDm*Int - WS*Int	TDm*Int - TDf*Int
Z	-6.314[b]	-6.159[b]	-5.985[b]	-4.898[b]	-5.613[b]	-6.024[b]	-6.000[b]	-.711[b]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.477

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Table 117 GNS - Trait ratings - Intelligence - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Intelligence - Angelman Syndrome * Intelligence	Negative Ranks	5[a]	8.00	40.00
	Positive Ranks	53[b]	31.53	1671.00
	Ties	0[c]		
	Total	58		
Typically Developing Male * Intelligence - Cornelia de Lange Syndrome * Intelligence	Negative Ranks	5[d]	12.00	60.00
	Positive Ranks	53[e]	31.15	1651.00
	Ties	0[f]		
	Total	58		
Typically Developing Male * Intelligence - Down Syndrome * Intelligence	Negative Ranks	7[g]	11.79	82.50
	Positive Ranks	51[h]	31.93	1628.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Intelligence - Fragile-X Syndrome * Intelligence	Negative Ranks	13[j]	16.15	210.00
	Positive Ranks	44[k]	32.80	1443.00
	Ties	1[l]		
	Total	58		
Typically Developing Male * Intelligence - Prader-Willi Syndrome * Intelligence	Negative Ranks	8[m]	16.31	130.50
	Positive Ranks	50[n]	31.61	1580.50
	Ties	0[o]		
	Total	58		
Typically Developing Male * Intelligence - Smith-Magenis Syndrome * Intelligence	Negative Ranks	6[p]	12.92	77.50
	Positive Ranks	52[q]	31.41	1633.50
	Ties	0[r]		
	Total	58		
Typically Developing Male * Intelligence - Williams Syndrome * Intelligence	Negative Ranks	5[s]	16.10	80.50
	Positive Ranks	53[t]	30.76	1630.50
	Ties	0[u]		

	Total	58		
Typically Developing Male * Intelligence - Typically Developing Female * Intelligence	Negative Ranks	25[v]	29.48	737.00
	Positive Ranks	32[w]	28.63	916.00
	Ties	1[x]		
	Total	58		

a. Typically Developing Male * Intelligence < Angelman Syndrome * Intelligence
b. Typically Developing Male * Intelligence > Angelman Syndrome * Intelligence
c. Typically Developing Male * Intelligence = Angelman Syndrome * Intelligence
d. Typically Developing Male * Intelligence < Cornelia de Lange Syndrome * Intelligence
e. Typically Developing Male * Intelligence > Cornelia de Lange Syndrome * Intelligence
f. Typically Developing Male * Intelligence = Cornelia de Lange Syndrome * Intelligence
g. Typically Developing Male * Intelligence < Down Syndrome * Intelligence
h. Typically Developing Male * Intelligence > Down Syndrome * Intelligence
i. Typically Developing Male * Intelligence = Down Syndrome * Intelligence
j. Typically Developing Male * Intelligence < Fragile-X Syndrome * Intelligence
k. Typically Developing Male * Intelligence > Fragile-X Syndrome * Intelligence
l. Typically Developing Male * Intelligence = Fragile-X Syndrome * Intelligence
m. Typically Developing Male * Intelligence < Prader-Willi Syndrome * Intelligence
n. Typically Developing Male * Intelligence > Prader-Willi Syndrome * Intelligence
o. Typically Developing Male * Intelligence = Prader-Willi Syndrome * Intelligence
p. Typically Developing Male * Intelligence < Smith-Magenis Syndrome * Intelligence
q. Typically Developing Male * Intelligence > Smith-Magenis Syndrome * Intelligence
r. Typically Developing Male * Intelligence = Smith-Magenis Syndrome * Intelligence
s. Typically Developing Male * Intelligence < Williams Syndrome * Intelligence
t. Typically Developing Male * Intelligence > Williams Syndrome * Intelligence
u. Typically Developing Male * Intelligence = Williams Syndrome * Intelligence
v. Typically Developing Male * Intelligence < Typically Developing Female * Intelligence
w. Typically Developing Male * Intelligence > Typically Developing Female * Intelligence
x. Typically Developing Male * Intelligence = Typically Developing Female * Intelligence

Table 118 GNS - Trait ratings - Intelligence - Facetype x Information interaction - ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Intelligence - Angelman Syndrome * Intelligence	Negative Ranks	12[a]	15.33	184.00
	Positive Ranks	16[b]	13.88	222.00
	Ties	0[c]		
	Total	28		
Typically Developing Male * Intelligence - Cornelia de Lange Syndrome * Intelligence	Negative Ranks	21[d]	15.62	328.00
	Positive Ranks	7[e]	11.14	78.00
	Ties	0[f]		
	Total	28		
Typically Developing Male * Intelligence - Down Syndrome * Intelligence	Negative Ranks	12[g]	17.92	215.00
	Positive Ranks	16[h]	11.94	191.00
	Ties	0[i]		
	Total	28		
Typically Developing Male * Intelligence - Fragile-X Syndrome * Intelligence	Negative Ranks	9[j]	11.78	106.00
	Positive Ranks	19[k]	15.79	300.00
	Ties	0[l]		
	Total	28		
Typically Developing Male * Intelligence - Prader-Willi Syndrome * Intelligence	Negative Ranks	8[m]	11.00	88.00
	Positive Ranks	20[n]	15.90	318.00
	Ties	0[o]		
	Total	28		
Typically Developing Male * Intelligence - Smith-Magenis Syndrome * Intelligence	Negative Ranks	17[p]	16.41	279.00
	Positive Ranks	11[q]	11.55	127.00
	Ties	0[r]		
	Total	28		
Typically Developing Male * Intelligence - Williams Syndrome * Intelligence	Negative Ranks	18[s]	15.22	274.00
	Positive Ranks	10[t]	13.20	132.00
	Ties	0[u]		
	Total	28		

Typically Developing Male * Intelligence - Typically Developing Female * Intelligence	Negative Ranks	18[v]	16.56	298.00
	Positive Ranks	10[w]	10.80	108.00
	Ties	0[x]		
	Total	28		

a. Typically Developing Male * Intelligence < Angelman Syndrome * Intelligence
b. Typically Developing Male * Intelligence > Angelman Syndrome * Intelligence
c. Typically Developing Male * Intelligence = Angelman Syndrome * Intelligence
d. Typically Developing Male * Intelligence < Cornelia de Lange Syndrome * Intelligence
e. Typically Developing Male * Intelligence > Cornelia de Lange Syndrome * Intelligence
f. Typically Developing Male * Intelligence = Cornelia de Lange Syndrome * Intelligence
g. Typically Developing Male * Intelligence < Down Syndrome * Intelligence
h. Typically Developing Male * Intelligence > Down Syndrome * Intelligence
i. Typically Developing Male * Intelligence = Down Syndrome * Intelligence
j. Typically Developing Male * Intelligence < Fragile-X Syndrome * Intelligence
k. Typically Developing Male * Intelligence > Fragile-X Syndrome * Intelligence
l. Typically Developing Male * Intelligence = Fragile-X Syndrome * Intelligence
m. Typically Developing Male * Intelligence < Prader-Willi Syndrome * Intelligence
n. Typically Developing Male * Intelligence > Prader-Willi Syndrome * Intelligence
o. Typically Developing Male * Intelligence = Prader-Willi Syndrome * Intelligence
p. Typically Developing Male * Intelligence < Smith-Magenis Syndrome * Intelligence
q. Typically Developing Male * Intelligence > Smith-Magenis Syndrome * Intelligence
r. Typically Developing Male * Intelligence = Smith-Magenis Syndrome * Intelligence
s. Typically Developing Male * Intelligence < Williams Syndrome * Intelligence
t. Typically Developing Male * Intelligence > Williams Syndrome * Intelligence
u. Typically Developing Male * Intelligence = Williams Syndrome * Intelligence
v. Typically Developing Male * Intelligence < Typically Developing Female * Intelligence
w. Typically Developing Male * Intelligence > Typically Developing Female * Intelligence
x. Typically Developing Male * Intelligence = Typically Developing Female * Intelligence

Table 119 GNS - Trait ratings - Intelligence - Facetype x Information interaction - statistics

	TDm * AS	TDm * CdLS	TDm * DS	TDm * FXS	TDm * PWS	TDm * SMS	TDm * WS	TDm * TDf
Z	-.433[b]	-2.846[c]	-.273[c]	-2.209[b]	-2.619[b]	-1.731[c]	-1.617[c]	-2.164[c]
Asymp. Sig. (2-tailed)	.665	.004	.785	.027	.009	.084	.106	.030

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 120 GNS - Trait ratings - Trustworthiness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Trustworthiness	58	6	419	198.59	103.061
Cornelia de Lange Syndrome * Trustworthiness	58	3	332	130.98	85.075
Down Syndrome * Trustworthiness	58	12	447	250.81	102.161
Fragile-X Syndrome * Trustworthiness	58	49	488	259.86	109.800
Prader-Willi Syndrome * Trustworthiness	58	8	414	194.47	96.608
Smith-Magenis Syndrome * Trustworthiness	58	62	501	255.47	99.332
Williams Syndrome * Trustworthiness	58	9	487	234.55	102.247
Typically Developing Female * Trustworthiness	58	93	486	370.83	83.854
Typically Developing Male * Trustworthiness	58	154	484	365.02	64.101
Valid N (listwise)	58				

Table 121 GNS - Trait ratings - Trustworthiness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.217	81.283	35	.000	.748	.862	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 122 GNS - Trait ratings - Trustworthiness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	2779908.190	8	347488.524	49.973	.000
	Greenhouse-Geisser	2779908.190	5.983	464664.404	49.973	.000
	Huynh-Feldt	2779908.190	6.897	403035.066	49.973	.000
	Lower-bound	2779908.190	1.000	2779908.190	49.973	.000
face_type * I_OR_U	Sphericity Assumed	91107.800	8	11388.475	1.638	.112
	Greenhouse-Geisser	91107.800	5.983	15228.759	1.638	.136
	Huynh-Feldt	91107.800	6.897	13208.939	1.638	.124
	Lower-bound	91107.800	1.000	91107.800	1.638	.206
Error(face_type)	Sphericity Assumed	3115150.837	448	6953.462		
	Greenhouse-Geisser	3115150.837	335.026	9298.224		
	Huynh-Feldt	3115150.837	386.256	8064.983		
	Lower-bound	3115150.837	56.000	55627.694		

Table 123 GNS - Trait ratings - Trustworthiness - Friedman test

Ranks

	Mean Rank
Angelman Syndrome * Trustworthiness	3.69
Cornelia de Lange Syndrome * Trustworthiness	2.25
Down Syndrome * Trustworthiness	4.90
Fragile-X Syndrome * Trustworthiness	5.21
Prader-Willi Syndrome * Trustworthiness	3.46
Smith-Magenis Syndrome * Trustworthiness	5.18
Williams Syndrome * Trustworthiness	4.70
Typically Developing Female * Trustworthiness	7.95
Typically Developing Male * Trustworthiness	7.67

Test Statistics[a]

N	58
Chi-Square	214.244
df	8
Asymp. Sig.	.000

a. Friedman Test

Table 124 GNS - Trait ratings - Trustworthiness - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 9	1585353.340	1	1585353.340	112.348	.000
	Level 2 vs. Level 9	3159238.936	1	3159238.936	253.158	.000
	Level 3 vs. Level 9	754964.487	1	754964.487	50.410	.000
	Level 4 vs. Level 9	646548.857	1	646548.857	36.355	.000

	Level 5 vs. Level 9	1686586.940	1	1686586.940	97.082	.000
	Level 6 vs. Level 9	699100.553	1	699100.553	50.280	.000
	Level 7 vs. Level 9	979249.667	1	979249.667	61.210	.000
	Level 8 vs. Level 9	2416.307	1	2416.307	.453	.504
face_type * I_OR_U	Level 1 vs. Level 9	49076.650	1	49076.650	3.478	.067
	Level 2 vs. Level 9	12587.350	1	12587.350	1.009	.320
	Level 3 vs. Level 9	114.901	1	114.901	.008	.931
	Level 4 vs. Level 9	11644.030	1	11644.030	.655	.422
	Level 5 vs. Level 9	278.871	1	278.871	.016	.900
	Level 6 vs. Level 9	4438.966	1	4438.966	.319	.574
	Level 7 vs. Level 9	9919.874	1	9919.874	.620	.434
	Level 8 vs. Level 9	20456.997	1	20456.997	3.837	.055
Error(face_type)	Level 1 vs. Level 9	790219.574	56	14111.064		
	Level 2 vs. Level 9	698840.581	56	12479.296		
	Level 3 vs. Level 9	838678.617	56	14976.404		
	Level 4 vs. Level 9	995917.574	56	17784.242		
	Level 5 vs. Level 9	972881.474	56	17372.883		
	Level 6 vs. Level 9	778629.379	56	13904.096		
	Level 7 vs. Level 9	895896.557	56	15998.153		
	Level 8 vs. Level 9	298541.917	56	5331.106		

Table 125 GNS - Trait ratings - Trustworthiness - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3665771.648	1	3665771.648	1361.777	.000
I_OR_U	6933.998	1	6933.998	2.576	.114
Error	150746.523	56	2691.902		

Table 126 GNS - Trait ratings - Trustworthiness – Wilcoxon test statistics

	TDm*Tru - AS*Tru	TDm*Tru-CDLS*Tru	TDm*Tru - DS*Tru	TDm*Tru-FXS*Tru	TDm*Tru-PWS*Tru	TDm*Tru-SMS*Tru	TDm*Tru -WS*Tru	TDm*Tru - TDf*Tru
Z	-6.360[b]	-6.616[b]	-5.644[b]	-5.125[b]	-6.089[b]	-5.408[b]	-5.582[b]	-1.041[c]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.298

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Table 127 GNS - Trait ratings - Trustworthiness – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
Typically Developing Male * Trustworthiness - Angelman Syndrome * Trustworthiness	Negative Ranks	4[a]	8.50	34.00
	Positive Ranks	54[b]	31.06	1677.00
	Ties	0[c]		
	Total	58		
Typically Developing Male * Trustworthiness - Cornelia de Lange Syndrome * Trustworthiness	Negative Ranks	1[d]	1.00	1.00
	Positive Ranks	57[e]	30.00	1710.00
	Ties	0[f]		
	Total	58		

Typically Developing Male * Trustworthiness - Down Syndrome * Trustworthiness	Negative Ranks	7[g]	18.07	126.50
	Positive Ranks	51[h]	31.07	1584.50
	Ties	0[i]		
	Total	58		
Typically Developing Male * Trustworthiness - Fragile-X Syndrome * Trustworthiness	Negative Ranks	11[j]	17.59	193.50
	Positive Ranks	47[k]	32.29	1517.50
	Ties	0[l]		
	Total	58		
Typically Developing Male * Trustworthiness - Prader-Willi Syndrome * Trustworthiness	Negative Ranks	4[m]	17.25	69.00
	Positive Ranks	54[n]	30.41	1642.00
	Ties	0[o]		
	Total	58		
Typically Developing Male * Trustworthiness - Smith-Magenis Syndrome * Trustworthiness	Negative Ranks	9[p]	17.44	157.00
	Positive Ranks	49[q]	31.71	1554.00
	Ties	0[r]		
	Total	58		
Typically Developing Male * Trustworthiness - Williams Syndrome * Trustworthiness	Negative Ranks	8[s]	16.81	134.50
	Positive Ranks	50[t]	31.53	1576.50
	Ties	0[u]		
	Total	58		
Typically Developing Male * Trustworthiness - Typically Developing Female * Trustworthiness	Negative Ranks	33[v]	30.00	990.00
	Positive Ranks	25[w]	28.84	721.00
	Ties	0[x]		
	Total	58		

a. Typically Developing Male * Trustworthiness < Angelman Syndrome * Trustworthiness
b. Typically Developing Male * Trustworthiness > Angelman Syndrome * Trustworthiness
c. Typically Developing Male * Trustworthiness = Angelman Syndrome * Trustworthiness
d. Typically Developing Male * Trustworthiness < Cornelia de Lange Syndrome * Trustworthiness
e. Typically Developing Male * Trustworthiness > Cornelia de Lange Syndrome * Trustworthiness
f. Typically Developing Male * Trustworthiness = Cornelia de Lange Syndrome * Trustworthiness
g. Typically Developing Male * Trustworthiness < Down Syndrome * Trustworthiness
h. Typically Developing Male * Trustworthiness > Down Syndrome * Trustworthiness
i. Typically Developing Male * Trustworthiness = Down Syndrome * Trustworthiness
j. Typically Developing Male * Trustworthiness < Fragile-X Syndrome * Trustworthiness
k. Typically Developing Male * Trustworthiness > Fragile-X Syndrome * Trustworthiness
l. Typically Developing Male * Trustworthiness = Fragile-X Syndrome * Trustworthiness
m. Typically Developing Male * Trustworthiness < Prader-Willi Syndrome * Trustworthiness
n. Typically Developing Male * Trustworthiness > Prader-Willi Syndrome * Trustworthiness
o. Typically Developing Male * Trustworthiness = Prader-Willi Syndrome * Trustworthiness
p. Typically Developing Male * Trustworthiness < Smith-Magenis Syndrome * Trustworthiness
q. Typically Developing Male * Trustworthiness > Smith-Magenis Syndrome * Trustworthiness
r. Typically Developing Male * Trustworthiness = Smith-Magenis Syndrome * Trustworthiness
s. Typically Developing Male * Trustworthiness < Williams Syndrome * Trustworthiness
t. Typically Developing Male * Trustworthiness > Williams Syndrome * Trustworthiness
u. Typically Developing Male * Trustworthiness = Williams Syndrome * Trustworthiness
v. Typically Developing Male * Trustworthiness < Typically Developing Female * Trustworthiness
w. Typically Developing Male * Trustworthiness > Typically Developing Female * Trustworthiness
x. Typically Developing Male * Trustworthiness = Typically Developing Female * Trustworthiness

Appendix R GNS - Experiment data tables – Time taken to make trait ratings

Table 128 GNS - Rating time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angelman Syndrome * Aggressiveness	58	1033	8020	3363.69	1548.297
Angelman Syndrome * Approachability	58	1315	12117	3539.41	2052.060
Angelman Syndrome * Attractiveness	58	1218	9603	3488.57	1844.990
Angelman Syndrome * Babyfacedness	58	1564	9749	3573.26	1750.259
Angelman Syndrome * Dominance	58	1299	12466	3560.53	2170.567
Angelman Syndrome * Intelligence	58	1384	11771	3774.43	2080.224
Angelman Syndrome * Trustworthiness	58	1156	13230	3611.74	2077.097
Cornelia de Lange Syndrome * Aggressiveness	58	1666	10060	3292.48	1779.748
Cornelia de Lange Syndrome * Approachability	58	1680	8852	3152.79	1569.650
Cornelia de Lange Syndrome * Attractiveness	58	1349	6959	3081.09	1352.757
Cornelia de Lange Syndrome * Babyfacedness	58	1454	13856	3809.45	2396.932
Cornelia de Lange Syndrome * Dominance	58	1327	7189	3297.05	1479.833
Cornelia de Lange Syndrome * Intelligence	58	1439	27495	4124.16	3769.496
Cornelia de Lange Syndrome * Trustworthiness	58	1186	14223	3510.97	2166.808
Down Syndrome * Aggressiveness	58	1693	7702	3345.16	1413.488
Down Syndrome * Approachability	58	1476	9044	3568.03	1816.213
Down Syndrome * Attractiveness	58	1214	13005	3500.07	2058.504
Down Syndrome * Babyfacedness	58	1474	11450	3599.88	1918.397
Down Syndrome * Dominance	58	1339	20244	3954.12	3395.628
Down Syndrome * Intelligence	58	1435	9595	3522.33	1665.747
Down Syndrome * Trustworthiness	58	1224	9247	3477.24	1595.422
Fragile-X Syndrome * Aggressiveness	58	1457	8099	3454.66	1578.345
Fragile-X Syndrome * Approachability	58	1549	10809	3325.02	1630.993
Fragile-X Syndrome * Attractiveness	58	1363	13328	3584.21	2096.728
Fragile-X Syndrome * Babyfacedness	58	1367	7723	3172.57	1278.582
Fragile-X Syndrome * Dominance	58	1072	12067	3443.19	2062.136
Fragile-X Syndrome * Intelligence	58	995	13799	3796.84	2447.887
Fragile-X Syndrome * Trustworthiness	58	1372	11995	3958.40	2576.108
Prader-Willi Syndrome * Aggressiveness	58	1570	8759	3496.79	1528.060
Prader-Willi Syndrome * Approachability	58	1400	11030	3640.90	1923.865
Prader-Willi Syndrome * Attractiveness	58	1390	9087	3565.55	1724.794
Prader-Willi Syndrome * Babyfacedness	58	1583	6924	3228.60	1267.974
Prader-Willi Syndrome * Dominance	58	1151	7439	3315.72	1556.428
Prader-Willi Syndrome * Intelligence	58	1448	11870	3712.40	1978.612
Prader-Willi Syndrome * Trustworthiness	58	1241	11643	3696.12	2001.472
Smith-Magenis Syndrome * Aggressiveness	58	1742	8823	3741.69	1755.664
Smith-Magenis Syndrome * Approachability	58	1615	11098	3874.64	2083.384
Smith-Magenis Syndrome * Attractiveness	58	1100	8227	3523.98	1787.563
Smith-Magenis Syndrome * Babyfacedness	58	1409	11674	3485.71	1818.654
Smith-Magenis Syndrome * Dominance	58	1138	8528	3452.93	1569.734
Smith-Magenis Syndrome * Intelligence	58	1429	10594	3860.41	2077.548
Smith-Magenis Syndrome * Trustworthiness	58	1481	9961	3930.90	1876.280
Williams Syndrome * Aggressiveness	58	1506	10784	3700.57	1787.550
Williams Syndrome * Approachability	58	1541	18471	3900.31	2471.486
Williams Syndrome * Attractiveness	58	1453	18621	3746.69	2784.089
Williams Syndrome * Babyfacedness	58	1454	19686	3620.67	2741.217
Williams Syndrome * Dominance	58	1100	9130	3407.97	1681.518
Williams Syndrome * Intelligence	58	1393	13732	3897.98	2358.333
Williams Syndrome * Trustworthiness	58	1247	13006	3709.17	2108.692
TDAggressiveness	58	1562	7738	3200.19	1268.029
TDApproachability	58	1537	11929	3090.92	1621.978
TDAttractiveness	58	1252	10513	3506.04	1926.674
TDBabyfacedness	58	1474	8176	3345.09	1402.928
TDDominance	58	1252	5749	3228.45	1138.275
TDIntelligence	58	1328	9842	3428.18	1573.855
Typically Developing Female * Trustworthiness	58	1528	6852	3098.10	1377.162
Valid N (listwise)	58				

Table 129 GNS - Rating time - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
Angelman Syndrome * Aggressiveness	Uninformed	.217	30	.001	.898	30	.007
	Informed	.267	28	.000	.820	28	.000
Angelman Syndrome * Approachability	Uninformed	.167	30	.032	.809	30	.000
	Informed	.237	28	.000	.799	28	.000
Angelman Syndrome * Attractiveness	Uninformed	.240	30	.000	.745	30	.000
	Informed	.126	28	.200*	.948	28	.177
Angelman Syndrome * Babyfacedness	Uninformed	.182	30	.013	.864	30	.001
	Informed	.161	28	.061	.921	28	.038
Angelman Syndrome * Dominance	Uninformed	.157	30	.058	.869	30	.002
	Informed	.246	28	.000	.764	28	.000
Angelman Syndrome * Intelligence	Uninformed	.222	30	.001	.787	30	.000
	Informed	.215	28	.002	.741	28	.000
Angelman Syndrome * Trustworthiness	Uninformed	.177	30	.017	.886	30	.004
	Informed	.253	28	.000	.727	28	.000
Cornelia de Lange Syndrome * Aggressiveness	Uninformed	.198	30	.004	.692	30	.000
	Informed	.241	28	.000	.717	28	.000
Cornelia de Lange Syndrome * Approachability	Uninformed	.274	30	.000	.705	30	.000
	Informed	.242	28	.000	.728	28	.000
Cornelia de Lange Syndrome * Attractiveness	Uninformed	.201	30	.003	.880	30	.003
	Informed	.258	28	.000	.813	28	.000
Cornelia de Lange Syndrome * Babyfacedness	Uninformed	.182	30	.013	.788	30	.000
	Informed	.221	28	.001	.709	28	.000
Cornelia de Lange Syndrome * Dominance	Uninformed	.125	30	.200*	.928	30	.045
	Informed	.155	28	.082	.913	28	.024
Cornelia de Lange Syndrome * Intelligence	Uninformed	.304	30	.000	.425	30	.000
	Informed	.190	28	.011	.767	28	.000
Cornelia de Lange Syndrome * Trustworthiness	Uninformed	.237	30	.000	.688	30	.000
	Informed	.159	28	.069	.894	28	.008
Down Syndrome * Aggressiveness	Uninformed	.179	30	.015	.876	30	.002
	Informed	.176	28	.027	.856	28	.001
Down Syndrome * Approachability	Uninformed	.227	30	.000	.825	30	.000
	Informed	.191	28	.010	.846	28	.001
Down Syndrome * Attractiveness	Uninformed	.173	30	.022	.875	30	.002
	Informed	.206	28	.004	.785	28	.000
Down Syndrome * Babyfacedness	Uninformed	.132	30	.193	.830	30	.000
	Informed	.170	28	.037	.782	28	.000
Down Syndrome * Dominance	Uninformed	.270	30	.000	.665	30	.000
	Informed	.286	28	.000	.539	28	.000
Down Syndrome * Intelligence	Uninformed	.176	30	.018	.898	30	.007
	Informed	.177	28	.025	.826	28	.000
Down Syndrome * Trustworthiness	Uninformed	.185	30	.010	.909	30	.014
	Informed	.164	28	.053	.874	28	.003
Fragile-X Syndrome * Aggressiveness	Uninformed	.219	30	.001	.878	30	.003
	Informed	.234	28	.000	.858	28	.001

Fragile-X Syndrome * Approachability	Uninformed	.157	30	.058	.800	30	.000
	Informed	.151	28	.104	.863	28	.002
Fragile-X Syndrome * Attractiveness	Uninformed	.225	30	.000	.657	30	.000
	Informed	.179	28	.022	.885	28	.005
Fragile-X Syndrome * Babyfacedness	Uninformed	.171	30	.026	.849	30	.001
	Informed	.146	28	.132	.940	28	.109
Fragile-X Syndrome * Dominance	Uninformed	.193	30	.006	.755	30	.000
	Informed	.201	28	.005	.816	28	.000
Fragile-X Syndrome * Intelligence	Uninformed	.171	30	.025	.794	30	.000
	Informed	.272	28	.000	.701	28	.000
Fragile-X Syndrome * Trustworthiness	Uninformed	.188	30	.008	.840	30	.000
	Informed	.282	28	.000	.763	28	.000
Prader-Willi Syndrome * Aggressiveness	Uninformed	.181	30	.014	.847	30	.001
	Informed	.166	28	.045	.875	28	.003
Prader-Willi Syndrome * Approachability	Uninformed	.194	30	.006	.780	30	.000
	Informed	.194	28	.008	.934	28	.076
Prader-Willi Syndrome * Attractiveness	Uninformed	.176	30	.018	.894	30	.006
	Informed	.195	28	.008	.853	28	.001
Prader-Willi Syndrome * Babyfacedness	Uninformed	.207	30	.002	.844	30	.000
	Informed	.109	28	.200*	.970	28	.579
Prader-Willi Syndrome * Dominance	Uninformed	.180	30	.015	.887	30	.004
	Informed	.109	28	.200*	.943	28	.132
Prader-Willi Syndrome * Intelligence	Uninformed	.246	30	.000	.758	30	.000
	Informed	.196	28	.007	.829	28	.000
Prader-Willi Syndrome * Trustworthiness	Uninformed	.213	30	.001	.735	30	.000
	Informed	.111	28	.200*	.930	28	.063
Smith-Magenis Syndrome * Aggressiveness	Uninformed	.183	30	.012	.851	30	.001
	Informed	.180	28	.021	.880	28	.004
Smith-Magenis Syndrome * Approachability	Uninformed	.240	30	.000	.801	30	.000
	Informed	.213	28	.002	.847	28	.001
Smith-Magenis Syndrome * Attractiveness	Uninformed	.199	30	.004	.873	30	.002
	Informed	.100	28	.200*	.962	28	.378
Smith-Magenis Syndrome * Babyfacedness	Uninformed	.245	30	.000	.791	30	.000
	Informed	.187	28	.014	.896	28	.009
Smith-Magenis Syndrome * Dominance	Uninformed	.107	30	.200*	.906	30	.012
	Informed	.137	28	.190	.907	28	.017
Smith-Magenis Syndrome * Intelligence	Uninformed	.163	30	.040	.898	30	.008
	Informed	.235	28	.000	.771	28	.000
Smith-Magenis Syndrome * Trustworthiness	Uninformed	.151	30	.078	.901	30	.009
	Informed	.142	28	.156	.899	28	.011
Williams Syndrome * Aggressiveness	Uninformed	.148	30	.094	.866	30	.001
	Informed	.149	28	.111	.881	28	.004
Williams Syndrome * Approachability	Uninformed	.319	30	.000	.537	30	.000
	Informed	.109	28	.200*	.936	28	.086
Williams Syndrome * Attractiveness	Uninformed	.323	30	.000	.652	30	.000
	Informed	.222	28	.001	.580	28	.000
Williams Syndrome * Babyfacedness	Uninformed	.207	30	.002	.647	30	.000
	Informed	.251	28	.000	.540	28	.000

Williams Syndrome * Dominance	Uninformed	.175	30	.020	.896	30	.007
	Informed	.189	28	.012	.827	28	.000
Williams Syndrome * Intelligence	Uninformed	.184	30	.011	.759	30	.000
	Informed	.187	28	.014	.869	28	.002
Williams Syndrome * Trustworthiness	Uninformed	.215	30	.001	.684	30	.000
	Informed	.145	28	.134	.880	28	.004
TDAggressiveness	Uninformed	.167	30	.032	.890	30	.005
	Informed	.169	28	.040	.903	28	.013
TDApproachability	Uninformed	.252	30	.000	.590	30	.000
	Informed	.123	28	.200*	.894	28	.008
TDAttractiveness	Uninformed	.201	30	.003	.923	30	.032
	Informed	.220	28	.001	.803	28	.000
TDBabyfacedness	Uninformed	.123	30	.200*	.920	30	.027
	Informed	.168	28	.042	.896	28	.009
TDDominance	Uninformed	.161	30	.045	.950	30	.171
	Informed	.152	28	.096	.912	28	.022
TDIntelligence	Uninformed	.152	30	.077	.915	30	.020
	Informed	.190	28	.011	.828	28	.000
Typically Developing Female * Trustworthiness	Uninformed	.197	30	.004	.857	30	.001
	Informed	.170	28	.037	.861	28	.002

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 130 GNS - Rating time - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.476	39.650	27	.056	.822	.943	.143
trait_ratings	.475	40.076	20	.005	.824	.930	.167
face_type * trait_ratings	.000	2035.832	902	.000	.291	.384	.024

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type + trait_ratings + face_type * trait_ratings
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 131 GNS - Rating time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	53602686.170	7	7657526.595	3.703	.001
	Greenhouse-Geisser	53602686.170	5.754	9315774.182	3.703	.002
	Huynh-Feldt	53602686.170	6.602	8119012.480	3.703	.001
	Lower-bound	53602686.170	1.000	53602686.170	3.703	.059
face_type * I_OR_U	Sphericity Assumed	12715523.470	7	1816503.353	.878	.523
	Greenhouse-Geisser	12715523.470	5.754	2209869.574	.878	.507
	Huynh-Feldt	12715523.470	6.602	1925976.124	.878	.519

	Lower-bound	12715523.470	1.000	12715523.470	.878	.353
Error(face_type)	Sphericity Assumed	810601335.600	392	2067860.550		
	Greenhouse-Geisser	810601335.600	322.222	2515658.507		
	Huynh-Feldt	810601335.600	369.719	2192481.528		
	Lower-bound	810601335.600	56.000	14475023.850		
trait_ratings	Sphericity Assumed	36289054.420	6	6048175.736	1.415	.208
	Greenhouse-Geisser	36289054.420	4.946	7337663.345	1.415	.219
	Huynh-Feldt	36289054.420	5.579	6504318.018	1.415	.212
	Lower-bound	36289054.420	1.000	36289054.420	1.415	.239
trait_ratings * I_OR_U	Sphericity Assumed	14401381.640	6	2400230.273	.562	.761
	Greenhouse-Geisser	14401381.640	4.946	2911965.932	.562	.727
	Huynh-Feldt	14401381.640	5.579	2581251.223	.562	.748
	Lower-bound	14401381.640	1.000	14401381.640	.562	.457
Error(trait_ratings)	Sphericity Assumed	1435889707.000	336	4273481.272		
	Greenhouse-Geisser	1435889707.000	276.953	5184599.167		
	Huynh-Feldt	1435889707.000	312.437	4595779.364		
	Lower-bound	1435889707.000	56.000	25640887.630		
face_type * trait_ratings	Sphericity Assumed	101706644.600	42	2421586.776	1.248	.133
	Greenhouse-Geisser	101706644.600	12.202	8334968.465	1.248	.245
	Huynh-Feldt	101706644.600	16.114	6311829.514	1.248	.224
	Lower-bound	101706644.600	1.000	101706644.600	1.248	.269
face_type * trait_ratings * I_OR_U	Sphericity Assumed	65496564.010	42	1559442.000	.804	.812
	Greenhouse-Geisser	65496564.010	12.202	5367513.575	.804	.649
	Huynh-Feldt	65496564.010	16.114	4064662.121	.804	.683
	Lower-bound	65496564.010	1.000	65496564.010	.804	.374
Error(face_type*trait_ratings)	Sphericity Assumed	4563619178.000	2352	1940314.276		
	Greenhouse-Geisser	4563619178.000	683.335	6678454.996		
	Huynh-Feldt	4563619178.000	902.365	5057399.981		
	Lower-bound	4563619178.000	56.000	81493199.600		

Table 132 GNS - Rating time - Friedman test

Ranks

	Mean Rank
AngelmanSyndrome	4.64
CorneliadeLangeSyndrome	4.09
DownSyndrome	4.59
FragileXSyndrome	4.21
PraderWilliSyndrome	4.52
SmithMagenisSyndrome	5.29

WilliamsSyndrome	5.28
TypicallyDeveloping	3.40

Test Statistics[a]

N	58
Chi-Square	26.414
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 133 GNS - Rating time - Within-subjects contrasts

Source	face_type	trait_ratings	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8		33165309.660	1	33165309.660	8.514	.005
	Level 2 vs. Level 8		15024027.730	1	15024027.730	3.084	.085
	Level 3 vs. Level 8		35981964.700	1	35981964.700	8.280	.006
	Level 4 vs. Level 8		27465995.280	1	27465995.280	6.931	.011
	Level 5 vs. Level 8		25852621.750	1	25852621.750	8.368	.005
	Level 6 vs. Level 8		71632453.690	1	71632453.690	23.219	.000
	Level 7 vs. Level 8		78889670.690	1	78889670.690	15.097	.000
face_type * I_OR_U	Level 1 vs. Level 8		1138067.406	1	1138067.406	.292	.591
	Level 2 vs. Level 8		3886616.497	1	3886616.497	.798	.376
	Level 3 vs. Level 8		1628846.770	1	1628846.770	.375	.543
	Level 4 vs. Level 8		1812409.543	1	1812409.543	.457	.502
	Level 5 vs. Level 8		484176.558	1	484176.558	.157	.694
	Level 6 vs. Level 8		6791554.613	1	6791554.613	2.201	.143
	Level 7 vs. Level 8		8355.729	1	8355.729	.002	.968
Error(face_type)	Level 1 vs. Level 8		218139355.800	56	3895345.640		
	Level 2 vs. Level 8		272793501.000	56	4871312.518		
	Level 3 vs. Level 8		243368646.800	56	4345868.693		
	Level 4 vs. Level 8		221901800.400	56	3962532.151		
	Level 5 vs. Level 8		173020219.900	56	3089646.783		
	Level 6 vs. Level 8		172761650.800	56	3085029.479		
	Level 7 vs. Level 8		292630903.300	56	5225551.845		
trait_ratings		Linear	1995301.253	1	1995301.253	3.217	.078
		Quadratic	224448.541	1	224448.541	.428	.516
		Cubic	8629.673	1	8629.673	.018	.893
		Order 4	1302776.465	1	1302776.465	2.683	.107

		Order 5	815904.712	1	815904.712	1.275	.264
		Order 6	189071.159	1	189071.159	.411	.524
trait_ratings * I_OR_U		Linear	65626.012	1	65626.012	.106	.746
		Quadratic	39508.815	1	39508.815	.075	.785
		Cubic	341621.491	1	341621.491	.720	.400
		Order 4	100227.581	1	100227.581	.206	.651
		Order 5	921712.353	1	921712.353	1.440	.235
		Order 6	331476.453	1	331476.453	.720	.400
Error(trait_ratings)		Linear	34735492.650	56	620276.654		
		Quadratic	29383825.880	56	524711.176		
		Cubic	26567496.040	56	474419.572		
		Order 4	27192525.770	56	485580.817		
		Order 5	35834584.730	56	639903.299		
		Order 6	25772288.370	56	460219.435		
face_type * trait_ratings	Level 1 vs. Level 8	Linear	2741682.047	1	2741682.047	.881	.352
		Quadratic	1745272.166	1	1745272.166	1.013	.318
		Cubic	101498.572	1	101498.572	.064	.802
		Order 4	1524844.389	1	1524844.389	.663	.419
		Order 5	4615326.946	1	4615326.946	.985	.325
		Order 6	829421.680	1	829421.680	.473	.495
	Level 2 vs. Level 8	Linear	14656316.740	1	14656316.740	5.184	.027
		Quadratic	2185647.127	1	2185647.127	.870	.355
		Cubic	6524790.379	1	6524790.379	1.637	.206
		Order 4	743574.404	1	743574.404	.131	.719
		Order 5	51312.382	1	51312.382	.023	.881
		Order 6	21650451.620	1	21650451.620	5.111	.028
	Level 3 vs. Level 8	Linear	831208.409	1	831208.409	.404	.528
		Quadratic	161888.237	1	161888.237	.050	.824
		Cubic	123973.643	1	123973.643	.044	.835
		Order 4	18203.350	1	18203.350	.009	.923
		Order 5	19644261.340	1	19644261.340	4.348	.042
		Order 6	456249.973	1	456249.973	.149	.701
	Level 4 vs. Level 8	Linear	9936412.139	1	9936412.139	3.587	.063
		Quadratic	20276107.670	1	20276107.670	8.401	.005
		Cubic	1074636.804	1	1074636.804	.593	.445
		Order 4	848688.520	1	848688.520	.377	.542
		Order 5	349747.507	1	349747.507	.130	.719
		Order 6	1833787.494	1	1833787.494	1.044	.311
	Level 5 vs. Level 8	Linear	341548.189	1	341548.189	.147	.703
		Quadratic	14739262.670	1	14739262.670	5.614	.021
		Cubic	2864095.238	1	2864095.238	1.575	.215
		Order 4	5105472.968	1	5105472.968	3.172	.080
		Order 5	1351232.229	1	1351232.229	.470	.496
		Order 6	22769.267	1	22769.267	.010	.919
	Level 6 vs. Level 8	Linear	279280.105	1	279280.105	.104	.748
		Quadratic	21684368.260	1	21684368.260	10.630	.002
		Cubic	1676829.553	1	1676829.553	.628	.431
		Order 4	4151434.818	1	4151434.818	1.915	.172
		Order 5	5188688.532	1	5188688.532	2.363	.130
		Order 6	1444335.697	1	1444335.697	.706	.404
	Level 7 vs. Level 8	Linear	460830.114	1	460830.114	.090	.765
		Quadratic	7418175.174	1	7418175.174	1.646	.205
		Cubic	2400695.975	1	2400695.975	.957	.332
		Order 4	4502162.005	1	4502162.005	.737	.394

		Order 5	825849.702	1	825849.702	.314	.577
		Order 6	2281205.333	1	2281205.333	.874	.354
face_type * trait_ratings * I_OR_U	Level 1 vs. Level 8	Linear	3421114.779	1	3421114.779	1.099	.299
		Quadratic	2200968.002	1	2200968.002	1.278	.263
		Cubic	679.146	1	679.146	.000	.984
		Order 4	8629778.163	1	8629778.163	3.752	.058
		Order 5	3714613.793	1	3714613.793	.793	.377
		Order 6	4688617.964	1	4688617.964	2.673	.108
	Level 2 vs. Level 8	Linear	6670662.845	1	6670662.845	2.360	.130
		Quadratic	1062418.286	1	1062418.286	.423	.518
		Cubic	1818410.120	1	1818410.120	.456	.502
		Order 4	676997.918	1	676997.918	.119	.731
		Order 5	251224.467	1	251224.467	.111	.740
		Order 6	440194.317	1	440194.317	.104	.748
	Level 3 vs. Level 8	Linear	2058407.592	1	2058407.592	1.000	.322
		Quadratic	3109299.157	1	3109299.157	.955	.333
		Cubic	11582.661	1	11582.661	.004	.949
		Order 4	554980.276	1	554980.276	.285	.596
		Order 5	4411248.745	1	4411248.745	.976	.327
		Order 6	513757.005	1	513757.005	.168	.684
	Level 4 vs. Level 8	Linear	1750157.389	1	1750157.389	.632	.430
		Quadratic	795243.233	1	795243.233	.329	.568
		Cubic	9157.867	1	9157.867	.005	.944
		Order 4	4202377.218	1	4202377.218	1.864	.178
		Order 5	851077.090	1	851077.090	.317	.576
		Order 6	229154.587	1	229154.587	.131	.719
	Level 5 vs. Level 8	Linear	58755.868	1	58755.868	.025	.874
		Quadratic	8955957.849	1	8955957.849	3.411	.070
		Cubic	222961.301	1	222961.301	.123	.728
		Order 4	176248.481	1	176248.481	.110	.742
		Order 5	6217817.608	1	6217817.608	2.164	.147
		Order 6	1738067.750	1	1738067.750	.798	.375
	Level 6 vs. Level 8	Linear	175860.662	1	175860.662	.066	.799
		Quadratic	380002.750	1	380002.750	.186	.668
		Cubic	3085563.346	1	3085563.346	1.156	.287
		Order 4	118678.431	1	118678.431	.055	.816
		Order 5	97691.561	1	97691.561	.044	.834
		Order 6	4669773.008	1	4669773.008	2.282	.137
	Level 7 vs. Level 8	Linear	7063675.184	1	7063675.184	1.386	.244
		Quadratic	4215031.990	1	4215031.990	.935	.338
		Cubic	1322805.481	1	1322805.481	.527	.471
		Order 4	2385645.474	1	2385645.474	.390	.535
		Order 5	2768804.126	1	2768804.126	1.054	.309
		Order 6	3543342.600	1	3543342.600	1.357	.249
Error(face_type*trait_ratings)	Level 1 vs. Level 8	Linear	174275955.600	56	3112070.635		
		Quadratic	96441790.550	56	1722174.831		
		Cubic	89430788.750	56	1596978.370		
		Order 4	128786126.700	56	2299752.263		
		Order 5	262469171.000	56	4686949.482		
		Order 6	98227872.060	56	1754069.144		
	Level 2 vs. Level 8	Linear	158311882.100	56	2826997.895		
		Quadratic	140644724.200	56	2511512.932		
		Cubic	223203363.200	56	3985774.342		
		Order 4	318156772.100	56	5681370.929		
		Order 5	126333853.400	56	2255961.667		
		Order 6	237213320.600	56	4235952.154		
		Linear	115293442.300	56	2058811.470		

		Quadratic	182313039.000	56	3255589.981		
		Cubic	157804678.000	56	2817940.679		
	Level 3 vs. Level 8	Order 4	109090332.600	56	1948041.654		
		Order 5	253021275.500	56	4518237.062		
		Order 6	171537118.000	56	3063162.821		
	Level 4 vs. Level 8	Linear	155111547.900	56	2769849.071		
		Quadratic	135161443.100	56	2413597.198		
		Cubic	101534563.900	56	1813117.212		
		Order 4	126221068.200	56	2253947.646		
		Order 5	150266597.300	56	2683332.095		
		Order 6	98332402.660	56	1755935.762		
	Level 5 vs. Level 8	Linear	130356879.300	56	2327801.417		
		Quadratic	147035712.300	56	2625637.719		
		Cubic	101812128.800	56	1818073.729		
		Order 4	90133620.220	56	1609528.932		
		Order 5	160941032.700	56	2873947.013		
		Order 6	121943195.600	56	2177557.064		
	Level 6 vs. Level 8	Linear	150220871.800	56	2682515.568		
		Quadratic	114235179.400	56	2039913.918		
		Cubic	149520234.500	56	2670004.188		
		Order 4	121415181.900	56	2168128.248		
		Order 5	122988707.200	56	2196226.914		
		Order 6	114613107.200	56	2046662.629		
	Level 7 vs. Level 8	Linear	285467816.400	56	5097639.579		
		Quadratic	252396342.600	56	4507077.547		
		Cubic	140496978.500	56	2508874.616		
		Order 4	342180757.900	56	6110370.676		
		Order 5	147138850.500	56	2627479.472		
		Order 6	146235341.000	56	2611345.375		

Table 134 GNS - Rating time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5090824371.000	1	5090824371.000	418.156	.000
I_OR_U	1790604.091	1	1790604.091	.147	.703
Error	681769934.800	56	12174463.120		

Table 135 GNS - Rating time - Wilcoxon statistics

	TD - AS	TD - CDLS	TD - DS	TD - FXS	TD - PWS	TD - SMS	TD - WS
Z	-3.457[b]	-1.436[b]	-2.652[b]	-2.745[b]	-2.915[b]	-4.572[b]	-3.960[b]
Asymp. Sig. (2-tailed)	.001	.151	.008	.006	.004	.000	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Table 136 GNS - Rating time - Wilcoxon ranks

		N	Mean Rank	Sum of Ranks
TypicallyDeveloping - AngelmanSyndrome	Negative Ranks	39[a]	33.38	1302.00
	Positive Ranks	19[b]	21.53	409.00

	Ties	0[c]		
	Total	58		
TypicallyDeveloping - CorneliadeLangeSyndrome	Negative Ranks	30[d]	34.70	1041.00
	Positive Ranks	28[e]	23.93	670.00
	Ties	0[f]		
	Total	58		
TypicallyDeveloping - DownSyndrome	Negative Ranks	36[g]	33.28	1198.00
	Positive Ranks	22[h]	23.32	513.00
	Ties	0[i]		
	Total	58		
TypicallyDeveloping - FragileXSyndrome	Negative Ranks	37[j]	32.70	1210.00
	Positive Ranks	21[k]	23.86	501.00
	Ties	0[l]		
	Total	58		
TypicallyDeveloping - PraderWilliSyndrome	Negative Ranks	35[m]	35.20	1232.00
	Positive Ranks	23[n]	20.83	479.00
	Ties	0[o]		
	Total	58		
TypicallyDeveloping - SmithMagenisSyndrome	Negative Ranks	45[p]	32.13	1446.00
	Positive Ranks	13[q]	20.38	265.00
	Ties	0[r]		
	Total	58		
TypicallyDeveloping - WilliamsSyndrome	Negative Ranks	45[s]	30.38	1367.00
	Positive Ranks	13[t]	26.46	344.00
	Ties	0[u]		
	Total	58		

a. TypicallyDeveloping < AngelmanSyndrome
b. TypicallyDeveloping > AngelmanSyndrome
c. TypicallyDeveloping = AngelmanSyndrome
d. TypicallyDeveloping < CorneliadeLangeSyndrome
e. TypicallyDeveloping > CorneliadeLangeSyndrome
f. TypicallyDeveloping = CorneliadeLangeSyndrome
g. TypicallyDeveloping < DownSyndrome
h. TypicallyDeveloping > DownSyndrome
i. TypicallyDeveloping = DownSyndrome
j. TypicallyDeveloping < FragileXSyndrome
k. TypicallyDeveloping > FragileXSyndrome
l. TypicallyDeveloping = FragileXSyndrome
m. TypicallyDeveloping < PraderWilliSyndrome
n. TypicallyDeveloping > PraderWilliSyndrome
o. TypicallyDeveloping = PraderWilliSyndrome
p. TypicallyDeveloping < SmithMagenisSyndrome
q. TypicallyDeveloping > SmithMagenisSyndrome
r. TypicallyDeveloping = SmithMagenisSyndrome
s. TypicallyDeveloping < WilliamsSyndrome
t. TypicallyDeveloping > WilliamsSyndrome
u. TypicallyDeveloping = WilliamsSyndrome

Appendix S GNS - experiment data tables – Number of fixations to the whole face

Table 137 GNS - Total fixations - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS	48	3.00	11.67	8.6460	1.68461
CdLS	48	2.00	13.00	9.1177	2.13220
DS	48	2.33	13.67	9.0075	2.15188
FXS	48	3.33	12.00	8.6873	1.93183
PWS	48	2.33	12.33	8.3331	2.26671
SMS	48	2.00	12.33	8.6252	2.23763
WS	48	2.67	12.00	8.5863	1.82538
TD	48	2.67	12.33	8.2294	2.09311
Valid N (listwise)	48				

Table 138 GNS - Total fixations - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
AS	Uninformed	.147	24	.194	.956	24	.359
	Informed	.158	24	.124	.902	24	.024
CdLS	Uninformed	.132	24	.200*	.964	24	.514
	Informed	.243	24	.001	.817	24	.001
DS	Uninformed	.094	24	.200*	.975	24	.786
	Informed	.197	24	.017	.887	24	.011
FXS	Uninformed	.153	24	.153	.916	24	.049
	Informed	.228	24	.002	.888	24	.012
PWS	Uninformed	.132	24	.200*	.942	24	.179
	Informed	.148	24	.184	.910	24	.035
SMS	Uninformed	.122	24	.200*	.968	24	.614
	Informed	.189	24	.026	.856	24	.003
WS	Uninformed	.106	24	.200*	.973	24	.740
	Informed	.156	24	.135	.919	24	.055
TD	Uninformed	.134	24	.200*	.971	24	.686
	Informed	.211	24	.007	.865	24	.004

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 139 GNS - Total fixations - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.351	45.507	27	.015	.768	.900	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U

Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 140 GNS - Total fixations - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	30.233	7	4.319	4.095	.000
	Greenhouse-Geisser	30.233	5.376	5.624	4.095	.001
	Huynh-Feldt	30.233	6.302	4.797	4.095	.000
	Lower-bound	30.233	1.000	30.233	4.095	.049
face_type * I_OR_U	Sphericity Assumed	4.660	7	.666	.631	.730
	Greenhouse-Geisser	4.660	5.376	.867	.631	.688
	Huynh-Feldt	4.660	6.302	.739	.631	.713
	Lower-bound	4.660	1.000	4.660	.631	.431
Error(face_type)	Sphericity Assumed	339.600	322	1.055		
	Greenhouse-Geisser	339.600	247.281	1.373		
	Huynh-Feldt	339.600	289.912	1.171		
	Lower-bound	339.600	46.000	7.383		

Table 141 GNS - Total fixations - Friedman test

Ranks

	Mean Rank
AS	4.40
CdLS	5.53
DS	5.28
FXS	4.57
PWS	3.85
SMS	4.35
WS	4.45
TD	3.56

Test Statistics[a]

N	48
Chi-Square	25.107
df	7
Asymp. Sig.	.001

a. Friedman Test

Table 142 GNS - Total fixations - Within-subjects contrasts

face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Level 1 vs. Level 8	8.333	1	8.333	3.788	.058
Level 2 vs. Level 8	37.879	1	37.879	16.067	.000
Level 3 vs. Level 8	29.063	1	29.063	14.304	.000
Level 4 vs. Level 8	10.065	1	10.065	4.097	.049
Level 5 vs. Level 8	.517	1	.517	.294	.590
Level 6 vs. Level 8	7.521	1	7.521	2.455	.124
Level 7 vs. Level 8	6.113	1	6.113	3.027	.089
Level 1 vs. Level 8	.672	1	.672	.306	.583
Level 2 vs. Level 8	.400	1	.400	.170	.682
Level 3 vs. Level 8	1.453	1	1.453	.715	.402
Level 4 vs. Level 8	2.236	1	2.236	.910	.345
Level 5 vs. Level 8	.330	1	.330	.188	.667
Level 6 vs. Level 8	.445	1	.445	.145	.705
Level 7 vs. Level 8	1.071	1	1.071	.530	.470

Level 1 vs. Level 8	101.190	46	2.200		
Level 2 vs. Level 8	108.448	46	2.358		
Level 3 vs. Level 8	93.465	46	2.032		
Level 4 vs. Level 8	113.015	46	2.457		
Level 5 vs. Level 8	80.877	46	1.758		
Level 6 vs. Level 8	140.939	46	3.064		
Level 7 vs. Level 8	92.910	46	2.020		

Table 143 GNS - Total fixations - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3594.854	1	3594.854	1075.067	.000
I_OR_U	.579	1	.579	.173	.679
Error	153.817	46	3.344		

Table 144 GNS - Total fixations - Wilcoxon test statistics

	TD - AS	TD - CdLS	TD - DS	TD - FXS	TD - PWS	TD - SMS	TD - WS
Z	-1.626[b]	-3.912[b]	-3.586[b]	-1.924[b]	-.323[b]	-1.397[b]	-1.901[b]
Asymp. Sig. (2-tailed)	.104	.000	.000	.054	.747	.163	.057

- Wilcoxon Signed Ranks Test
- Based on positive ranks

Table 145 GNS - Total fixations – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD - AS	Negative Ranks	30[a]	23.92	717.50
	Positive Ranks	17[b]	24.15	410.50
	Ties	1[c]		
	Total	48		
TD - CdLS	Negative Ranks	35[d]	26.67	933.50
	Positive Ranks	12[e]	16.21	194.50
	Ties	1[f]		
	Total	48		
TD - DS	Negative Ranks	34[g]	24.56	835.00
	Positive Ranks	11[h]	18.18	200.00
	Ties	3[i]		
	Total	48		
TD - FXS	Negative Ranks	28[j]	25.59	716.50
	Positive Ranks	18[k]	20.25	364.50
	Ties	2[l]		
	Total	48		
TD - PWS	Negative Ranks	24[m]	25.81	619.50
	Positive Ranks	24[n]	23.19	556.50
	Ties	0[o]		
	Total	48		
TD - SMS	Negative Ranks	31[p]	23.35	724.00
	Positive Ranks	17[q]	26.59	452.00
	Ties	0[r]		
	Total	48		

TD - WS	Negative Ranks	24[s]	24.04	577.00
	Positive Ranks	17[t]	16.71	284.00
	Ties	7[u]		
	Total	48		

a. TD < AS
b. TD > AS
c. TD = AS
d. TD < CdLS
e. TD > CdLS
f. TD = CdLS
g. TD < DS
h. TD > DS
i. TD = DS
j. TD < FXS
k. TD > FXS
l. TD = FXS
m. TD < PWS
n. TD > PWS
o. TD = PWS
p. TD < SMS
q. TD > SMS
r. TD = SMS
s. TD < WS
t. TD > WS
u. TD = WS

Appendix T GNS - Experiment data tables – Interest area data

Table 146 GNS - Fixation count - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
AS_E	Uninformed	.135	24	.200*	.941	24	.172
	Informed	.115	24	.200*	.973	24	.734
AS_N	Uninformed	.191	24	.024	.941	24	.168
	Informed	.195	24	.019	.917	24	.050
AS_M	Uninformed	.162	24	.105	.946	24	.224
	Informed	.180	24	.042	.932	24	.106
CdLS_E	Uninformed	.101	24	.200*	.976	24	.806
	Informed	.165	24	.092	.928	24	.090
CdLS_N	Uninformed	.124	24	.200*	.963	24	.492
	Informed	.190	24	.025	.860	24	.003
CdLS_M	Uninformed	.177	24	.049	.909	24	.033
	Informed	.194	24	.021	.896	24	.018
DS_E	Uninformed	.168	24	.079	.937	24	.137
	Informed	.128	24	.200*	.977	24	.843
DS_N	Uninformed	.071	24	.200*	.981	24	.913
	Informed	.136	24	.200*	.933	24	.115
DS_M	Uninformed	.168	24	.077	.883	24	.010
	Informed	.184	24	.034	.907	24	.031
FX_E	Uninformed	.134	24	.200*	.956	24	.362
	Informed	.116	24	.200*	.969	24	.641
FX_N	Uninformed	.105	24	.200*	.949	24	.256
	Informed	.183	24	.037	.919	24	.055
FX_M	Uninformed	.200	24	.014	.901	24	.022
	Informed	.165	24	.088	.926	24	.081
PWS_E	Uninformed	.203	24	.012	.932	24	.110
	Informed	.129	24	.200*	.965	24	.537
PWS_N	Uninformed	.122	24	.200*	.940	24	.162
	Informed	.151	24	.162	.885	24	.010
PWS_M	Uninformed	.169	24	.075	.882	24	.009
	Informed	.156	24	.134	.901	24	.022
SMS_E	Uninformed	.118	24	.200*	.943	24	.189
	Informed	.103	24	.200*	.958	24	.403
SMS_N	Uninformed	.125	24	.200*	.953	24	.311
	Informed	.202	24	.012	.893	24	.016
SMS_M	Uninformed	.179	24	.045	.853	24	.003
	Informed	.208	24	.009	.869	24	.005
WS_E	Uninformed	.178	24	.047	.920	24	.060
	Informed	.172	24	.065	.957	24	.372
WS_N	Uninformed	.223	24	.003	.884	24	.010
	Informed	.178	24	.048	.916	24	.049
WS_M	Uninformed	.129	24	.200*	.910	24	.035
	Informed	.131	24	.200*	.958	24	.406
TD_E	Uninformed	.105	24	.200*	.979	24	.884
	Informed	.150	24	.170	.944	24	.196
TD_N	Uninformed	.086	24	.200*	.983	24	.948
	Informed	.152	24	.158	.931	24	.104

TD_M	Uninformed	.182	24	.039	.867	24	.005
	Informed	.173	24	.062	.943	24	.189

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 147 GNS - Fixation percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
AS_E	Uninformed	.121	24	.200*	.948	24	.248
	Informed	.115	24	.200*	.972	24	.723
AS_N	Uninformed	.129	24	.200*	.945	24	.209
	Informed	.161	24	.108	.884	24	.010
AS_M	Uninformed	.134	24	.200*	.952	24	.300
	Informed	.090	24	.200*	.974	24	.774
CdLS_E	Uninformed	.121	24	.200*	.945	24	.216
	Informed	.102	24	.200*	.911	24	.037
CdLS_N	Uninformed	.111	24	.200*	.945	24	.214
	Informed	.255	24	.000	.733	24	.000
CdLS_M	Uninformed	.122	24	.200*	.927	24	.083
	Informed	.144	24	.200*	.927	24	.083
DS_E	Uninformed	.140	24	.200*	.981	24	.921
	Informed	.160	24	.116	.958	24	.396
DS_N	Uninformed	.150	24	.176	.957	24	.380
	Informed	.163	24	.097	.846	24	.002
DS_M	Uninformed	.142	24	.200*	.882	24	.009
	Informed	.104	24	.200*	.965	24	.558
FX_E	Uninformed	.096	24	.200*	.974	24	.759
	Informed	.107	24	.200*	.952	24	.293
FX_N	Uninformed	.124	24	.200*	.947	24	.237
	Informed	.195	24	.019	.922	24	.065
FX_M	Uninformed	.175	24	.056	.924	24	.072
	Informed	.232	24	.002	.827	24	.001
PWS_E	Uninformed	.133	24	.200*	.964	24	.520
	Informed	.167	24	.083	.968	24	.612
PWS_N	Uninformed	.121	24	.200*	.929	24	.094
	Informed	.231	24	.002	.754	24	.000
PWS_M	Uninformed	.153	24	.154	.910	24	.034
	Informed	.170	24	.071	.863	24	.004
SMS_E	Uninformed	.135	24	.200*	.959	24	.410
	Informed	.131	24	.200*	.967	24	.603
SMS_N	Uninformed	.158	24	.126	.951	24	.292
	Informed	.268	24	.000	.765	24	.000
SMS_M	Uninformed	.146	24	.200*	.859	24	.003
	Informed	.187	24	.029	.901	24	.023
WS_E	Uninformed	.110	24	.200*	.957	24	.376
	Informed	.151	24	.163	.969	24	.653
WS_N	Uninformed	.211	24	.007	.888	24	.012
	Informed	.213	24	.006	.773	24	.000
WS_M	Uninformed	.112	24	.200*	.925	24	.075
	Informed	.081	24	.200*	.980	24	.902
TD_E	Uninformed	.130	24	.200*	.966	24	.560
	Informed	.217	24	.005	.868	24	.005

TD_N	Uninformed	.106	24	.200*	.979	24	.876
	Informed	.218	24	.005	.784	24	.000
TD_M	Uninformed	.128	24	.200*	.889	24	.013
	Informed	.102	24	.200*	.954	24	.334

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 148 GNS - Dwell time - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
AS_E	Uninformed	.094	24	.200*	.940	24	.164
	Informed	.164	24	.096	.891	24	.014
AS_N	Uninformed	.151	24	.164	.916	24	.047
	Informed	.200	24	.014	.879	24	.008
AS_M	Uninformed	.123	24	.200*	.952	24	.298
	Informed	.196	24	.018	.901	24	.022
CdLS_E	Uninformed	.160	24	.117	.961	24	.455
	Informed	.122	24	.200*	.973	24	.730
CdLS_N	Uninformed	.149	24	.179	.944	24	.195
	Informed	.231	24	.002	.721	24	.000
CdLS_M	Uninformed	.180	24	.044	.902	24	.024
	Informed	.137	24	.200*	.882	24	.009
DS_E	Uninformed	.123	24	.200*	.971	24	.681
	Informed	.084	24	.200*	.984	24	.958
DS_N	Uninformed	.101	24	.200*	.958	24	.394
	Informed	.207	24	.009	.770	24	.000
DS_M	Uninformed	.157	24	.132	.886	24	.011
	Informed	.126	24	.200*	.943	24	.187
FX_E	Uninformed	.127	24	.200*	.953	24	.307
	Informed	.173	24	.062	.936	24	.135
FX_N	Uninformed	.099	24	.200*	.942	24	.183
	Informed	.197	24	.017	.950	24	.268
FX_M	Uninformed	.179	24	.046	.910	24	.036
	Informed	.233	24	.002	.918	24	.052
PWS_E	Uninformed	.117	24	.200*	.966	24	.568
	Informed	.111	24	.200*	.974	24	.759
PWS_N	Uninformed	.136	24	.200*	.943	24	.190
	Informed	.162	24	.101	.887	24	.011
PWS_M	Uninformed	.145	24	.200*	.886	24	.011
	Informed	.120	24	.200*	.918	24	.052
SMS_E	Uninformed	.123	24	.200*	.954	24	.334
	Informed	.139	24	.200*	.963	24	.500
SMS_N	Uninformed	.126	24	.200*	.938	24	.145
	Informed	.273	24	.000	.746	24	.000
SMS_M	Uninformed	.150	24	.173	.890	24	.014
	Informed	.173	24	.062	.916	24	.048
WS_E	Uninformed	.129	24	.200*	.942	24	.176
	Informed	.109	24	.200*	.977	24	.846
WS_N	Uninformed	.149	24	.177	.919	24	.057
	Informed	.285	24	.000	.717	24	.000
WS_M	Uninformed	.106	24	.200*	.954	24	.323
	Informed	.083	24	.200*	.964	24	.518

TD_E	Uninformed	.094	24	.200*	.973	24	.735
	Informed	.220	24	.004	.887	24	.012
TD_N	Uninformed	.115	24	.200*	.972	24	.727
	Informed	.266	24	.000	.733	24	.000
TD_M	Uninformed	.161	24	.109	.891	24	.014
	Informed	.134	24	.200*	.943	24	.195

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 149 GNS - Dwell percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
AS_E	Uninformed	.101	24	.200*	.952	24	.298
	Informed	.155	24	.141	.918	24	.052
AS_N	Uninformed	.153	24	.153	.904	24	.026
	Informed	.178	24	.047	.898	24	.019
AS_M	Uninformed	.113	24	.200*	.960	24	.442
	Informed	.178	24	.049	.917	24	.050
CdLS_E	Uninformed	.088	24	.200*	.976	24	.813
	Informed	.117	24	.200*	.965	24	.550
CdLS_N	Uninformed	.134	24	.200*	.938	24	.149
	Informed	.196	24	.017	.774	24	.000
CdLS_M	Uninformed	.198	24	.016	.902	24	.023
	Informed	.131	24	.200*	.894	24	.016
DS_E	Uninformed	.088	24	.200*	.978	24	.852
	Informed	.097	24	.200*	.978	24	.864
DS_N	Uninformed	.129	24	.200*	.957	24	.384
	Informed	.182	24	.039	.809	24	.000
DS_M	Uninformed	.166	24	.086	.875	24	.007
	Informed	.123	24	.200*	.937	24	.142
FX_E	Uninformed	.151	24	.165	.949	24	.257
	Informed	.198	24	.016	.936	24	.131
FX_N	Uninformed	.109	24	.200*	.945	24	.209
	Informed	.145	24	.200*	.967	24	.582
FX_M	Uninformed	.186	24	.032	.926	24	.078
	Informed	.178	24	.048	.950	24	.275
PWS_E	Uninformed	.115	24	.200*	.977	24	.833
	Informed	.136	24	.200*	.965	24	.556
PWS_N	Uninformed	.153	24	.149	.942	24	.179
	Informed	.154	24	.146	.921	24	.063
PWS_M	Uninformed	.150	24	.175	.887	24	.011
	Informed	.117	24	.200*	.923	24	.069
SMS_E	Uninformed	.116	24	.200*	.951	24	.280
	Informed	.160	24	.112	.961	24	.450
SMS_N	Uninformed	.182	24	.038	.931	24	.100
	Informed	.267	24	.000	.781	24	.000
SMS_M	Uninformed	.156	24	.136	.889	24	.013
	Informed	.176	24	.053	.914	24	.044
WS_E	Uninformed	.156	24	.137	.950	24	.267
	Informed	.122	24	.200*	.977	24	.830
WS_N	Uninformed	.146	24	.200*	.922	24	.065
	Informed	.283	24	.000	.753	24	.000

WS_M	Uninformed	.097	24	.200*	.952	24	.298
	Informed	.098	24	.200*	.965	24	.538
TD_E	Uninformed	.087	24	.200*	.982	24	.936
	Informed	.210	24	.008	.890	24	.013
TD_N	Uninformed	.077	24	.200*	.977	24	.835
	Informed	.263	24	.000	.761	24	.000
TD_M	Uninformed	.185	24	.034	.895	24	.017
	Informed	.124	24	.200*	.952	24	.303

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 150 GNS - Eyes - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_E	48	.0000	2.5000	1.197917	.6707818
CdLS_E	48	.0000	3.0000	1.600694	.7553901
DS_E	48	.0000	4.0000	1.753472	.8852546
FX_E	48	.0000	3.1667	1.614583	.7727298
PWS_E	48	.1667	3.1667	1.513889	.7593650
SMS_E	48	.0000	3.3333	1.628472	.9341433
WS_E	48	.0000	2.8333	1.340278	.7862277
TD_E	48	.0000	3.1667	1.602431	.7738027
Valid N (listwise)	48				

Table 151 GNS - Eyes - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
facetype	.531	27.477	27	.440	.872	1.000	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: facetype
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 152 GNS - Eyes - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Sphericity Assumed	10.730	7	1.533	9.450	.000
	Greenhouse-Geisser	10.730	6.102	1.758	9.450	.000
	Huynh-Feldt	10.730	7.000	1.533	9.450	.000
	Lower-bound	10.730	1.000	10.730	9.450	.004
facetype * I_OR_U	Sphericity Assumed	.714	7	.102	.629	.732
	Greenhouse-Geisser	.714	6.102	.117	.629	.710
	Huynh-Feldt	.714	7.000	.102	.629	.732
	Lower-bound	.714	1.000	.714	.629	.432
Error(facetype)	Sphericity Assumed	52.231	322	.162		
	Greenhouse-Geisser	52.231	280.710	.186		
	Huynh-Feldt	52.231	322.000	.162		
	Lower-bound	52.231	46.000	1.135		

Table 153 GNS - Eyes - Fixation count - Friedman test

Ranks

	Mean Rank
AS_E	2.65
CdLS_E	5.00
DS_E	5.71
FX_E	4.90
PWS_E	4.46
SMS_E	5.03
WS_E	3.41
TD_E	4.85

Test Statistics[a]

N	48
Chi-Square	58.751
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 154 GNS - Eyes - Fixation count - Within-subjects contrasts

Source	facetype	Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Level 1 vs. Level 8	7.854	1	7.854	27.995	.000
	Level 2 vs. Level 8	.000	1	.000	.001	.981
	Level 3 vs. Level 8	1.095	1	1.095	4.005	.051
	Level 4 vs. Level 8	.007	1	.007	.028	.867
	Level 5 vs. Level 8	.376	1	.376	1.982	.166
	Level 6 vs. Level 8	.033	1	.033	.097	.757
	Level 7 vs. Level 8	3.299	1	3.299	10.531	.002
facetype * I_OR_U	Level 1 vs. Level 8	.024	1	.024	.087	.769
	Level 2 vs. Level 8	.122	1	.122	.473	.495
	Level 3 vs. Level 8	.001	1	.001	.005	.945
	Level 4 vs. Level 8	.347	1	.347	1.388	.245
	Level 5 vs. Level 8	.064	1	.064	.336	.565
	Level 6 vs. Level 8	.470	1	.470	1.395	.244
	Level 7 vs. Level 8	.077	1	.077	.244	.623
Error(facetype)	Level 1 vs. Level 8	12.906	46	.281		
	Level 2 vs. Level 8	11.830	46	.257		
	Level 3 vs. Level 8	12.577	46	.273		
	Level 4 vs. Level 8	11.514	46	.250		
	Level 5 vs. Level 8	8.734	46	.190		
	Level 6 vs. Level 8	15.504	46	.337		
	Level 7 vs. Level 8	14.409	46	.313		

Table 155 GNS - Eyes - Fixation count - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	112.579	1	112.579	248.897	.000
I_OR_U	2.347	1	2.347	5.190	.027
Error	20.806	46	.452		

Table 156 GNS - Eyes - Fixation count – Wilcoxon test statistics

	TD_E - AS_E	TD_E - CdLS_E	TD_E - DS_E	TD_E - FX_E	TD_E - PWS_E	TD_E - SMS_E	TD_E - WS_E
Z	-4.289[b]	-.078[b]	-2.066[c]	-.169[c]	-1.384[b]	-.678[c]	-2.946[b]
Asymp. Sig. (2-tailed)	.000	.938	.039	.866	.166	.498	.003

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 157 GNS - Eyes - Fixation count - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_E - AS_E	Negative Ranks	10[a]	11.80	118.00
	Positive Ranks	33[b]	25.09	828.00
	Ties	5[c]		
	Total	48		
TD_E - CdLS_E	Negative Ranks	22[d]	19.30	424.50
	Positive Ranks	19[e]	22.97	436.50
	Ties	7[f]		
	Total	48		
TD_E - DS_E	Negative Ranks	24[g]	26.83	644.00
	Positive Ranks	19[h]	15.89	302.00
	Ties	5[i]		
	Total	48		
TD_E - FX_E	Negative Ranks	21[j]	21.12	443.50
	Positive Ranks	20[k]	20.88	417.50
	Ties	7[l]		
	Total	48		
TD_E - PWS_E	Negative Ranks	17[m]	21.09	358.50
	Positive Ranks	26[n]	22.60	587.50
	Ties	5[o]		
	Total	48		
TD_E - SMS_E	Negative Ranks	25[p]	23.10	577.50
	Positive Ranks	20[q]	22.88	457.50
	Ties	3[r]		
	Total	48		
TD_E - WS_E	Negative Ranks	15[s]	18.07	271.00
	Positive Ranks	31[t]	26.13	810.00
	Ties	2[u]		
	Total	48		

a. TD_E < AS_E
b. TD_E > AS_E
c. TD_E = AS_E
d. TD_E < CdLS_E
e. TD_E > CdLS_E
f. TD_E = CdLS_E
g. TD_E < DS_E
h. TD_E > DS_E
i. TD_E = DS_E
j. TD_E < FX_E
k. TD_E > FX_E
l. TD_E = FX_E
m. TD_E < PWS_E
n. TD_E > PWS_E
o. TD_E = PWS_E
p. TD_E < SMS_E
q. TD_E > SMS_E
r. TD_E = SMS_E
s. TD_E < WS_E
t. TD_E > WS_E
u. TD_E = WS_E

Table 158 GNS - Eyes - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_E	48	.0000	.3294	.135269	.0751019
CdLS_E	48	.0000	.2897	.171766	.0771100
DS_E	48	.0000	.3588	.188153	.0787907
FX_E	48	.0000	.3472	.180509	.0806739
PWS_E	48	.0167	.3528	.175920	.0790879
SMS_E	48	.0000	.3816	.182459	.0960244
WS_E	48	.0000	.3273	.146322	.0812812
TD_E	48	.0000	.3489	.187174	.0797071
Valid N (listwise)	48				

Table 159 GNS - Eyes - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.411	38.648	27	.069	.822	.973	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 160 GNS - Eyes - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	.129	7	.018	10.149	.000
	Greenhouse-Geisser	.129	5.751	.022	10.149	.000
	Huynh-Feldt	.129	6.808	.019	10.149	.000
	Lower-bound	.129	1.000	.129	10.149	.003
face_type * I_OR_U	Sphericity Assumed	.003	7	.000	.199	.986
	Greenhouse-Geisser	.003	5.751	.000	.199	.974
	Huynh-Feldt	.003	6.808	.000	.199	.984
	Lower-bound	.003	1.000	.003	.199	.657
Error(face_type)	Sphericity Assumed	.585	322	.002		
	Greenhouse-Geisser	.585	264.526	.002		
	Huynh-Feldt	.585	313.178	.002		
	Lower-bound	.585	46.000	.013		

Table 161 GNS - Eyes - Fixation count - Friedman test

Ranks

	Mean Rank
AS_E	2.65
CdLS_E	4.55
DS_E	5.38
FX_E	5.06
PWS_E	4.97
SMS_E	5.01
WS_E	3.19
TD_E	5.20

Test Statistics[a]

N	48
Chi-Square	58.397
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 162 GNS - Eyes - Fixation count - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	.129	1	.129	36.211	.000
	Level 2 vs. Level 8	.011	1	.011	4.228	.045
	Level 3 vs. Level 8	4.599E-5	1	4.599E-5	.015	.904
	Level 4 vs. Level 8	.002	1	.002	.634	.430
	Level 5 vs. Level 8	.006	1	.006	1.905	.174
	Level 6 vs. Level 8	.001	1	.001	.286	.596
	Level 7 vs. Level 8	.080	1	.080	21.195	.000
face_type * I_OR_U	Level 1 vs. Level 8	.001	1	.001	.347	.559
	Level 2 vs. Level 8	.003	1	.003	1.022	.317
	Level 3 vs. Level 8	.001	1	.001	.292	.592
	Level 4 vs. Level 8	.003	1	.003	.937	.338
	Level 5 vs. Level 8	.000	1	.000	.115	.736
	Level 6 vs. Level 8	.002	1	.002	.626	.433
	Level 7 vs. Level 8	.002	1	.002	.544	.465
Error(face_type)	Level 1 vs. Level 8	.164	46	.004		
	Level 2 vs. Level 8	.124	46	.003		
	Level 3 vs. Level 8	.144	46	.003		
	Level 4 vs. Level 8	.155	46	.003		
	Level 5 vs. Level 8	.147	46	.003		
	Level 6 vs. Level 8	.172	46	.004		
	Level 7 vs. Level 8	.174	46	.004		

Table 163 GNS - Eyes - Fixation count - Between-subjects contrasts

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.403	1	1.403	303.683	.000
I_OR_U	.024	1	.024	5.185	.027
Error	.212	46	.005		

Table 164 GNS - Eyes - Fixation count - Wilcoxon test statistics

	TD_E - AS_E	TD_E - CdLS_E	TD_E - DS_E	TD_E - FX_E	TD_E - PWS_E	TD_E - SMS_E	TD_E - WS_E
Z	-5.005[b]	-2.064[b]	-.390[c]	-.593[b]	-1.538[b]	-.011[b]	-3.989[b]
Asymp. Sig. (2-tailed)	.000	.039	.697	.553	.124	.992	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 165 GNS - Eyes - Fixation count – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_E - AS_E	Negative Ranks	9[a]	10.11	91.00
	Positive Ranks	38[b]	27.29	1037.00
	Ties	1[c]		
	Total	48		
TD_E - CdLS_E	Negative Ranks	16[d]	23.06	369.00
	Positive Ranks	31[e]	24.48	759.00
	Ties	1[f]		
	Total	48		
TD_E - DS_E	Negative Ranks	25[g]	25.04	626.00
	Positive Ranks	23[h]	23.91	550.00
	Ties	0[i]		
	Total	48		
TD_E - FX_E	Negative Ranks	21[j]	24.19	508.00
	Positive Ranks	26[k]	23.85	620.00
	Ties	1[l]		
	Total	48		
TD_E - PWS_E	Negative Ranks	22[m]	19.91	438.00
	Positive Ranks	26[n]	28.38	738.00
	Ties	0[o]		
	Total	48		
TD_E - SMS_E	Negative Ranks	26[p]	21.65	563.00
	Positive Ranks	21[q]	26.90	565.00
	Ties	1[r]		
	Total	48		
TD_E - WS_E	Negative Ranks	13[s]	14.38	187.00
	Positive Ranks	34[t]	27.68	941.00
	Ties	1[u]		
	Total	48		

a. TD_E < AS_E
b. TD_E > AS_E
c. TD_E = AS_E
d. TD_E < CdLS_E
e. TD_E > CdLS_E
f. TD_E = CdLS_E
g. TD_E < DS_E
h. TD_E > DS_E
i. TD_E = DS_E
j. TD_E < FX_E
k. TD_E > FX_E
l. TD_E = FX_E
m. TD_E < PWS_E
n. TD_E > PWS_E
o. TD_E = PWS_E
p. TD_E < SMS_E
q. TD_E > SMS_E
r. TD_E = SMS_E
s. TD_E < WS_E
t. TD_E > WS_E
u. TD_E = WS_E

Table 166 GNS - Eyes - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_E	48	.0000	1199.8333	388.895833	247.4262853
CdLS_E	48	.0000	996.1667	483.416667	229.6454998
DS_E	48	.0000	966.1667	540.180556	230.9352166
FX_E	48	.0000	1050.6667	505.524306	229.0192885
PWS_E	48	35.0000	1132.1667	497.527778	241.7778354
SMS_E	48	.0000	1196.0000	508.475694	279.4286491

WS_E	48	.0000	917.8333	402.753472	234.5273679
TD_E	48	.0000	1123.1667	552.572917	255.9172880
Valid N (listwise)	48				

Table 167 GNS - Eyes - Dwell time - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.482	31.720	27	.245	.836	.993	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 168 GNS - Eyes - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1187675.962	7	169667.995	7.938	.000
	Greenhouse-Geisser	1187675.962	5.853	202931.098	7.938	.000
	Huynh-Feldt	1187675.962	6.948	170949.432	7.938	.000
	Lower-bound	1187675.962	1.000	1187675.962	7.938	.007
face_type * I_OR_U	Sphericity Assumed	41619.034	7	5945.576	.278	.962
	Greenhouse-Geisser	41619.034	5.853	7111.196	.278	.944
	Huynh-Feldt	41619.034	6.948	5990.481	.278	.962
	Lower-bound	41619.034	1.000	41619.034	.278	.600
Error(face_type)	Sphericity Assumed	6882189.632	322	21373.260		
	Greenhouse-Geisser	6882189.632	269.220	25563.449		
	Huynh-Feldt	6882189.632	319.586	21534.684		
	Lower-bound	6882189.632	46.000	149612.818		

Table 169 GNS - Eyes - Dwell time - Friedman test

Ranks

	Mean Rank
AS_E	2.97
CdLS_E	4.26
DS_E	5.54
FX_E	4.86
PWS_E	4.75
SMS_E	4.78
WS_E	3.32
TD_E	5.51

Test Statistics[a]

N	48
Chi-Square	49.827
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 170 GNS - Eyes - Dwell time - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	1285929.005	1	1285929.005	25.140	.000
	Level 2 vs. Level 8	229564.172	1	229564.172	6.750	.013
	Level 3 vs. Level 8	7371.389	1	7371.389	.187	.668
	Level 4 vs. Level 8	106251.447	1	106251.447	2.435	.126
	Level 5 vs. Level 8	145438.431	1	145438.431	4.222	.046
	Level 6 vs. Level 8	93339.120	1	93339.120	2.079	.156
	Level 7 vs. Level 8	1077401.565	1	1077401.565	21.926	.000
face_type * I_OR_U	Level 1 vs. Level 8	11016.070	1	11016.070	.215	.645
	Level 2 vs. Level 8	3369.542	1	3369.542	.099	.754
	Level 3 vs. Level 8	7.130	1	7.130	.000	.989
	Level 4 vs. Level 8	1157.058	1	1157.058	.027	.871
	Level 5 vs. Level 8	2458.172	1	2458.172	.071	.791
	Level 6 vs. Level 8	15914.083	1	15914.083	.355	.554
	Level 7 vs. Level 8	18723.000	1	18723.000	.381	.540
Error(face_type)	Level 1 vs. Level 8	2352926.703	46	51150.580		
	Level 2 vs. Level 8	1564543.369	46	34011.812		
	Level 3 vs. Level 8	1815442.508	46	39466.141		
	Level 4 vs. Level 8	2007177.690	46	43634.298		
	Level 5 vs. Level 8	1584563.064	46	34447.023		
	Level 6 vs. Level 8	2064980.574	46	44890.882		
	Level 7 vs. Level 8	2260345.325	46	49137.942		

Table 171 GNS - Eyes - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	11287001.150	1	11287001.150	304.494	.000
I_OR_U	230423.665	1	230423.665	6.216	.016
Error	1705132.034	46	37068.088		

Table 172 GNS - Eyes - Dwell time – Wilcoxon test statistics

	TD_E - AS_E	TD_E - CdLS_E	TD_E - DS_E	TD_E - FX_E	TD_E - PWS_E	TD_E - SMS_E	TD_E - WS_E
Z	-4.413[b]	-2.646[b]	-.179[b]	-1.693[b]	-2.062[b]	-.931[b]	-4.138[b]
Asymp. Sig. (2-tailed)	.000	.008	.858	.090	.039	.352	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Table 173 GNS - Eyes - Dwell time - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_E - AS_E	Negative Ranks	12[a]	12.25	147.00
	Positive Ranks	35[b]	28.03	981.00
	Ties	1[c]		
	Total	48		
TD_E - CdLS_E	Negative Ranks	16[d]	19.63	314.00
	Positive Ranks	31[e]	26.26	814.00

	Ties	1[f]		
	Total	48		
TD_E - DS_E	Negative Ranks	23[g]	24.80	570.50
	Positive Ranks	25[h]	24.22	605.50
	Ties	0[i]		
	Total	48		
TD_E - FX_E	Negative Ranks	15[j]	26.93	404.00
	Positive Ranks	32[k]	22.63	724.00
	Ties	1[l]		
	Total	48		
TD_E - PWS_E	Negative Ranks	19[m]	20.37	387.00
	Positive Ranks	29[n]	27.21	789.00
	Ties	0[o]		
	Total	48		
TD_E - SMS_E	Negative Ranks	20[p]	23.80	476.00
	Positive Ranks	27[q]	24.15	652.00
	Ties	1[r]		
	Total	48		
TD_E - WS_E	Negative Ranks	12[s]	14.42	173.00
	Positive Ranks	35[t]	27.29	955.00
	Ties	1[u]		
	Total	48		

a. TD_E < AS_E
b. TD_E > AS_E
c. TD_E = AS_E
d. TD_E < CdLS_E
e. TD_E > CdLS_E
f. TD_E = CdLS_E
g. TD_E < DS_E
h. TD_E > DS_E
i. TD_E = DS_E
j. TD_E < FX_E
k. TD_E > FX_E
l. TD_E = FX_E
m. TD_E < PWS_E
n. TD_E > PWS_E
o. TD_E = PWS_E
p. TD_E < SMS_E
q. TD_E > SMS_E
r. TD_E = SMS_E
s. TD_E < WS_E
t. TD_E > WS_E
u. TD_E = WS_E

Table 174 GNS - Eyes - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_E	48	.0000	.4167	.142658	.0880126
CdLS_E	48	.0000	.3696	.179819	.0838862
DS_E	48	.0000	.3920	.201489	.0876502
FX_E	48	.0000	.3729	.187024	.0817831
PWS_E	48	.0123	.4016	.184397	.0878711
SMS_E	48	.0000	.4325	.189251	.1052330
WS_E	48	.0000	.3392	.149681	.0878639
TD_E	48	.0000	.3951	.203171	.0928693
Valid N (listwise)	48				

Table 175 GNS - Eyes - Dwell percent - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	.483	31.626	27	.248	.833	.988	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 176 GNS - Eyes - Dwell percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.166	7	.024	8.771	.000
	Greenhouse-Geisser	.166	5.832	.029	8.771	.000
	Huynh-Feldt	.166	6.919	.024	8.771	.000
	Lower-bound	.166	1.000	.166	8.771	.005
Face_type * I_OR_U	Sphericity Assumed	.004	7	.001	.195	.986
	Greenhouse-Geisser	.004	5.832	.001	.195	.976
	Huynh-Feldt	.004	6.919	.001	.195	.986
	Lower-bound	.004	1.000	.004	.195	.661
Error(Face_type)	Sphericity Assumed	.873	322	.003		
	Greenhouse-Geisser	.873	268.273	.003		
	Huynh-Feldt	.873	318.291	.003		
	Lower-bound	.873	46.000	.019		

Table 177 GNS - Eyes - Dwell percent - Friedman test

Ranks

	Mean Rank
AS_E	2.91
CdLS_E	4.30
DS_E	5.58
FX_E	4.86
PWS_E	4.71
SMS_E	4.84
WS_E	3.26
TD_E	5.53

Test Statistics[a]

N	48
Chi-Square	53.698
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 178 GNS - Eyes - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 8	.176	1	.176	27.587	.000
	Level 2 vs. Level 8	.026	1	.026	5.980	.018
	Level 3 vs. Level 8	.000	1	.000	.028	.868
	Level 4 vs. Level 8	.013	1	.013	2.360	.131
	Level 5 vs. Level 8	.017	1	.017	3.973	.052

	Level 6 vs. Level 8	.009	1	.009	1.600	.212
	Level 7 vs. Level 8	.137	1	.137	22.695	.000
Face_type * I_OR_U	Level 1 vs. Level 8	.001	1	.001	.098	.756
	Level 2 vs. Level 8	.001	1	.001	.119	.732
	Level 3 vs. Level 8	8.138E-7	1	8.138E-7	.000	.990
	Level 4 vs. Level 8	5.594E-5	1	5.594E-5	.011	.919
	Level 5 vs. Level 8	.000	1	.000	.039	.844
	Level 6 vs. Level 8	.002	1	.002	.373	.544
	Level 7 vs. Level 8	.001	1	.001	.244	.624
Error(Face_type)	Level 1 vs. Level 8	.293	46	.006		
	Level 2 vs. Level 8	.201	46	.004		
	Level 3 vs. Level 8	.223	46	.005		
	Level 4 vs. Level 8	.244	46	.005		
	Level 5 vs. Level 8	.196	46	.004		
	Level 6 vs. Level 8	.267	46	.006		
	Level 7 vs. Level 8	.278	46	.006		

Table 179 GNS - Eyes - Dwell percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.550	1	1.550	297.474	.000
I_OR_U	.029	1	.029	5.480	.024
Error	.240	46	.005		

Table 180 GNS - Eyes - Dwell percent - Wilcoxon test statistics

	TD_E - AS_E	TD_E - CdLS_E	TD_E - DS_E	TD_E - FX_E	TD_E - PWS_E	TD_E - SMS_E	TD_E - WS_E
Z	-4.487[b]	-2.413[b]	-.133[c]	-1.577[b]	-1.969[b]	-.899[b]	-4.159[b]
Asymp. Sig. (2-tailed)	.000	.016	.894	.115	.049	.368	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 181 GNS - Eyes - Dwell percent - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_E - AS_E	Negative Ranks	11[a]	12.73	140.00
	Positive Ranks	36[b]	27.44	988.00
	Ties	1[c]		
	Total	48		
TD_E - CdLS_E	Negative Ranks	16[d]	21.00	336.00
	Positive Ranks	31[e]	25.55	792.00
	Ties	1[f]		
	Total	48		
TD_E - DS_E	Negative Ranks	23[g]	26.13	601.00
	Positive Ranks	25[h]	23.00	575.00
	Ties	0[i]		
	Total	48		
TD_E - FX_E	Negative Ranks	16[j]	25.94	415.00
	Positive Ranks	31[k]	23.00	713.00

	Ties	1[l]		
	Total	48		
TD_E - PWS_E	Negative Ranks	18[m]	22.00	396.00
	Positive Ranks	30[n]	26.00	780.00
	Ties	0[o]		
	Total	48		
TD_E - SMS_E	Negative Ranks	20[p]	23.95	479.00
	Positive Ranks	27[q]	24.04	649.00
	Ties	1[r]		
	Total	48		
TD_E - WS_E	Negative Ranks	12[s]	14.25	171.00
	Positive Ranks	35[t]	27.34	957.00
	Ties	1[u]		
	Total	48		

a. TD_E < AS_E
b. TD_E > AS_E
c. TD_E = AS_E
d. TD_E < CdLS_E
e. TD_E > CdLS_E
f. TD_E = CdLS_E
g. TD_E < DS_E
h. TD_E > DS_E
i. TD_E = DS_E
j. TD_E < FX_E
k. TD_E > FX_E
l. TD_E = FX_E
m. TD_E < PWS_E
n. TD_E > PWS_E
o. TD_E = PWS_E
p. TD_E < SMS_E
q. TD_E > SMS_E
r. TD_E = SMS_E
s. TD_E < WS_E
t. TD_E > WS_E
u. TD_E = WS_E

Table 182 GNS - Nose - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_N	48	1.0000	6.3333	2.972222	1.2200712
CdLS_N	48	1.3333	6.3333	3.250000	1.1659065
DS_N	48	.66667	6.00000	3.2361111	1.17088060
FX_N	48	1.3333	6.3333	3.027778	1.2122958
PWS_N	48	1.3333	7.3333	3.159722	1.2145485
SMS_N	48	1.0000	6.0000	3.048611	1.2490934
WS_N	48	1.3333	6.3333	3.173611	1.1689230
TD_N	48	1.0000	5.5000	2.854167	.9605855
Valid N (listwise)	48				

Table 183 GNS - Nose - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
facetype	.475	32.330	27	.222	.801	.944	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: facetype
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 184 GNS - Nose - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Sphericity Assumed	6.426	7	.918	1.672	.115
	Greenhouse-Geisser	6.426	5.605	1.146	1.672	.133
	Huynh-Feldt	6.426	6.611	.972	1.672	.120
	Lower-bound	6.426	1.000	6.426	1.672	.202
facetype * I_OR_U	Sphericity Assumed	1.366	7	.195	.355	.927
	Greenhouse-Geisser	1.366	5.605	.244	.355	.896
	Huynh-Feldt	1.366	6.611	.207	.355	.920
	Lower-bound	1.366	1.000	1.366	.355	.554
Error(facetype)	Sphericity Assumed	176.757	322	.549		
	Greenhouse-Geisser	176.757	257.848	.686		
	Huynh-Feldt	176.757	304.117	.581		
	Lower-bound	176.757	46.000	3.843		

Table 185 GNS - Nose - Fixation count - Within-subjects contrasts

Source	facetype	Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Level 1 vs. Level 8	.669	1	.669	.654	.423
	Level 2 vs. Level 8	7.521	1	7.521	10.473	.002
	Level 3 vs. Level 8	7.002	1	7.002	8.367	.006
	Level 4 vs. Level 8	1.447	1	1.447	1.165	.286
	Level 5 vs. Level 8	4.481	1	4.481	5.882	.019
	Level 6 vs. Level 8	1.815	1	1.815	1.801	.186
	Level 7 vs. Level 8	4.898	1	4.898	5.204	.027
facetype * I_OR_U	Level 1 vs. Level 8	.002	1	.002	.002	.962
	Level 2 vs. Level 8	.391	1	.391	.545	.464
	Level 3 vs. Level 8	.113	1	.113	.136	.714
	Level 4 vs. Level 8	.836	1	.836	.673	.416
	Level 5 vs. Level 8	.083	1	.083	.109	.742
	Level 6 vs. Level 8	.231	1	.231	.230	.634
	Level 7 vs. Level 8	.750	1	.750	.797	.377
Error(facetype)	Level 1 vs. Level 8	47.051	46	1.023		
	Level 2 vs. Level 8	33.032	46	.718		
	Level 3 vs. Level 8	38.495	46	.837		
	Level 4 vs. Level 8	57.106	46	1.241		
	Level 5 vs. Level 8	35.046	46	.762		
	Level 6 vs. Level 8	46.343	46	1.007		
	Level 7 vs. Level 8	43.296	46	.941		

Table 186 GNS - Nose - Fixation count - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	458.391	1	458.391	540.598	.000
I_OR_U	3.431	1	3.431	4.046	.050
Error	39.005	46	.848		

Table 187 GNS - Nose - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_N	48	.1157	.8056	.351203	.1520283
CdLS_N	48	.1574	1.0000	.383061	.1751780
DS_N	48	.08467	.88890	.3840604	.16599798
FX_N	48	.1303	.7444	.362297	.1503560
PWS_N	48	.1726	.9333	.406000	.1795794
SMS_N	48	.1242	1.0000	.382981	.1938115
WS_N	48	.1750	.9048	.392599	.1808487
TD_N	48	.1369	.7500	.370361	.1395925
Valid N (listwise)	48				

Table 188 GNS - Nose - Fixation percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.487	31.230	27	.264	.862	1.000	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 189 GNS - Nose - Fixation percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	.101	7	.014	1.769	.093
	Greenhouse-Geisser	.101	6.031	.017	1.769	.105
	Huynh-Feldt	.101	7.000	.014	1.769	.093
	Lower-bound	.101	1.000	.101	1.769	.190
face_type * I_OR_U	Sphericity Assumed	.027	7	.004	.482	.847
	Greenhouse-Geisser	.027	6.031	.005	.482	.822
	Huynh-Feldt	.027	7.000	.004	.482	.847
	Lower-bound	.027	1.000	.027	.482	.491
Error(face_type)	Sphericity Assumed	2.618	322	.008		
	Greenhouse-Geisser	2.618	277.419	.009		
	Huynh-Feldt	2.618	322.000	.008		
	Lower-bound	2.618	46.000	.057		

Table 190 GNS - Nose - Fixation percent - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	.018	1	.018	1.310	.258
	Level 2 vs. Level 8	.008	1	.008	.438	.511
	Level 3 vs. Level 8	.009	1	.009	.542	.465
	Level 4 vs. Level 8	.003	1	.003	.170	.682
	Level 5 vs. Level 8	.061	1	.061	4.592	.037
	Level 6 vs. Level 8	.008	1	.008	.528	.471
	Level 7 vs. Level 8	.024	1	.024	1.186	.282
face_type * I_OR_U	Level 1 vs. Level 8	.001	1	.001	.072	.790
	Level 2 vs. Level 8	.009	1	.009	.524	.473

	Level 3 vs. Level 8	.006	1	.006	.375	.543
	Level 4 vs. Level 8	.007	1	.007	.392	.534
	Level 5 vs. Level 8	.004	1	.004	.324	.572
	Level 6 vs. Level 8	.004	1	.004	.254	.617
	Level 7 vs. Level 8	.013	1	.013	.670	.417
Error(face_type)	Level 1 vs. Level 8	.619	46	.013		
	Level 2 vs. Level 8	.813	46	.018		
	Level 3 vs. Level 8	.764	46	.017		
	Level 4 vs. Level 8	.844	46	.018		
	Level 5 vs. Level 8	.611	46	.013		
	Level 6 vs. Level 8	.666	46	.014		
	Level 7 vs. Level 8	.921	46	.020		

Table 191 GNS - Nose - Fixation percent – Between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6.897	1	6.897	331.390	.000
I_OR_U	.039	1	.039	1.895	.175
Error	.957	46	.021		

Table 192 GNS - Nose - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_N	48	237.6667	2192.0000	853.409722	459.9607200
CdLS_N	48	288.6667	3033.3333	968.902778	524.4268466
DS_N	48	129.33333	2654.00000	950.5625000	506.34846370
FX_N	48	190.0000	2123.3333	937.715278	446.0954641
PWS_N	48	359.0000	2719.0000	1081.597222	554.4179875
SMS_N	48	202.3333	3028.0000	981.069444	594.2259759
WS_N	48	314.0000	2762.6667	1019.000000	573.9714864
TD_N	48	327.1667	2631.0000	960.854167	483.6337568
Valid N (listwise)	48				

Table 193 GNS - Nose - Dwell time - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.380	42.041	27	.033	.794	.936	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 194 GNS - Nose - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1443350.556	7	206192.937	2.808	.008
	Greenhouse-Geisser	1443350.556	5.560	259594.638	2.808	.014
	Huynh-Feldt	1443350.556	6.550	220359.764	2.808	.009

	Lower-bound	1443350.556	1.000	1443350.556	2.808	.101
face_type * I_OR_U	Sphericity Assumed	195103.999	7	27872.000	.380	.914
	Greenhouse-Geisser	195103.999	5.560	35090.541	.380	.880
	Huynh-Feldt	195103.999	6.550	29786.992	.380	.905
	Lower-bound	195103.999	1.000	195103.999	.380	.541
Error(face_type)	Sphericity Assumed	23648038.680	322	73441.114		
	Greenhouse-Geisser	23648038.680	255.761	92461.554		
	Huynh-Feldt	23648038.680	301.299	78487.007		
	Lower-bound	23648038.680	46.000	514087.797		

Table 195 GNS - Nose - Dwell time - Friedman tests

Ranks

	Mean Rank
AS_N	3.55
CdLS_N	4.48
DS_N	4.44
FX_N	4.25
PWS_N	5.50
SMS_N	4.38
WS_N	5.00
TD_N	4.41

Test Statistics[a]

N	48
Chi-Square	17.923
df	7
Asymp. Sig.	.012

a. Friedman Test

Table 196 GNS - Nose - Dwell time - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	554126.816	1	554126.816	2.944	.093
	Level 2 vs. Level 8	3109.447	1	3109.447	.018	.895
	Level 3 vs. Level 8	5084.083	1	5084.083	.029	.865
	Level 4 vs. Level 8	25699.593	1	25699.593	.133	.717
	Level 5 vs. Level 8	699786.503	1	699786.503	5.537	.023
	Level 6 vs. Level 8	19615.558	1	19615.558	.122	.728
	Level 7 vs. Level 8	162285.021	1	162285.021	.733	.396
face_type * I_OR_U	Level 1 vs. Level 8	670.009	1	670.009	.004	.953
	Level 2 vs. Level 8	62905.947	1	62905.947	.357	.553
	Level 3 vs. Level 8	34561.333	1	34561.333	.200	.657
	Level 4 vs. Level 8	3513.481	1	3513.481	.018	.893
	Level 5 vs. Level 8	20322.613	1	20322.613	.161	.690
	Level 6 vs. Level 8	14065.336	1	14065.336	.088	.769
	Level 7 vs. Level 8	134796.669	1	134796.669	.609	.439
Error(face_type)	Level 1 vs. Level 8	8657140.343	46	188198.703		
	Level 2 vs. Level 8	8115491.996	46	176423.739		
	Level 3 vs. Level 8	7968503.197	46	173228.330		
	Level 4 vs. Level 8	8865375.204	46	192725.548		
	Level 5 vs. Level 8	5813730.498	46	126385.446		

	Level 6 vs. Level 8	7384315.497	46	160528.598		
	Level 7 vs. Level 8	10183751.810	46	221385.909		

Table 197 GNS - Nose - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	45083048.930	1	45083048.930	218.973	.000
I_OR_U	273071.184	1	273071.184	1.326	.255
Error	9470646.257	46	205883.614		

Table 198 GNS - Nose - Dwell time - Wilcoxon test statistics

	TD_N - AS_N	TD_N - CdLS_N	TD_N - DS_N	TD_N - FX_N	TD_N - PWS_N	TD_N - SMS_N	TD_N - WS_N
Z	-1.831[b]	-.585[c]	-.185[b]	-.318[b]	-2.759[c]	-.077[c]	-.995[c]
Asymp. Sig. (2-tailed)	.067	.559	.854	.751	.006	.939	.320

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 199 GNS - Nose - Dwell time – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_N - AS_N	Negative Ranks	18[a]	21.72	391.00
	Positive Ranks	29[b]	25.41	737.00
	Ties	1[c]		
	Total	48		
TD_N - CdLS_N	Negative Ranks	25[d]	25.80	645.00
	Positive Ranks	23[e]	23.09	531.00
	Ties	0[f]		
	Total	48		
TD_N - DS_N	Negative Ranks	24[g]	23.75	570.00
	Positive Ranks	24[h]	25.25	606.00
	Ties	0[i]		
	Total	48		
TD_N - FX_N	Negative Ranks	23[j]	24.22	557.00
	Positive Ranks	25[k]	24.76	619.00
	Ties	0[l]		
	Total	48		
TD_N - PWS_N	Negative Ranks	34[m]	25.21	857.00
	Positive Ranks	14[n]	22.79	319.00
	Ties	0[o]		
	Total	48		
TD_N - SMS_N	Negative Ranks	22[p]	27.07	595.50
	Positive Ranks	26[q]	22.33	580.50
	Ties	0[r]		
	Total	48		
TD_N - WS_N	Negative Ranks	26[s]	26.35	685.00
	Positive Ranks	22[t]	22.32	491.00
	Ties	0[u]		
	Total	48		

a. TD_N < AS_N

b. TD_N > AS_N
c. TD_N = AS_N
d. TD_N < CdLS_N
e. TD_N > CdLS_N
f. TD_N = CdLS_N
g. TD_N < DS_N
h. TD_N > DS_N
i. TD_N = DS_N
j. TD_N < FX_N
k. TD_N > FX_N
l. TD_N = FX_N
m. TD_N < PWS_N
n. TD_N > PWS_N
o. TD_N = PWS_N
p. TD_N < SMS_N
q. TD_N > SMS_N
r. TD_N = SMS_N
s. TD_N < WS_N
t. TD_N > WS_N
u. TD_N = WS_N

Table 200 GNS - Nose - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_N	48	.0873	.8243	.312723	.1690689
CdLS_N	48	.1065	1.0000	.358499	.1858040
DS_N	48	.05063	.89623	.3511354	.17996025
FX_N	48	.0733	.7562	.345590	.1592415
PWS_N	48	.1317	.9495	.395458	.1927529
SMS_N	48	.0777	1.0000	.357933	.2048814
WS_N	48	.1160	.9238	.373186	.1976518
TD_N	48	.1220	.8781	.349133	.1655623
Valid N (listwise)	48				

Table 201 GNS - Nose - Dwell percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	.375	42.619	27	.029	.798	.941	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 202 GNS - Nose - Dwell percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.188	7	.027	2.848	.007
	Greenhouse-Geisser	.188	5.586	.034	2.848	.013
	Huynh-Feldt	.188	6.585	.029	2.848	.008
	Lower-bound	.188	1.000	.188	2.848	.098
Face_type * I_OR_U	Sphericity Assumed	.030	7	.004	.456	.866
	Greenhouse-Geisser	.030	5.586	.005	.456	.828
	Huynh-Feldt	.030	6.585	.005	.456	.856
	Lower-bound	.030	1.000	.030	.456	.503
Error(Face_type)	Sphericity Assumed	3.033	322	.009		
	Greenhouse-Geisser	3.033	256.961	.012		
	Huynh-Feldt	3.033	302.918	.010		

	Lower-bound	3.033	46.000	.066		

Table 203 GNS - Nose - Dwell percent - Friedman tests

Ranks

	Mean Rank
AS_N	3.52
CdLS_N	4.59
DS_N	4.50
FX_N	4.23
PWS_N	5.46
SMS_N	4.32
WS_N	5.02
TD_N	4.35

Test Statistics[a]

N	48
Chi-Square	18.270
df	7
Asymp. Sig.	.011

a. Friedman Test

Table 204 GNS - Nose - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 8	.064	1	.064	2.657	.110
	Level 2 vs. Level 8	.004	1	.004	.199	.657
	Level 3 vs. Level 8	.000	1	.000	.009	.925
	Level 4 vs. Level 8	.001	1	.001	.026	.873
	Level 5 vs. Level 8	.103	1	.103	6.390	.015
	Level 6 vs. Level 8	.004	1	.004	.196	.660
	Level 7 vs. Level 8	.028	1	.028	.992	.325
Face_type * I_OR_U	Level 1 vs. Level 8	.001	1	.001	.041	.840
	Level 2 vs. Level 8	.007	1	.007	.334	.566
	Level 3 vs. Level 8	.008	1	.008	.370	.546
	Level 4 vs. Level 8	.001	1	.001	.031	.860
	Level 5 vs. Level 8	.001	1	.001	.047	.829
	Level 6 vs. Level 8	.001	1	.001	.036	.851
	Level 7 vs. Level 8	.015	1	.015	.546	.464
Error(Face_type)	Level 1 vs. Level 8	1.102	46	.024		
	Level 2 vs. Level 8	.972	46	.021		
	Level 3 vs. Level 8	.996	46	.022		
	Level 4 vs. Level 8	1.075	46	.023		
	Level 5 vs. Level 8	.742	46	.016		
	Level 6 vs. Level 8	.872	46	.019		
	Level 7 vs. Level 8	1.288	46	.028		

Table 205 GNS - Nose - Dwell percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6.065	1	6.065	245.777	.000
I_OR_U	.047	1	.047	1.923	.172

Error	1.135	46	.025		

Table 206 GNS - Nose - Dwell percent – Wilcoxon test statistics

	TD_N - AS_N	TD_N - CdLS_N	TD_N - DS_N	TD_N - FX_N	TD_N - PWS_N	TD_N - SMS_N	TD_N - WS_N
Z	-1.713[b]	-.933[c]	-.103[c]	-.021[b]	-2.677[c]	-.072[c]	-1.144[c]
Asymp. Sig. (2-tailed)	.087	.351	.918	.984	.007	.943	.253

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Based on positive ranks.

Table 207 GNS - Nose - Dwell percent - Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_N - AS_N	Negative Ranks	19[a]	22.16	421.00
	Positive Ranks	29[b]	26.03	755.00
	Ties	0[c]		
	Total	48		
TD_N - CdLS_N	Negative Ranks	27[d]	25.15	679.00
	Positive Ranks	21[e]	23.67	497.00
	Ties	0[f]		
	Total	48		
TD_N - DS_N	Negative Ranks	25[g]	23.92	598.00
	Positive Ranks	23[h]	25.13	578.00
	Ties	0[i]		
	Total	48		
TD_N - FX_N	Negative Ranks	24[j]	24.42	586.00
	Positive Ranks	24[k]	24.58	590.00
	Ties	0[l]		
	Total	48		
TD_N - PWS_N	Negative Ranks	32[m]	26.53	849.00
	Positive Ranks	16[n]	20.44	327.00
	Ties	0[o]		
	Total	48		
TD_N - SMS_N	Negative Ranks	22[p]	27.05	595.00
	Positive Ranks	26[q]	22.35	581.00
	Ties	0[r]		
	Total	48		
TD_N - WS_N	Negative Ranks	26[s]	26.90	699.50
	Positive Ranks	22[t]	21.66	476.50
	Ties	0[u]		
	Total	48		

a. TD_N < AS_N
b. TD_N > AS_N
c. TD_N = AS_N
d. TD_N < CdLS_N
e. TD_N > CdLS_N
f. TD_N = CdLS_N
g. TD_N < DS_N
h. TD_N > DS_N
i. TD_N = DS_N
j. TD_N < FX_N
k. TD_N > FX_N
l. TD_N = FX_N
m. TD_N < PWS_N
n. TD_N > PWS_N
o. TD_N = PWS_N
p. TD_N < SMS_N
q. TD_N > SMS_N

r. TD_N = SMS_N
s. TD_N < WS_N
t. TD_N > WS_N
u. TD_N = WS_N

Table 208 GNS - Mouth - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_M	48	.3333	5.3333	2.534722	1.2101610
CdLS_M	48	.0000	3.6667	1.111111	.9259417
DS_M	48	.0000	3.6667	1.215278	.8574237
FX_M	48	.0000	4.3333	1.430556	.9526827
PWS_M	48	.0000	2.6667	.958333	.8382832
SMS_M	48	.0000	5.0000	1.118056	1.0371118
WS_M	48	.0000	5.0000	1.798611	1.1643637
TD_M	48	.0000	3.6667	.899306	.6743700
Valid N (listwise)	48				

Table 209 GNS - Mouth - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
facetype	.353	45.285	27	.015	.765	.897	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: facetype
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 210 GNS - Mouth - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Sphericity Assumed	100.224	7	14.318	35.830	.000
	Greenhouse-Geisser	100.224	5.357	18.708	35.830	.000
	Huynh-Feldt	100.224	6.278	15.965	35.830	.000
	Lower-bound	100.224	1.000	100.224	35.830	.000
facetype * I_OR_U	Sphericity Assumed	1.119	7	.160	.400	.902
	Greenhouse-Geisser	1.119	5.357	.209	.400	.860
	Huynh-Feldt	1.119	6.278	.178	.400	.886
	Lower-bound	1.119	1.000	1.119	.400	.530
Error(facetype)	Sphericity Assumed	128.674	322	.400		
	Greenhouse-Geisser	128.674	246.432	.522		
	Huynh-Feldt	128.674	288.779	.446		
	Lower-bound	128.674	46.000	2.797		

Table 211 GNS - Mouth - Fixation count - Friedman test

Ranks

	Mean Rank
AS_M	7.28
CdLS_M	3.85
DS_M	4.16
FX_M	4.90
PWS_M	3.11
SMS_M	3.74

WS_M	5.89
TD_M	3.07

Test Statistics[a]

N	48
Chi-Square	129.101
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 212 GNS - Mouth - Fixation count - Within-subjects contrasts

Source	facetype	Type III Sum of Squares	df	Mean Square	F	Sig.
facetype	Level 1 vs. Level 8	128.380	1	128.380	126.650	.000
	Level 2 vs. Level 8	2.153	1	2.153	3.398	.072
	Level 3 vs. Level 8	4.792	1	4.792	8.407	.006
	Level 4 vs. Level 8	13.547	1	13.547	23.770	.000
	Level 5 vs. Level 8	.167	1	.167	.464	.499
	Level 6 vs. Level 8	2.297	1	2.297	4.567	.038
	Level 7 vs. Level 8	38.820	1	38.820	51.762	.000
facetype * I_OR_U	Level 1 vs. Level 8	.630	1	.630	.622	.434
	Level 2 vs. Level 8	.001	1	.001	.001	.976
	Level 3 vs. Level 8	.070	1	.070	.123	.728
	Level 4 vs. Level 8	.098	1	.098	.172	.681
	Level 5 vs. Level 8	.014	1	.014	.040	.842
	Level 6 vs. Level 8	.098	1	.098	.194	.661
	Level 7 vs. Level 8	.209	1	.209	.279	.600
Error(facetype)	Level 1 vs. Level 8	46.628	46	1.014		
	Level 2 vs. Level 8	29.152	46	.634		
	Level 3 vs. Level 8	26.221	46	.570		
	Level 4 vs. Level 8	26.216	46	.570		
	Level 5 vs. Level 8	16.568	46	.360		
	Level 6 vs. Level 8	23.133	46	.503		
	Level 7 vs. Level 8	34.499	46	.750		

Table 213 GNS - Mouth - Fixation count - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	91.842	1	91.842	155.335	.000
I_OR_U	.955	1	.955	1.615	.210
Error	27.197	46	.591		

Table 214 GNS - Mouth - Fixation count - Wilcoxon test statistics

	TD_M - AS_M	TD_M - CdLS_M	TD_M - DS_M	TD_M - FX_M	TD_M - PWS_M	TD_M - SMS_M	TD_M - WS_M
Z	-5.844[b]	-1.378[b]	-2.782[b]	-4.395[b]	-.128[b]	-1.331[b]	-5.413[b]
Asymp. Sig. (2-tailed)	.000	.168	.005	.000	.898	.183	.000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Table 215 GNS - Mouth - Fixation count – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_M - AS_M	Negative Ranks	45[a]	23.00	1035.00
	Positive Ranks	0[b]	.00	.00
	Ties	3[c]		
	Total	48		
TD_M - CdLS_M	Negative Ranks	23[d]	24.41	561.50
	Positive Ranks	19[e]	17.97	341.50
	Ties	6[f]		
	Total	48		
TD_M - DS_M	Negative Ranks	30[g]	23.43	703.00
	Positive Ranks	13[h]	18.69	243.00
	Ties	5[i]		
	Total	48		
TD_M - FX_M	Negative Ranks	38[j]	22.01	836.50
	Positive Ranks	5[k]	21.90	109.50
	Ties	5[l]		
	Total	48		
TD_M - PWS_M	Negative Ranks	19[m]	22.08	419.50
	Positive Ranks	21[n]	19.07	400.50
	Ties	8[o]		
	Total	48		
TD_M - SMS_M	Negative Ranks	22[p]	24.23	533.00
	Positive Ranks	19[q]	17.26	328.00
	Ties	7[r]		
	Total	48		
TD_M - WS_M	Negative Ranks	40[s]	23.03	921.00
	Positive Ranks	3[t]	8.33	25.00
	Ties	5[u]		
	Total	48		

a. TD_M < AS_M
b. TD_M > AS_M
c. TD_M = AS_M
d. TD_M < CdLS_M
e. TD_M > CdLS_M
f. TD_M = CdLS_M
g. TD_M < DS_M
h. TD_M > DS_M
i. TD_M = DS_M
j. TD_M < FX_M
k. TD_M > FX_M
l. TD_M = FX_M
m. TD_M < PWS_M
n. TD_M > PWS_M
o. TD_M = PWS_M
p. TD_M < SMS_M
q. TD_M > SMS_M
r. TD_M = SMS_M
s. TD_M < WS_M
t. TD_M > WS_M
u. TD_M = WS_M

Table 216 GNS - Mouth - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_M	48	.0476	.6435	.287081	.1354424
CdLS_M	48	.0000	.3576	.114930	.0907590
DS_M	48	.0000	.4122	.129083	.0883467
FX_M	48	.0000	.4471	.163222	.1034845
PWS_M	48	.0000	.3657	.105533	.0961321
SMS_M	48	.0000	.5053	.125161	.1131416
WS_M	48	.0000	.5037	.192683	.1194982

TD_M	48	.0000	.4115	.107238	.0767749
Valid N (listwise)	48				

Table 217 GNS - Mouth - Fixation percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	.236	62.671	27	.000	.710	.823	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 218 GNS - Mouth - Fixation percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1.286	7	.184	34.822	.000
	Greenhouse-Geisser	1.286	4.968	.259	34.822	.000
	Huynh-Feldt	1.286	5.763	.223	34.822	.000
	Lower-bound	1.286	1.000	1.286	34.822	.000
face_type * I_OR_U	Sphericity Assumed	.030	7	.004	.805	.584
	Greenhouse-Geisser	.030	4.968	.006	.805	.546
	Huynh-Feldt	.030	5.763	.005	.805	.562
	Lower-bound	.030	1.000	.030	.805	.374
Error(face_type)	Sphericity Assumed	1.699	322	.005		
	Greenhouse-Geisser	1.699	228.518	.007		
	Huynh-Feldt	1.699	265.081	.006		
	Lower-bound	1.699	46.000	.037		

Table 219 GNS - Mouth - Fixation percent - Friedman test

Ranks

	Mean Rank
AS_M	7.45
CdLS_M	3.67
DS_M	4.10
FX_M	4.81
PWS_M	3.09
SMS_M	3.84
WS_M	5.77
TD_M	3.26

Test Statistics[a]

N	48
Chi-Square	124.746
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 220 GNS - Mouth - Fixation percent - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	1.552	1	1.552	121.992	.000

	Level 2 vs. Level 8	.003	1	.003	.383	.539
	Level 3 vs. Level 8	.023	1	.023	3.073	.086
	Level 4 vs. Level 8	.150	1	.150	20.272	.000
	Level 5 vs. Level 8	.000	1	.000	.027	.871
	Level 6 vs. Level 8	.015	1	.015	2.122	.152
	Level 7 vs. Level 8	.350	1	.350	36.727	.000
face_type * I_OR_U	Level 1 vs. Level 8	.015	1	.015	1.208	.277
	Level 2 vs. Level 8	.000	1	.000	.051	.823
	Level 3 vs. Level 8	.000	1	.000	.017	.897
	Level 4 vs. Level 8	.006	1	.006	.829	.367
	Level 5 vs. Level 8	4.472E-5	1	4.472E-5	.009	.927
	Level 6 vs. Level 8	.007	1	.007	.943	.336
	Level 7 vs. Level 8	.002	1	.002	.158	.693
Error(face_type)	Level 1 vs. Level 8	.585	46	.013		
	Level 2 vs. Level 8	.341	46	.007		
	Level 3 vs. Level 8	.343	46	.007		
	Level 4 vs. Level 8	.341	46	.007		
	Level 5 vs. Level 8	.241	46	.005		
	Level 6 vs. Level 8	.334	46	.007		
	Level 7 vs. Level 8	.439	46	.010		

Table 221 GNS - Mouth - Fixation percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.125	1	1.125	181.870	.000
I_OR_U	.012	1	.012	1.971	.167
Error	.285	46	.006		

Table 222 GNS - Mouth - Fixation percent - Wilcoxon test statistics

	TD_M - AS_M	TD_M - CdLS_M	TD_M - DS_M	TD_M - FX_M	TD_M - PWS_M	TD_M - SMS_M	TD_M - WS_M
Z	-6.000[b]	-.384[b]	-2.148[b]	-4.179[b]	-.377[c]	-1.033[b]	-4.977[b]
Asymp. Sig. (2-tailed)	.000	.701	.032	.000	.706	.302	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 223 GNS - Mouth - Fixation percent – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_M - AS_M	Negative Ranks	47[a]	24.96	1173.00
	Positive Ranks	1[b]	3.00	3.00
	Ties	0[c]		
	Total	48		
TD_M - CdLS_M	Negative Ranks	23[d]	23.98	551.50
	Positive Ranks	22[e]	21.98	483.50
	Ties	3[f]		
	Total	48		

TD_M - DS_M	Negative Ranks	30[g]	25.57	767.00
	Positive Ranks	17[h]	21.24	361.00
	Ties	1[i]		
	Total	48		
TD_M - FX_M	Negative Ranks	38[j]	24.29	923.00
	Positive Ranks	8[k]	19.75	158.00
	Ties	2[l]		
	Total	48		
TD_M - PWS_M	Negative Ranks	20[m]	25.30	506.00
	Positive Ranks	26[n]	22.12	575.00
	Ties	2[o]		
	Total	48		
TD_M - SMS_M	Negative Ranks	22[p]	27.68	609.00
	Positive Ranks	23[q]	18.52	426.00
	Ties	3[r]		
	Total	48		
TD_M - WS_M	Negative Ranks	41[s]	24.29	996.00
	Positive Ranks	5[t]	17.00	85.00
	Ties	2[u]		
	Total	48		

a. TD_M < AS_M
b. TD_M > AS_M
c. TD_M = AS_M
d. TD_M < CdLS_M
e. TD_M > CdLS_M
f. TD_M = CdLS_M
g. TD_M < DS_M
h. TD_M > DS_M
i. TD_M = DS_M
j. TD_M < FX_M
k. TD_M > FX_M
l. TD_M = FX_M
m. TD_M < PWS_M
n. TD_M > PWS_M
o. TD_M = PWS_M
p. TD_M < SMS_M
q. TD_M > SMS_M
r. TD_M = SMS_M
s. TD_M < WS_M
t. TD_M > WS_M
u. TD_M = WS_M

Table 224 GNS - Mouth - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_M	48	105.0000	2078.0000	890.166667	454.3802731
CdLS_M	48	.0000	1256.0000	363.465278	322.6136594
DS_M	48	.0000	1159.0000	367.576389	276.2380063
FX_M	48	.0000	1339.6667	489.083333	306.4518713
PWS_M	48	.0000	973.6667	286.027778	263.5686338
SMS_M	48	.0000	1615.0000	405.763889	380.2890773
WS_M	48	.0000	1647.0000	608.736111	398.4377350
TD_M	48	.0000	1100.0000	320.170139	244.0320036
Valid N (listwise)	48				

Table 225 GNS - Mouth - Dwell time - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound

face_type	.115	93.801	27	.000	.650	.746	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 226 GNS - Mouth - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	13358783.820	7	1908397.689	33.251	.000
	Greenhouse-Geisser	13358783.820	4.549	2936491.640	33.251	.000
	Huynh-Feldt	13358783.820	5.220	2559270.320	33.251	.000
	Lower-bound	13358783.820	1.000	13358783.820	33.251	.000
face_type * I_OR_U	Sphericity Assumed	257714.657	7	36816.380	.641	.721
	Greenhouse-Geisser	257714.657	4.549	56650.137	.641	.654
	Huynh-Feldt	257714.657	5.220	49372.868	.641	.675
	Lower-bound	257714.657	1.000	257714.657	.641	.427
Error(face_type)	Sphericity Assumed	18480503.740	322	57392.869		
	Greenhouse-Geisser	18480503.740	209.265	88311.614		
	Huynh-Feldt	18480503.740	240.109	76967.116		
	Lower-bound	18480503.740	46.000	401750.081		

Table 227 GNS - Mouth - Dwell time - Friedman test

Ranks

	Mean Rank
AS_M	7.38
CdLS_M	3.77
DS_M	3.71
FX_M	4.84
PWS_M	2.92
SMS_M	3.96
WS_M	5.89
TD_M	3.54

Test Statistics[a]

N	48
Chi-Square	124.342
df	7
Asymp. Sig.	.000

b. Friedman Test

Table 228 GNS - Mouth - Dwell time - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 8	15595010.000	1	15595010.000	83.937	.000
	Level 2 vs. Level 8	89974.514	1	89974.514	1.031	.315
	Level 3 vs. Level 8	107872.922	1	107872.922	1.382	.246
	Level 4 vs. Level 8	1369520.028	1	1369520.028	16.472	.000

	Level 5 vs. Level 8	55953.639	1	55953.639	1.350	.251
	Level 6 vs. Level 8	351661.922	1	351661.922	4.294	.044
	Level 7 vs. Level 8	3996975.376	1	3996975.376	33.430	.000
face_type * I_OR_U	Level 1 vs. Level 8	87537.848	1	87537.848	.471	.496
	Level 2 vs. Level 8	9.334	1	9.334	.000	.992
	Level 3 vs. Level 8	2727.570	1	2727.570	.035	.853
	Level 4 vs. Level 8	74064.797	1	74064.797	.891	.350
	Level 5 vs. Level 8	894.126	1	894.126	.022	.884
	Level 6 vs. Level 8	89024.542	1	89024.542	1.087	.303
	Level 7 vs. Level 8	8644.806	1	8644.806	.072	.789
Error(face_type)	Level 1 vs. Level 8	8546500.292	46	185793.485		
	Level 2 vs. Level 8	4013556.623	46	87251.231		
	Level 3 vs. Level 8	3589360.313	46	78029.572		
	Level 4 vs. Level 8	3824448.425	46	83140.183		
	Level 5 vs. Level 8	1906823.930	46	41452.694		
	Level 6 vs. Level 8	3767426.230	46	81900.570		
	Level 7 vs. Level 8	5499935.847	46	119563.823		

Table 229 GNS - Mouth - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	10440212.450	1	10440212.450	163.001	.000
I_OR_U	76209.473	1	76209.473	1.190	.281
Error	2946290.897	46	64049.802		

Table 230 GNS - Mouth - Dwell time – Wilcoxon test statistics

	TD_M - AS_M	TD_M - CdLS_M	TD_M - DS_M	TD_M - FX_M	TD_M - PWS_M	TD_M - SMS_M	TD_M - WS_M
Z	-5.836[b]	-.310[b]	-.868[b]	-3.764[b]	-1.437[c]	-1.120[b]	-4.889[b]
Asymp. Sig. (2-tailed)	.000	.756	.386	.000	.151	.263	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 231 GNS - Mouth - Dwell time – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_M - AS_M	Negative Ranks	47[a]	24.62	1157.00
	Positive Ranks	1[b]	19.00	19.00
	Ties	0[c]		
	Total	48		
TD_M - CdLS_M	Negative Ranks	21[d]	25.95	545.00
	Positive Ranks	24[e]	20.42	490.00
	Ties	3[f]		
	Total	48		
TD_M - DS_M	Negative Ranks	26[g]	24.85	646.00
	Positive Ranks	21[h]	22.95	482.00
	Ties	1[i]		
	Total	48		
TD_M - FX_M	Negative Ranks	35[j]	25.29	885.00

	Positive Ranks	11[k]	17.82	196.00
	Ties	2[l]		
	Total	48		
TD_M - PWS_M	Negative Ranks	17[m]	24.06	409.00
	Positive Ranks	29[n]	23.17	672.00
	Ties	2[o]		
	Total	48		
TD_M - SMS_M	Negative Ranks	22[p]	26.86	591.00
	Positive Ranks	22[q]	18.14	399.00
	Ties	4[r]		
	Total	48		
TD_M - WS_M	Negative Ranks	39[s]	25.33	988.00
	Positive Ranks	7[t]	13.29	93.00
	Ties	2[u]		
	Total	48		

a. TD_M < AS_M
b. TD_M > AS_M
c. TD_M = AS_M
d. TD_M < CdLS_M
e. TD_M > CdLS_M
f. TD_M = CdLS_M
g. TD_M < DS_M
h. TD_M > DS_M
i. TD_M = DS_M
j. TD_M < FX_M
k. TD_M > FX_M
l. TD_M = FX_M
m. TD_M < PWS_M
n. TD_M > PWS_M
o. TD_M = PWS_M
p. TD_M < SMS_M
q. TD_M > SMS_M
r. TD_M = SMS_M
s. TD_M < WS_M
t. TD_M > WS_M
u. TD_M = WS_M

Table 232 GNS - Mouth - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AS_M	48	.0369	.7405	.327399	.1621884
CdLS_M	48	.0000	.4500	.133490	.1166572
DS_M	48	.0000	.4712	.137792	.1057023
FX_M	48	.0000	.5065	.181132	.1120118
PWS_M	48	.0000	.4088	.106842	.0997031
SMS_M	48	.0000	.5651	.148245	.1365405
WS_M	48	.0000	.5736	.224103	.1456084
TD_M	48	.0000	.4038	.116998	.0884041
Valid N (listwise)	48				

Table 233 GNS - Mouth - Dwell percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	.116	93.611	27	.000	.650	.746	.143

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 234 GNS - Mouth - Dwell percent - Within-subjects contrasts

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	1.797	7	.257	34.341	.000
	Greenhouse-Geisser	1.797	4.549	.395	34.341	.000
	Huynh-Feldt	1.797	5.219	.344	34.341	.000
	Lower-bound	1.797	1.000	1.797	34.341	.000
Face_type * I_OR_U	Sphericity Assumed	.024	7	.003	.450	.870
	Greenhouse-Geisser	.024	4.549	.005	.450	.796
	Huynh-Feldt	.024	5.219	.005	.450	.821
	Lower-bound	.024	1.000	.024	.450	.506
Error(Face_type)	Sphericity Assumed	2.407	322	.007		
	Greenhouse-Geisser	2.407	209.253	.012		
	Huynh-Feldt	2.407	240.094	.010		
	Lower-bound	2.407	46.000	.052		

Table 235 GNS - Mouth - Dwell percent - Friedman test

Ranks

	Mean Rank
AS_M	7.40
CdLS_M	3.77
DS_M	3.71
FX_M	4.89
PWS_M	2.96
SMS_M	3.99
WS_M	5.80
TD_M	3.49

Test Statistics[a]

N	48
Chi-Square	123.214
df	7
Asymp. Sig.	.000

a. Friedman Test

Table 236 GNS - Mouth - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 8	2.125	1	2.125	89.175	.000
	Level 2 vs. Level 8	.013	1	.013	1.132	.293
	Level 3 vs. Level 8	.021	1	.021	1.959	.168
	Level 4 vs. Level 8	.197	1	.197	18.626	.000
	Level 5 vs. Level 8	.005	1	.005	.915	.344
	Level 6 vs. Level 8	.047	1	.047	4.547	.038
	Level 7 vs. Level 8	.551	1	.551	36.008	.000
Face_type * I_OR_U	Level 1 vs. Level 8	.007	1	.007	.300	.586
	Level 2 vs. Level 8	.000	1	.000	.010	.922
	Level 3 vs. Level 8	.000	1	.000	.039	.845
	Level 4 vs. Level 8	.006	1	.006	.595	.444

	Level 5 vs. Level 8	.000	1	.000	.023	.881
	Level 6 vs. Level 8	.010	1	.010	.928	.341
	Level 7 vs. Level 8	.000	1	.000	.024	.877
Error(Face_type)	Level 1 vs. Level 8	1.096	46	.024		
	Level 2 vs. Level 8	.531	46	.012		
	Level 3 vs. Level 8	.487	46	.011		
	Level 4 vs. Level 8	.488	46	.011		
	Level 5 vs. Level 8	.249	46	.005		
	Level 6 vs. Level 8	.474	46	.010		
	Level 7 vs. Level 8	.703	46	.015		

Table 237 GNS - Mouth - Dwell percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.420	1	1.420	164.368	.000
I_OR_U	.011	1	.011	1.277	.264
Error	.397	46	.009		

Table 238 GNS - Mouth - Dwell percent - Wilcoxon test statistics

	TD_M - AS_M	TD_M - CdLS_M	TD_M - DS_M	TD_M - FX_M	TD_M - PWS_M	TD_M - SMS_M	TD_M - WS_M
Z	-5.846[b]	-.288[b]	-1.026[b]	-3.971[b]	-1.240[c]	-1.180[b]	-4.987[b]
Asymp. Sig. (2-tailed)	.000	.773	.305	.000	.215	.238	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 239 GNS - Mouth - Dwell percent – Wilcoxon test ranks

		N	Mean Rank	Sum of Ranks
TD_M - AS_M	Negative Ranks	47[a]	24.64	1158.00
	Positive Ranks	1[b]	18.00	18.00
	Ties	0[c]		
	Total	48		
TD_M - CdLS_M	Negative Ranks	21[d]	25.86	543.00
	Positive Ranks	24[e]	20.50	492.00
	Ties	3[f]		
	Total	48		
TD_M - DS_M	Negative Ranks	26[g]	25.42	661.00
	Positive Ranks	21[h]	22.24	467.00
	Ties	1[i]		
	Total	48		
TD_M - FX_M	Negative Ranks	36[j]	25.11	904.00
	Positive Ranks	10[k]	17.70	177.00
	Ties	2[l]		
	Total	48		
TD_M - PWS_M	Negative Ranks	18[m]	23.72	427.00
	Positive Ranks	28[n]	23.36	654.00
	Ties	2[o]		
	Total	48		

TD_M - SMS_M	Negative Ranks	23[p]	27.04	622.00
	Positive Ranks	22[q]	18.77	413.00
	Ties	3[r]		
	Total	48		
TD_M - WS_M	Negative Ranks	39[s]	25.56	997.00
	Positive Ranks	7[t]	12.00	84.00
	Ties	2[u]		
	Total	48		

a. TD_M < AS_M
b. TD_M > AS_M
c. TD_M = AS_M
d. TD_M < CdLS_M
e. TD_M > CdLS_M
f. TD_M = CdLS_M
g. TD_M < DS_M
h. TD_M > DS_M
i. TD_M = DS_M
j. TD_M < FX_M
k. TD_M > FX_M
l. TD_M = FX_M
m. TD_M < PWS_M
n. TD_M > PWS_M
o. TD_M = PWS_M
p. TD_M < SMS_M
q. TD_M > SMS_M
r. TD_M = SMS_M
s. TD_M < WS_M
t. TD_M > WS_M
u. TD_M = WS_M

Appendix U ASD experiment data tables – Trait ratings

Table 240 ASD – Trait ratings - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD_Agg	Uninformed	.116	30	.200*	.934	30	.063
	Informed	.129	28	.200*	.936	28	.086
ASD_App	Uninformed	.100	30	.200*	.978	30	.776
	Informed	.132	28	.200*	.945	28	.152
ASD_Att	Uninformed	.194	30	.005	.875	30	.002
	Informed	.097	28	.200*	.977	28	.767
ASD_Bab	Uninformed	.110	30	.200*	.950	30	.171
	Informed	.103	28	.200*	.958	28	.315
ASD_Dom	Uninformed	.084	30	.200*	.971	30	.560
	Informed	.091	28	.200*	.977	28	.763
ASD_Int	Uninformed	.112	30	.200*	.961	30	.332
	Informed	.103	28	.200*	.978	28	.793
ASD_Tru	Uninformed	.158	30	.053	.938	30	.079
	Informed	.155	28	.082	.955	28	.266
TD_Agg	Uninformed	.182	30	.012	.844	30	.000
	Informed	.097	28	.200*	.976	28	.758
TD_App	Uninformed	.143	30	.120	.946	30	.135
	Informed	.115	28	.200*	.952	28	.220
TD_Att	Uninformed	.164	30	.039	.901	30	.009
	Informed	.097	28	.200*	.972	28	.635
TD_Bab	Uninformed	.157	30	.058	.876	30	.002
	Informed	.150	28	.109	.926	28	.049
TD_Dom	Uninformed	.129	30	.200*	.941	30	.095
	Informed	.097	28	.200*	.970	28	.571
TD_Int	Uninformed	.114	30	.200*	.952	30	.186
	Informed	.148	28	.120	.953	28	.229
TD_Tru	Uninformed	.140	30	.137	.965	30	.403
	Informed	.101	28	.200*	.954	28	.256
ASDmTD_Agg	Uninformed	.116	30	.200*	.934	30	.063
	Informed	.129	28	.200*	.936	28	.086
ASDmTD_App	Uninformed	.100	30	.200*	.978	30	.776
	Informed	.132	28	.200*	.945	28	.152
ASDmTD_Att	Uninformed	.194	30	.005	.875	30	.002
	Informed	.097	28	.200*	.977	28	.767
ASDmTD_Bab	Uninformed	.110	30	.200*	.950	30	.171
	Informed	.103	28	.200*	.958	28	.315
ASDmTD_Dom	Uninformed	.084	30	.200*	.971	30	.560
	Informed	.091	28	.200*	.977	28	.763
ASDmTD_Int	Uninformed	.112	30	.200*	.961	30	.332
	Informed	.103	28	.200*	.978	28	.793
ASDmTD_Tru	Uninformed	.158	30	.053	.938	30	.079
	Informed	.155	28	.082	.955	28	.266
ASD_Agg_Pc	Uninformed	.116	30	.200*	.934	30	.063
	Informed	.129	28	.200*	.936	28	.086
ASD_App_Pc	Uninformed	.100	30	.200*	.978	30	.776
	Informed	.132	28	.200*	.945	28	.152

ASD_Att_Pc	Uninformed	.194	30	.005	.875	30	.002
	Informed	.097	28	.200*	.977	28	.767
ASD_Bab_Pc	Uninformed	.110	30	.200*	.950	30	.171
	Informed	.103	28	.200*	.958	28	.315
ASD_Dom_Pc	Uninformed	.084	30	.200*	.971	30	.560
	Informed	.091	28	.200*	.977	28	.763
ASD_Int_Pc	Uninformed	.112	30	.200*	.961	30	.332
	Informed	.103	28	.200*	.978	28	.793
ASD_Tru_Pc	Uninformed	.158	30	.053	.938	30	.079
	Informed	.155	28	.082	.955	28	.266
TD_Agg_Pc	Uninformed	.182	30	.012	.844	30	.000
	Informed	.097	28	.200*	.976	28	.758
TD_App_Pc	Uninformed	.143	30	.120	.946	30	.135
	Informed	.115	28	.200*	.952	28	.220
TD_Att_Pc	Uninformed	.164	30	.039	.901	30	.009
	Informed	.097	28	.200*	.972	28	.635
TD_Bab_Pc	Uninformed	.157	30	.058	.876	30	.002
	Informed	.150	28	.109	.926	28	.049
TD_Dom_Pc	Uninformed	.129	30	.200*	.941	30	.095
	Informed	.097	28	.200*	.970	28	.571
TD_Int_Pc	Uninformed	.114	30	.200*	.952	30	.186
	Informed	.148	28	.120	.953	28	.229
TD_Tru_Pc	Uninformed	.140	30	.137	.965	30	.403
	Informed	.101	28	.200*	.954	28	.256

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 241 ASD – Trait ratings - Aggressiveness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Agg	58	4.00	338.00	128.0000	88.82409
TD_Agg	58	7.00	398.00	124.7069	88.67880
Valid N (listwise)	58				

Table 242 ASD – Trait ratings - Aggressiveness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 243 ASD – Trait ratings - Aggressiveness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	189.934	1	189.934	.067	.796
	Greenhouse-Geisser	189.934	1.000	189.934	.067	.796
	Huynh-Feldt	189.934	1.000	189.934	.067	.796

	Lower-bound	189.934	1.000	189.934	.067	.796
Face_type * I_OR_U	Sphericity Assumed	13066.555	1	13066.555	4.635	.036
	Greenhouse-Geisser	13066.555	1.000	13066.555	4.635	.036
	Huynh-Feldt	13066.555	1.000	13066.555	4.635	.036
	Lower-bound	13066.555	1.000	13066.555	4.635	.036
Error(Face_type)	Sphericity Assumed	157883.454	56	2819.347		
	Greenhouse-Geisser	157883.454	56.000	2819.347		
	Huynh-Feldt	157883.454	56.000	2819.347		
	Lower-bound	157883.454	56.000	2819.347		

Table 244 ASD – Trait ratings - Aggressiveness - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	927279.914	1	927279.914	143.369	.000
I_OR_U	1307.397	1	1307.397	.202	.655
Error	362196.608	56	6467.797		

Table 245 ASD – Trait ratings - Approachability - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_App	58	265.00	501.00	372.5000	64.17144
TD_App	58	149.00	492.00	361.0172	85.43172
Valid N (listwise)	58				

Table 246 ASD – Trait ratings - Approachability - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 247 ASD – Trait ratings - Approachability - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	3684.593	1	3684.593	1.081	.303
	Greenhouse-Geisser	3684.593	1.000	3684.593	1.081	.303
	Huynh-Feldt	3684.593	1.000	3684.593	1.081	.303
	Lower-bound	3684.593	1.000	3684.593	1.081	.303
Face_type * I_OR_U	Sphericity Assumed	1015.627	1	1015.627	.298	.587
	Greenhouse-Geisser	1015.627	1.000	1015.627	.298	.587
	Huynh-Feldt	1015.627	1.000	1015.627	.298	.587
	Lower-bound	1015.627	1.000	1015.627	.298	.587

Error(Face_type)	Sphericity Assumed	190894.614	56	3408.832		
	Greenhouse-Geisser	190894.614	56.000	3408.832		
	Huynh-Feldt	190894.614	56.000	3408.832		
	Lower-bound	190894.614	56.000	3408.832		

Table 248 ASD – Trait ratings - Approachability - Between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	7801812.575	1	7801812.575	1924.388	.000
I_OR_U	2382.575	1	2382.575	.588	.447
Error	227034.045	56	4054.179		

Table 249 ASD – Trait ratings - Attractiveness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Att	58	47.00	478.00	302.6034	92.69492
TD_Att	58	37.00	468.00	305.9310	97.27297
Valid N (listwise)	58				

Table 250 ASD – Trait ratings - Attractiveness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 251 ASD – Trait ratings - Attractiveness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	340.493	1	340.493	.144	.705
	Greenhouse-Geisser	340.493	1.000	340.493	.144	.705
	Huynh-Feldt	340.493	1.000	340.493	.144	.705
	Lower-bound	340.493	1.000	340.493	.144	.705
Face_type * I_OR_U	Sphericity Assumed	248.424	1	248.424	.105	.747
	Greenhouse-Geisser	248.424	1.000	248.424	.105	.747
	Huynh-Feldt	248.424	1.000	248.424	.105	.747
	Lower-bound	248.424	1.000	248.424	.105	.747
Error(Face_type)	Sphericity Assumed	132117.964	56	2359.249		
	Greenhouse-Geisser	132117.964	56.000	2359.249		
	Huynh-Feldt	132117.964	56.000	2359.249		
	Lower-bound	132117.964	56.000	2359.249		

Table 252 ASD – Trait ratings - Attractiveness - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5382683.941	1	5382683.941	695.393	.000
I_OR_U	14898.838	1	14898.838	1.925	.171
Error	433467.770	56	7740.496		

Table 253 ASD – Trait ratings - Babyfacedness - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Bab	58	74.00	499.00	355.7241	94.22347
TD_Bab	58	161.00	495.00	394.6379	83.27543
Valid N (listwise)	58				

Table 254 ASD – Trait ratings - Babyfacedness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 255 ASD – Trait ratings - Babyfacedness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	43557.696	1	43557.696	17.247	.000
	Greenhouse-Geisser	43557.696	1.000	43557.696	17.247	.000
	Huynh-Feldt	43557.696	1.000	43557.696	17.247	.000
	Lower-bound	43557.696	1.000	43557.696	17.247	.000
Face_type * I_OR_U	Sphericity Assumed	445.420	1	445.420	.176	.676
	Greenhouse-Geisser	445.420	1.000	445.420	.176	.676
	Huynh-Feldt	445.420	1.000	445.420	.176	.676
	Lower-bound	445.420	1.000	445.420	.176	.676
Error(Face_type)	Sphericity Assumed	141427.864	56	2525.498		
	Greenhouse-Geisser	141427.864	56.000	2525.498		
	Huynh-Feldt	141427.864	56.000	2525.498		
	Lower-bound	141427.864	56.000	2525.498		

Table 256 ASD – Trait ratings - Babyfacedness - between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	8152811.547	1	8152811.547	1202.533	.000
I_OR_U	66.650	1	66.650	.010	.921
Error	379663.199	56	6779.700		

Table 257 ASD – Trait ratings - Babyfacedness - Friedman test

Ranks

	Mean Rank
ASD_Bab	1.33
TD_Bab	1.67

Test Statistics[a]

N	58
Chi-Square	6.897
df	1
Asymp. Sig.	.009

a. Friedman Test

Table 258 ASD – Trait ratings - Dominance - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Dom	58	33.00	455.00	220.5000	104.20328
TD_Dom	58	14.00	425.00	186.3793	107.04579
Valid N (listwise)	58				

Table 259 ASD – Trait ratings - Dominance - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U

Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 260 ASD – Trait ratings - Dominance - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	32317.379	1	32317.379	4.113	.047
	Greenhouse-Geisser	32317.379	1.000	32317.379	4.113	.047
	Huynh-Feldt	32317.379	1.000	32317.379	4.113	.047
	Lower-bound	32317.379	1.000	32317.379	4.113	.047
Face_type * I_OR_U	Sphericity Assumed	12568.966	1	12568.966	1.600	.211
	Greenhouse-Geisser	12568.966	1.000	12568.966	1.600	.211
	Huynh-Feldt	12568.966	1.000	12568.966	1.600	.211
	Lower-bound	12568.966	1.000	12568.966	1.600	.211
Error(Face_type)	Sphericity Assumed	440048.112	56	7858.002		
	Greenhouse-Geisser	440048.112	56.000	7858.002		
	Huynh-Feldt	440048.112	56.000	7858.002		
	Lower-bound	440048.112	56.000	7858.002		

Table 261 ASD – Trait ratings - Dominance - Between subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2402817.198	1	2402817.198	330.305	.000
I_OR_U	2355.233	1	2355.233	.324	.572
Error	407374.306	56	7274.541		

Table 262 ASD – Trait ratings - Dominance - Friedman test

Ranks	
	Mean Rank
ASD_Dom	1.71
TD_Dom	1.29

Test Statistics[a]	
N	58
Chi-Square	9.931
df	1
Asymp. Sig.	.002

a. Friedman Test

Table 263 ASD – Trait ratings - Intelligence - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Int	58	94.00	490.00	331.7241	71.28145
TD_Int	58	53.00	499.00	323.1897	101.63997
Valid N (listwise)	58				

Table 264 ASD – Trait ratings - Intelligence - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 265 ASD – Trait ratings - Intelligence - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	2157.143	1	2157.143	.636	.429
	Greenhouse-Geisser	2157.143	1.000	2157.143	.636	.429
	Huynh-Feldt	2157.143	1.000	2157.143	.636	.429
	Lower-bound	2157.143	1.000	2157.143	.636	.429
Face_type * I_OR_U	Sphericity Assumed	221.143	1	221.143	.065	.799
	Greenhouse-Geisser	221.143	1.000	221.143	.065	.799
	Huynh-Feldt	221.143	1.000	221.143	.065	.799
	Lower-bound	221.143	1.000	221.143	.065	.799
Error(Face_type)	Sphericity Assumed	189944.073	56	3391.858		
	Greenhouse-Geisser	189944.073	56.000	3391.858		
	Huynh-Feldt	189944.073	56.000	3391.858		
	Lower-bound	189944.073	56.000	3391.858		

Table 266 ASD – Trait ratings - Intelligence - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6216695.765	1	6216695.765	1013.934	.000
I_OR_U	801.006	1	801.006	.131	.719
Error	343350.636	56	6131.261		

Table 267 ASD – Trait ratings - Trustworthiness - Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
ASD_Tru	58	110.00	486.00	341.2586	74.97896
TD_Tru	58	153.00	497.00	351.3448	79.55943
Valid N (listwise)	58				

Table 268 ASD – Trait ratings - Trustworthiness - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 269 ASD – Trait ratings - Trustworthiness - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	3046.725	1	3046.725	.787	.379
	Greenhouse-Geisser	3046.725	1.000	3046.725	.787	.379
	Huynh-Feldt	3046.725	1.000	3046.725	.787	.379
	Lower-bound	3046.725	1.000	3046.725	.787	.379
Face_type * I_OR_U	Sphericity Assumed	701.898	1	701.898	.181	.672
	Greenhouse-Geisser	701.898	1.000	701.898	.181	.672
	Huynh-Feldt	701.898	1.000	701.898	.181	.672
	Lower-bound	701.898	1.000	701.898	.181	.672
Error(Face_type)	Sphericity Assumed	216866.387	56	3872.614		
	Greenhouse-Geisser	216866.387	56.000	3872.614		
	Huynh-Feldt	216866.387	56.000	3872.614		
	Lower-bound	216866.387	56.000	3872.614		

Table 270 ASD – Trait ratings - Trustworthiness - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6959512.870	1	6959512.870	1714.026	.000
I_OR_U	4456.491	1	4456.491	1.098	.299
Error	227378.479	56	4060.330		

Appendix V ASD – Experiment data tables – Time taken to make trait ratings

Table 271 ASD – Total fixations - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD * Aggressiveness	58	1292	9198	3232.10	1498.090
ASD * Approachability	58	1297	16119	3331.93	2620.929
ASD * Attractiveness	58	1328	13188	3766.74	2564.665
ASD * Babyfacedness	58	1534	6571	3168.36	1204.022
ASD * Dominance	58	1101	14874	3381.67	2186.438
ASD * Intelligence	58	1251	10066	3757.40	1705.369
ASD * Trustworthiness	58	1274	18737	3684.16	3108.821
TD * Aggressiveness	58	1514	8201	3239.71	1433.906
TD * Approachability	58	1220	11039	3375.98	1756.535
TD * Attractiveness	58	1204	11313	3388.19	1950.326
TD * Babyfacedness	58	1468	14538	3206.47	2100.101
TD * Dominance	58	1271	13113	3677.64	2196.095
TD * Intelligence	58	1321	10355	3544.47	2081.456
TD * Trustworthiness	58	1392	7816	3334.66	1643.764
Valid N (listwise)	58				

Table 272 ASD – Total fixations - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD * Aggressiveness	Uninformed	.188	30	.009	.813	30	.000
	Informed	.240	28	.000	.840	28	.001
ASD * Approachability	Uninformed	.255	30	.000	.498	30	.000
	Informed	.231	28	.001	.617	28	.000
ASD * Attractiveness	Uninformed	.279	30	.000	.708	30	.000
	Informed	.244	28	.000	.716	28	.000
ASD * Babyfacedness	Uninformed	.131	30	.200*	.941	30	.095
	Informed	.133	28	.200*	.932	28	.070
ASD * Dominance	Uninformed	.235	30	.000	.675	30	.000
	Informed	.254	28	.000	.626	28	.000
ASD * Intelligence	Uninformed	.147	30	.095	.950	30	.167
	Informed	.160	28	.065	.822	28	.000
ASD * Trustworthiness	Uninformed	.345	30	.000	.519	30	.000
	Informed	.231	28	.001	.699	28	.000
TD * Aggressiveness	Uninformed	.199	30	.004	.760	30	.000
	Informed	.127	28	.200*	.900	28	.012
TD * Approachability	Uninformed	.117	30	.200*	.946	30	.128
	Informed	.219	28	.001	.818	28	.000
TD * Attractiveness	Uninformed	.117	30	.200*	.946	30	.129
	Informed	.189	28	.011	.827	28	.000
TD * Babyfacedness	Uninformed	.239	30	.000	.794	30	.000
	Informed	.272	28	.000	.677	28	.000
TD * Dominance	Uninformed	.121	30	.200*	.874	30	.002
	Informed	.233	28	.000	.753	28	.000
TD * Intelligence	Uninformed	.189	30	.008	.813	30	.000
	Informed	.247	28	.000	.779	28	.000
TD * Trustworthiness	Uninformed	.171	30	.025	.860	30	.001

	Informed	.153	28	.090	.891	28	.007

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 273 ASD – Total fixations - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	1.000	.000	0	.	1.000	1.000	1.000
Trait_rated	.327	60.045	20	.000	.765	.857	.167
face_type * Trait_rated	.191	88.906	20	.000	.661	.730	.167

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type + Trait_rated + face_type * Trait_rated
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 274 ASD – Total fixations - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	1080163.406	1	1080163.406	.489	.487
	Greenhouse-Geisser	1080163.406	1.000	1080163.406	.489	.487
	Huynh-Feldt	1080163.406	1.000	1080163.406	.489	.487
	Lower-bound	1080163.406	1.000	1080163.406	.489	.487
face_type * I_OR_U	Sphericity Assumed	6841304.755	1	6841304.755	3.097	.084
	Greenhouse-Geisser	6841304.755	1.000	6841304.755	3.097	.084
	Huynh-Feldt	6841304.755	1.000	6841304.755	3.097	.084
	Lower-bound	6841304.755	1.000	6841304.755	3.097	.084
Error(face_type)	Sphericity Assumed	123710942.000	56	2209123.965		
	Greenhouse-Geisser	123710942.000	56.000	2209123.965		
	Huynh-Feldt	123710942.000	56.000	2209123.965		
	Lower-bound	123710942.000	56.000	2209123.965		
Trait_rated	Sphericity Assumed	21562501.760	6	3593750.294	1.073	.378
	Greenhouse-Geisser	21562501.760	4.590	4697274.715	1.073	.374
	Huynh-Feldt	21562501.760	5.140	4195045.141	1.073	.376
	Lower-bound	21562501.760	1.000	21562501.760	1.073	.305
Trait_rated * I_OR_U	Sphericity Assumed	11814707.870	6	1969117.978	.588	.740
	Greenhouse-Geisser	11814707.870	4.590	2573770.388	.588	.695
	Huynh-Feldt	11814707.870	5.140	2298584.523	.588	.714
	Lower-bound	11814707.870	1.000	11814707.870	.588	.446
Error(Trait_rated)	Sphericity Assumed	1125516682.000	336	3349752.030		

	Greenhouse-Geisser	1125516682.000	257.064	4378352.481		
	Huynh-Feldt	1125516682.000	287.840	3910221.866		
	Lower-bound	1125516682.000	56.000	20098512.180		
face_type * Trait_rated	Sphericity Assumed	10383542.590	6	1730590.432	.950	.459
	Greenhouse-Geisser	10383542.590	3.965	2618595.074	.950	.435
	Huynh-Feldt	10383542.590	4.381	2369880.829	.950	.441
	Lower-bound	10383542.590	1.000	10383542.590	.950	.334
face_type * Trait_rated * I_OR_U	Sphericity Assumed	6021263.002	6	1003543.834	.551	.769
	Greenhouse-Geisser	6021263.002	3.965	1518484.611	.551	.697
	Huynh-Feldt	6021263.002	4.381	1374258.894	.551	.715
	Lower-bound	6021263.002	1.000	6021263.002	.551	.461
Error(face_type*Trait_rated)	Sphericity Assumed	612181614.500	336	1821969.091		
	Greenhouse-Geisser	612181614.500	222.057	2756862.165		
	Huynh-Feldt	612181614.500	245.362	2495015.308		
	Lower-bound	612181614.500	56.000	10931814.540		

Table 275 ASD – Total fixations - Within-subjects contrasts

Source	face_type	Trait_rated	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 2		2160326.811	1	2160326.811	.489	.487
face_type * I_OR_U	Level 1 vs. Level 2		13682609.510	1	13682609.510	3.097	.084
Error(face_type)	Level 1 vs. Level 2		247421884.100	56	4418247.930		
Trait_rated		Linear	3611555.521	1	3611555.521	2.673	.108
		Quadratic	98663.003	1	98663.003	.043	.836
		Cubic	12409.869	1	12409.869	.005	.943
		Order 4	2473790.434	1	2473790.434	3.162	.081
		Order 5	896858.124	1	896858.124	.602	.441
		Order 6	3687973.929	1	3687973.929	2.120	.151
Trait_rated * I_OR_U		Linear	3591472.551	1	3591472.551	2.658	.109
		Quadratic	661400.567	1	661400.567	.291	.592

		Cubic	1076670.156	1	1076670.156	.447	.507
		Order 4	1642.643	1	1642.643	.002	.964
		Order 5	99200.342	1	99200.342	.067	.797
		Order 6	476967.674	1	476967.674	.274	.603
Error(Trait_rated)		Linear	75655913.890	56	1350998.462		
		Quadratic	127384961.700	56	2274731.458		
		Cubic	135012282.500	56	2410933.617		
		Order 4	43806899.580	56	782266.064		
		Order 5	83490445.580	56	1490900.814		
		Order 6	97407837.860	56	1739425.676		
face_type * Trait_rated	Level 1 vs. Level 2	Linear	1837633.579	1	1837633.579	.673	.415
		Quadratic	1951175.238	1	1951175.238	.517	.475
		Cubic	5879910.349	1	5879910.349	1.228	.273
		Order 4	55167.094	1	55167.094	.022	.882
		Order 5	10892831.920	1	10892831.920	3.390	.071
		Order 6	150367.003	1	150367.003	.031	.861
face_type * Trait_rated * I_OR_U	Level 1 vs. Level 2	Linear	1746245.047	1	1746245.047	.640	.427
		Quadratic	2672925.649	1	2672925.649	.708	.404
		Cubic	267594.211	1	267594.211	.056	.814
		Order 4	2047690.717	1	2047690.717	.826	.367
		Order 5	2775078.661	1	2775078.661	.864	.357
		Order 6	2532991.718	1	2532991.718	.519	.474
Error(face_type*Trait_rated)	Level 1 vs. Level 2	Linear	152867679.800	56	2729779.996		
		Quadratic	211351738.900	56	3774138.195		
		Cubic	268141284.400	56	4788237.221		
		Order 4	138800107.100	56	2478573.342		
		Order 5	179920694.400	56	3212869.543		

	Order 6	273281724.500	56	4880030.794	

Table 276 ASD – Total fixations - Between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4801305852.000	1	4801305852.000	360.182	.000
I_OR_U	12121327.440	1	12121327.440	.909	.344
Error	746491580.900	56	13330206.800		

Appendix W ASD – Experiment data tables – Number of fixations to the whole face

Table 277 ASD – Total fixations - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD	48	4.33	12.00	8.1948	2.01641
TD	48	3.00	11.33	8.2846	1.95460
Valid N (listwise)	48				

Table 278 ASD – Total fixations - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD	0	.101	24	.200*	.955	24	.348
	1	.123	24	.200*	.946	24	.225
TD	0	.177	24	.049	.923	24	.068
	1	.134	24	.200*	.957	24	.386

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 279 ASD – Total fixations - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 280 ASD – Total fixations - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.194	1	.194	.143	.707
	Greenhouse-Geisser	.194	1.000	.194	.143	.707
	Huynh-Feldt	.194	1.000	.194	.143	.707
	Lower-bound	.194	1.000	.194	.143	.707
Face_type * I_OR_U	Sphericity Assumed	1.579	1	1.579	1.170	.285
	Greenhouse-Geisser	1.579	1.000	1.579	1.170	.285
	Huynh-Feldt	1.579	1.000	1.579	1.170	.285
	Lower-bound	1.579	1.000	1.579	1.170	.285
Error(Face_type)	Sphericity Assumed	62.058	46	1.349		
	Greenhouse-Geisser	62.058	46.000	1.349		
	Huynh-Feldt	62.058	46.000	1.349		
	Lower-bound	62.058	46.000	1.349		

Table 281 ASD – Total fixations - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.387	1	.387	.143	.707
Face_type * I_OR_U	Level 1 vs. Level 2	3.157	1	3.157	1.170	.285
Error(Face_type)	Level 1 vs. Level 2	124.117	46	2.698		

Table 282 ASD – Total fixations - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3258.838	1	3258.838	977.360	.000
I_OR_U	.132	1	.132	.040	.843
Error	153.379	46	3.334		

Appendix X ASD – Experiment data tables – Interest area data

Table 283 ASD – Fixation count - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD_E	Uninformed	.143	24	.200*	.966	24	.568
	Informed	.179	24	.046	.953	24	.308
ASD_N	Uninformed	.090	24	.200*	.966	24	.563
	Informed	.161	24	.107	.940	24	.162
ASD_M	Uninformed	.220	24	.004	.859	24	.003
	Informed	.133	24	.200*	.932	24	.106
TD_E	Uninformed	.115	24	.200*	.949	24	.260
	Informed	.108	24	.200*	.971	24	.686
TD_N	Uninformed	.168	24	.078	.956	24	.357
	Informed	.153	24	.151	.963	24	.508
TD_M	Uninformed	.164	24	.096	.881	24	.009
	Informed	.165	24	.092	.910	24	.035

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 284 ASD – Fixation percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD_E	Uninformed	.094	24	.200*	.984	24	.959
	Informed	.223	24	.003	.843	24	.002
ASD_N	Uninformed	.125	24	.200*	.955	24	.348
	Informed	.160	24	.115	.856	24	.003
ASD_M	Uninformed	.154	24	.145	.900	24	.021
	Informed	.125	24	.200*	.946	24	.224
TD_E	Uninformed	.124	24	.200*	.929	24	.091
	Informed	.140	24	.200*	.962	24	.489
TD_N	Uninformed	.212	24	.007	.896	24	.018
	Informed	.153	24	.151	.902	24	.023
TD_M	Uninformed	.151	24	.169	.896	24	.017
	Informed	.105	24	.200*	.938	24	.144

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 285 ASD – Dwell time - Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ASD_E	.106	48	.200*	.964	48	.142
ASD_N	.104	48	.200*	.924	48	.004
ASD_M	.130	48	.042	.918	48	.003
TD_E	.118	48	.090	.963	48	.131
TD_N	.144	48	.014	.909	48	.001
TD_M	.129	48	.044	.913	48	.002

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 286 ASD – Dwell percent - Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	I_OR_U	Statistic	df	Sig.	Statistic	df	Sig.
ASD_E	Uninformed	.122	24	.200*	.976	24	.809
	Informed	.189	24	.027	.877	24	.007
ASD_N	Uninformed	.112	24	.200*	.941	24	.169
	Informed	.172	24	.064	.862	24	.004
ASD_M	Uninformed	.143	24	.200*	.908	24	.032
	Informed	.116	24	.200*	.931	24	.100
TD_E	Uninformed	.092	24	.200*	.974	24	.769
	Informed	.170	24	.070	.921	24	.060
TD_N	Uninformed	.136	24	.200*	.922	24	.063
	Informed	.206	24	.010	.894	24	.016
TD_M	Uninformed	.194	24	.019	.891	24	.014
	Informed	.108	24	.200*	.944	24	.198

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 287 ASD – Eyes - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_E	48	.0000	3.1667	1.531250	.7807194
TD_E	48	.0000	3.1667	1.559028	.7896266
Valid N (listwise)	48				

Table 288 ASD – Eyes - Fixation count - Sphericity

					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 289 ASD – Eyes - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	.019	1	.019	.108	.744
	Greenhouse-Geisser	.019	1.000	.019	.108	.744
	Huynh-Feldt	.019	1.000	.019	.108	.744
	Lower-bound	.019	1.000	.019	.108	.744
face_type * I_OR_U	Sphericity Assumed	.463	1	.463	2.693	.108
	Greenhouse-Geisser	.463	1.000	.463	2.693	.108
	Huynh-Feldt	.463	1.000	.463	2.693	.108
	Lower-bound	.463	1.000	.463	2.693	.108
Error(face_type)	Sphericity Assumed	7.907	46	.172		
	Greenhouse-Geisser	7.907	46.000	.172		
	Huynh-Feldt	7.907	46.000	.172		
	Lower-bound	7.907	46.000	.172		

Table 290 ASD – Eyes - Fixation count - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 2	.037	1	.037	.108	.744
face_type * I_OR_U	Level 1 vs. Level 2	.926	1	.926	2.693	.108
Error(face_type)	Level 1 vs. Level 2	15.815	46	.344		

Table 291 ASD – Eyes - Fixation count - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	114.598	1	114.598	231.443	.000
I_OR_U	2.014	1	2.014	4.068	.050
Error	22.777	46	.495		

Table 292 ASD – Eyes - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_E	48	.0000	.3426	.180958	.0796154
TD_E	48	.0000	.4111	.180824	.0890867
Valid N (listwise)	48				

Table 293 ASD – Eyes - Fixation percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 294 ASD – Eyes - Fixation percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	4.356E-7	1	4.356E-7	.000	.990
	Greenhouse-Geisser	4.356E-7	1.000	4.356E-7	.000	.990
	Huynh-Feldt	4.356E-7	1.000	4.356E-7	.000	.990
	Lower-bound	4.356E-7	1.000	4.356E-7	.000	.990
Face_type * I_OR_U	Sphericity Assumed	.005	1	.005	1.745	.193
	Greenhouse-Geisser	.005	1.000	.005	1.745	.193
	Huynh-Feldt	.005	1.000	.005	1.745	.193
	Lower-bound	.005	1.000	.005	1.745	.193
Error(Face_type)	Sphericity Assumed	.123	46	.003		
	Greenhouse-Geisser	.123	46.000	.003		

	Huynh-Feldt	.123	46.000	.003		
	Lower-bound	.123	46.000	.003		

Table 295 ASD – Eyes - Fixation percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	8.712E-7	1	8.712E-7	.000	.990
Face_type * I_OR_U	Level 1 vs. Level 2	.009	1	.009	1.745	.193
Error(Face_type)	Level 1 vs. Level 2	.247	46	.005		

Table 296 ASD – Eyes - Fixation percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.571	1	1.571	288.426	.000
I_OR_U	.021	1	.021	3.840	.056
Error	.250	46	.005		

Table 297 ASD – Eyes - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_E	48	.0000	1045.0000	518.850695	230.0955892
TD_E	48	.0000	1282.1667	497.628472	260.7582126
Valid N (listwise)	48				

Table 298 ASD – Eyes - Dwell time - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 299 ASD – Eyes - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	10809.185	1	10809.185	.480	.492
	Greenhouse-Geisser	10809.185	1.000	10809.185	.480	.492
	Huynh-Feldt	10809.185	1.000	10809.185	.480	.492
	Lower-bound	10809.185	1.000	10809.185	.480	.492
Face_type * I_OR_U	Sphericity Assumed	1959.029	1	1959.029	.087	.769
	Greenhouse-Geisser	1959.029	1.000	1959.029	.087	.769
	Huynh-Feldt	1959.029	1.000	1959.029	.087	.769
	Lower-bound	1959.029	1.000	1959.029	.087	.769

Error(Face_type)	Sphericity Assumed	1036096.342	46	22523.834		
	Greenhouse-Geisser	1036096.342	46.000	22523.834		
	Huynh-Feldt	1036096.342	46.000	22523.834		
	Lower-bound	1036096.342	46.000	22523.834		

Table 300 ASD – Eyes - Dwell time - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	21618.370	1	21618.370	.480	.492
Face_type * I_OR_U	Level 1 vs. Level 2	3918.058	1	3918.058	.087	.769
Error(Face_type)	Level 1 vs. Level 2	2072192.683	46	45047.667		

Table 301 ASD – Eyes - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	12398758.760	1	12398758.760	267.730	.000
I_OR_U	192744.502	1	192744.502	4.162	.047
Error	2130290.215	46	46310.657		

Table 302 ASD – Eyes - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_E	48	.0000	.3859	.194534	.0868729
TD_E	48	.0000	.4598	.185280	.0962316
Valid N (listwise)	48				

Table 303 ASD – Eyes - Dwell percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 304 ASD – Eyes - Dwell percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.002	1	.002	.680	.414
	Greenhouse-Geisser	.002	1.000	.002	.680	.414
	Huynh-Feldt	.002	1.000	.002	.680	.414
	Lower-bound	.002	1.000	.002	.680	.414
	Sphericity Assumed	.001	1	.001	.212	.647

Face_type * I_OR_U	Greenhouse-Geisser	.001	1.000	.001	.212	.647
	Huynh-Feldt	.001	1.000	.001	.212	.647
	Lower-bound	.001	1.000	.001	.212	.647
Error(Face_type)	Sphericity Assumed	.139	46	.003		
	Greenhouse-Geisser	.139	46.000	.003		
	Huynh-Feldt	.139	46.000	.003		
	Lower-bound	.139	46.000	.003		

Table 305 ASD – Eyes - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.004	1	.004	.680	.414
Face_type * I_OR_U	Level 1 vs. Level 2	.001	1	.001	.212	.647
Error(Face_type)	Level 1 vs. Level 2	.278	46	.006		

Table 306 ASD – Eyes - Dwell percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1.731	1	1.731	266.732	.000
I_OR_U	.027	1	.027	4.091	.049
Error	.299	46	.006		

Table 307 ASD – Nose - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_N	48	1.0000	5.6667	3.111111	1.1816832
TD_N	48	1.0000	6.0000	3.104167	1.0179390
Valid N (listwise)	48				

Table 308 ASD – Nose - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 309 ASD – Nose - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	.001	1	.001	.003	.958

	Greenhouse-Geisser	.001	1.000	.001	.003	.958
	Huynh-Feldt	.001	1.000	.001	.003	.958
	Lower-bound	.001	1.000	.001	.003	.958
face_type * I_OR_U	Sphericity Assumed	.334	1	.334	.827	.368
	Greenhouse-Geisser	.334	1.000	.334	.827	.368
	Huynh-Feldt	.334	1.000	.334	.827	.368
	Lower-bound	.334	1.000	.334	.827	.368
Error(face_type)	Sphericity Assumed	18.609	46	.405		
	Greenhouse-Geisser	18.609	46.000	.405		
	Huynh-Feldt	18.609	46.000	.405		
	Lower-bound	18.609	46.000	.405		

Table 310 ASD – Nose - Fixation count - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 2	.002	1	.002	.003	.958
face_type * I_OR_U	Level 1 vs. Level 2	.669	1	.669	.827	.368
Error(face_type)	Level 1 vs. Level 2	37.218	46	.809		

Table 311 ASD – Nose - Fixation count - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	463.556	1	463.556	476.221	.000
I_OR_U	2.917	1	2.917	2.997	.090
Error	44.777	46	.973		

Table 312 ASD – Nose - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_N	48	.1587	.8750	.397472	.1713879
TD_N	48	.1778	.8333	.404809	.1669603
Valid N (listwise)	48				

Table 313 ASD – Nose - Fixation percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U

Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 314 ASD – Nose - Fixation percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.001	1	.001	.154	.697
	Greenhouse-Geisser	.001	1.000	.001	.154	.697
	Huynh-Feldt	.001	1.000	.001	.154	.697
	Lower-bound	.001	1.000	.001	.154	.697
Face_type * I_OR_U	Sphericity Assumed	.010	1	.010	1.227	.274
	Greenhouse-Geisser	.010	1.000	.010	1.227	.274
	Huynh-Feldt	.010	1.000	.010	1.227	.274
	Lower-bound	.010	1.000	.010	1.227	.274
Error(Face_type)	Sphericity Assumed	.386	46	.008		
	Greenhouse-Geisser	.386	46.000	.008		
	Huynh-Feldt	.386	46.000	.008		
	Lower-bound	.386	46.000	.008		

Table 315 ASD – Nose - Fixation percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.003	1	.003	.154	.697
Face_type * I_OR_U	Level 1 vs. Level 2	.021	1	.021	1.227	.274
Error(Face_type)	Level 1 vs. Level 2	.772	46	.017		

Table 316 ASD – Nose - Fixation percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	7.724	1	7.724	322.967	.000
I_OR_U	.047	1	.047	1.973	.167
Error	1.100	46	.024		

Table 317 ASD – Nose - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_N	48	238.6667	2510.6667	1027.576389	539.5330909
TD_N	48	224.6667	2330.6667	1071.951389	528.4734337
Valid N (listwise)	48				

Table 318 ASD – Nose - Dwell time - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 319 ASD – Nose - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	47259.375	1	47259.375	.635	.430
	Greenhouse-Geisser	47259.375	1.000	47259.375	.635	.430
	Huynh-Feldt	47259.375	1.000	47259.375	.635	.430
	Lower-bound	47259.375	1.000	47259.375	.635	.430
Face_type * I_OR_U	Sphericity Assumed	132412.518	1	132412.518	1.780	.189
	Greenhouse-Geisser	132412.518	1.000	132412.518	1.780	.189
	Huynh-Feldt	132412.518	1.000	132412.518	1.780	.189
	Lower-bound	132412.518	1.000	132412.518	1.780	.189
Error(Face_type)	Sphericity Assumed	3422607.107	46	74404.502		
	Greenhouse-Geisser	3422607.107	46.000	74404.502		
	Huynh-Feldt	3422607.107	46.000	74404.502		
	Lower-bound	3422607.107	46.000	74404.502		

Table 320 ASD – Nose - Dwell time - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	94518.750	1	94518.750	.635	.430
Face_type * I_OR_U	Level 1 vs. Level 2	264825.037	1	264825.037	1.780	.189
Error(Face_type)	Level 1 vs. Level 2	6845214.213	46	148809.005		

Table 321 ASD – Nose - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	52896202.680	1	52896202.680	221.338	.000
I_OR_U	633191.021	1	633191.021	2.650	.110
Error	10993232.140	46	238983.307		

Table 322 ASD – Nose - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_N	48	.0841	.9241	.379417	.1938885
TD_N	48	.0804	.8415	.391863	.1825463
Valid N (listwise)	48				

Table 323 ASD – Nose - Dwell percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 324 ASD – Nose - Dwell percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.004	1	.004	.412	.524
	Greenhouse-Geisser	.004	1.000	.004	.412	.524
	Huynh-Feldt	.004	1.000	.004	.412	.524
	Lower-bound	.004	1.000	.004	.412	.524
Face_type * I_OR_U	Sphericity Assumed	.017	1	.017	1.916	.173
	Greenhouse-Geisser	.017	1.000	.017	1.916	.173
	Huynh-Feldt	.017	1.000	.017	1.916	.173
	Lower-bound	.017	1.000	.017	1.916	.173
Error(Face_type)	Sphericity Assumed	.415	46	.009		
	Greenhouse-Geisser	.415	46.000	.009		
	Huynh-Feldt	.415	46.000	.009		
	Lower-bound	.415	46.000	.009		

Table 325 ASD – Nose - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.007	1	.007	.412	.524
Face_type * I_OR_U	Level 1 vs. Level 2	.035	1	.035	1.916	.173
Error(Face_type)	Level 1 vs. Level 2	.830	46	.018		

Table 326 ASD – Nose - Dwell percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	7.138	1	7.138	240.573	.000
I_OR_U	.085	1	.085	2.878	.097
Error	1.365	46	.030		

Table 327 ASD – Mouth - Fixation count - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_M	48	.0000	3.6667	.868056	.7679748
TD_M	48	.0000	3.6667	.937500	.8495758
Valid N (listwise)	48				

Table 328 ASD – Mouth - Fixation count - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept + I_OR_U
Within Subjects Design: face_type
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 329 ASD – Mouth - Fixation count - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Sphericity Assumed	.116	1	.116	.578	.451
	Greenhouse-Geisser	.116	1.000	.116	.578	.451
	Huynh-Feldt	.116	1.000	.116	.578	.451
	Lower-bound	.116	1.000	.116	.578	.451
face_type * I_OR_U	Sphericity Assumed	.005	1	.005	.023	.880
	Greenhouse-Geisser	.005	1.000	.005	.023	.880
	Huynh-Feldt	.005	1.000	.005	.023	.880
	Lower-bound	.005	1.000	.005	.023	.880
Error(face_type)	Sphericity Assumed	9.213	46	.200		
	Greenhouse-Geisser	9.213	46.000	.200		
	Huynh-Feldt	9.213	46.000	.200		
	Lower-bound	9.213	46.000	.200		

Table 330 ASD – Mouth - Fixation count - Within-subjects contrasts

Source	face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
face_type	Level 1 vs. Level 2	.231	1	.231	.578	.451
face_type * I_OR_U	Level 1 vs. Level 2	.009	1	.009	.023	.880
Error(face_type)	Level 1 vs. Level 2	18.426	46	.401		

Table 331 ASD – Mouth - Fixation count - Between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	39.120	1	39.120	69.262	.000
I_OR_U	.231	1	.231	.410	.525
Error	25.981	46	.565		

Table 332 ASD – Mouth - Fixation percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_M	48	.0000	.3741	.100242	.0839404
TD_M	48	.0000	.3515	.104997	.0896461
Valid N (listwise)	48				

Table 333 ASD – Mouth - Fixation percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 334 ASD – Mouth - Fixation percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.001	1	.001	.148	.702
	Greenhouse-Geisser	.001	1.000	.001	.148	.702
	Huynh-Feldt	.001	1.000	.001	.148	.702
	Lower-bound	.001	1.000	.001	.148	.702
Face_type * I_OR_U	Sphericity Assumed	.002	1	.002	.509	.479
	Greenhouse-Geisser	.002	1.000	.002	.509	.479
	Huynh-Feldt	.002	1.000	.002	.509	.479
	Lower-bound	.002	1.000	.002	.509	.479
Error(Face_type)	Sphericity Assumed	.169	46	.004		
	Greenhouse-Geisser	.169	46.000	.004		
	Huynh-Feldt	.169	46.000	.004		
	Lower-bound	.169	46.000	.004		

Table 335 ASD – Mouth - Fixation percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.001	1	.001	.148	.702
Face_type * I_OR_U	Level 1 vs. Level 2	.004	1	.004	.509	.479
Error(Face_type)	Level 1 vs. Level 2	.337	46	.007		

Table 336 ASD – Mouth - Fixation percent - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	.505	1	.505	86.478	.000
I_OR_U	.000	1	.000	.048	.828
Error	.269	46	.006		

Table 337 ASD – Mouth - Dwell time - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_M	48	.0000	1021.0000	290.805556	257.9520255

TD_M	48	.0000	1021.3333	305.631944	270.2314413
Valid N (listwise)	48				

Table 338 ASD – Mouth - Dwell time - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 339 ASD – Mouth - Dwell time - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	5275.723	1	5275.723	.123	.728
	Greenhouse-Geisser	5275.723	1.000	5275.723	.123	.728
	Huynh-Feldt	5275.723	1.000	5275.723	.123	.728
	Lower-bound	5275.723	1.000	5275.723	.123	.728
Face_type * I_OR_U	Sphericity Assumed	3812.760	1	3812.760	.089	.767
	Greenhouse-Geisser	3812.760	1.000	3812.760	.089	.767
	Huynh-Feldt	3812.760	1.000	3812.760	.089	.767
	Lower-bound	3812.760	1.000	3812.760	.089	.767
Error(Face_type)	Sphericity Assumed	1974988.238	46	42934.527		
	Greenhouse-Geisser	1974988.238	46.000	42934.527		
	Huynh-Feldt	1974988.238	46.000	42934.527		
	Lower-bound	1974988.238	46.000	42934.527		

Table 340 ASD – Mouth - Dwell time - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	10551.447	1	10551.447	.123	.728
Face_type * I_OR_U	Level 1 vs. Level 2	7625.521	1	7625.521	.089	.767
Error(Face_type)	Level 1 vs. Level 2	3949976.476	46	85869.054		

Table 341 ASD – Mouth - Dwell time - Between-subjects effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4268852.297	1	4268852.297	85.740	.000
I_OR_U	100.630	1	100.630	.002	.964
Error	2290259.434	46	49788.249		

Table 342 ASD – Mouth - Dwell percent - Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ASD_M	48	.0000	.3703	.108383	.0957669
TD_M	48	.0000	.3642	.113132	.0980631
Valid N (listwise)	48				

Table 343 ASD – Mouth - Dwell percent - Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Face_type	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + I_OR_U
Within Subjects Design: Face_type

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 344 ASD – Mouth - Dwell percent - Within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Sphericity Assumed	.001	1	.001	.100	.753
	Greenhouse-Geisser	.001	1.000	.001	.100	.753
	Huynh-Feldt	.001	1.000	.001	.100	.753
	Lower-bound	.001	1.000	.001	.100	.753
Face_type * I_OR_U	Sphericity Assumed	.000	1	.000	.077	.782
	Greenhouse-Geisser	.000	1.000	.000	.077	.782
	Huynh-Feldt	.000	1.000	.000	.077	.782
	Lower-bound	.000	1.000	.000	.077	.782
Error(Face_type)	Sphericity Assumed	.249	46	.005		
	Greenhouse-Geisser	.249	46.000	.005		
	Huynh-Feldt	.249	46.000	.005		
	Lower-bound	.249	46.000	.005		

Table 345 ASD – Mouth - Dwell percent - Within-subjects contrasts

Source	Face_type	Type III Sum of Squares	df	Mean Square	F	Sig.
Face_type	Level 1 vs. Level 2	.001	1	.001	.100	.753
Face_type * I_OR_U	Level 1 vs. Level 2	.001	1	.001	.077	.782
Error(Face_type)	Level 1 vs. Level 2	.499	46	.011		

Table 346 ASD – Mouth - Dwell percent - Between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	.589	1	.589	85.547	.000
I_OR_U	4.033E-5	1	4.033E-5	.006	.939
Error	.317	46	.007		