Examining the effects of message framing and social norms on judgments of earthquake
legislation

by

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Abstract

To increase earthquake preparation, it is beneficial to understand the effects of different types of information used in risk communications. This thesis adapts methods that have been used with other hazards or in hypothetical situations and applies them to increasing support for current earthquake-strengthening legislation in Wellington, New Zealand (NZ). Study 1 examined valence and numerical format framing. Expressing the number of buildings affected by the legislation as a negatively-valenced frequency was found to be most effective at increasing earthquake-related judgments¹. Study 2 examined descriptive and injunctive norms and found that a range of subject factors such as age and previous knowledge of the legislation influenced the effects of norms. Study 3 used the same manipulation and included a sample from Palmerston North, where earthquake risk perceptions are lower. This study showed several clear norm effects, with the combination of both descriptive and injunctive norms the most effective at increasing support for the earthquake legislation. All three studies showed that belief in the effectiveness of strengthening earthquake-prone buildings predicted support for the legislation and lower earthquake-risk tolerance, suggesting that this could be a key perception to target in communications. Overall, these studies suggest that certain messages are more effective at increasing support for the governmental legislation, but also that framing and social norm effects on real-world issues interact with other variables such as age and knowledge which ought to be examined further to increase the usefulness of psychological research to risk communication.

¹ The results of this study have been accepted for publication as a peer-reviewed journal article: Vinnell, L. J., McClure, J., & Milfont, T. L. (in press). Do framing messages increase support for earthquake legislation? *Disaster Prevention and Management*, 26(1).

Chapter 1: General Introduction

Psychological science has advanced our understanding of perceptions and responses to life-threatening hazards (for a review, see Joffe, Rossetto, & Adams, 2013). Social psychological research, in particular, has contributed to increasing preparation for hazards such as earthquakes (e.g., Solberg, Rossetto, & Joffe, 2010; Paton & McClure, 2013). Increasing preparation for hazards requires understanding how to encourage people to see the risk as one for which they not only *can* prepare, but *should* prepare. One of the tools that can be used to this end is effective risk communication. Communications about risks may be more or less successful depending on different aspects of the message. Also, given the differences between types of risk, it is valuable to test communication strategies in specific risk contexts. Indeed, in their review on disaster preparedness, Paton and Johnston (2001) argue that risk communications should be researched within the context of the specific risk they target. This includes clarifying how the message is processed and used, taking into account social-psychological factors. Research has examined communications about various risks in domains such as health (e.g., vaccination; Ferguson & Gallagher, 2007), anthropogenic (e.g., traffic accidents; Lucidi et al., 2006), and natural hazards (e.g., flooding: de Boer, Botzen, & Terpstra, 2014; climate change: e.g., Evans, Milfont, & Lawrence, 2014; Bertolotti & Catellani, 2014). However, there is less research on risk communications applied to earthquakes. What research does exist suggests that the area is not yet sufficiently understood (Solberg et al., 2010).

The aim of this thesis is to demonstrate how risk communications affect citizens' support for earthquake-strengthening legislation, to test the effectiveness of types of information using two social-psychological concepts. The two concepts used in the experiments for this thesis, framing manipulations and social norms, will be introduced at the beginning of the individual studies. This general introduction will instead outline some of the background and important considerations of examining risk perceptions and communications in the earthquake domain, such as beliefs about responsibility for preparation and other factors which influence preparation behaviour. Following this, the specific context for the current research will be introduced.

Disaster Risk Communication.

There is not a straightforward link between information and actions, with the type and format of messages affecting the success of the communication (Paton & Johnston,

2001). For example, Ballantyne, Paton, Johnston, Kozuch, and Daly (2000) found a counter-intuitive negative relationship between a risk message and the response where a warning about volcano risk *decreased* concern about that volcano risk in nearly a third of the sample. The lack of a straightforward link between information and action can be explained in part by a range of beliefs about preparation as well as various individual differences. This means that any research looking at the effect of providing risk information on perceptions of that risk ought not to consider these effects in isolation. While the brief review which follows is by no means exhaustive, it presents and discusses some of the potential factors considered in this thesis.

Type of preparation. Even when earthquakes are perceived as a risk, this perception only weakly relates to preparation behaviour, and in several countries, including New Zealand (NZ), most earthquake preparation which does occur focuses on actions to help recovery rather than preventive actions to mitigate damage (Solberg et al., 2010). To increase the chances of surviving an earthquake, two types of actions may be taken: those to help survive and recover after the event such as storing water (recovery actions), and those to limit damage during the event such as securing fixtures and strengthening buildings (mitigation actions). Notably, the motivation for these actions can differ; research has shown that a tendency for risk-taking predicted making preparations to survive after an earthquake, but that locus of control (whether outcomes can be controlled by the individual or are external to them) predicted preventive actions to reduce damage during the event (Spittal, McClure, Siegert, & Walkey, 2008). While it is important to encourage steps to help recovery, such as creating an emergency kit, research into increasing mitigation actions should provide substantial benefits for earthquake survival. Therefore, it is important to conduct research focused on increasing mitigation as these behaviours are less common yet provide substantial benefits for both survival and recovery.

Other research in the US provides support for targeting perceptions of mitigation preparation. Although most people tend to see earthquake preparation as the responsibility of the individual (Arlkatti, Lindell, & Prater, 2007), research has also shown that people believe that their city could prepare in ways such as strengthening vulnerable buildings (Flynn, Slovic, Mertz, & Carlisle, 1999). Given that it is not an earthquake itself which is deadly but the collapse of poorly constructed buildings, seismic retrofitting can reduce financial and personal risk. Increasing mitigation behaviour not only reduces injuries and fatalities but improves post-event recovery and encourages

community resilience. Strong buildings and infrastructure which can survive earthquakes with some level of functionality allow for easier rescue and recovery, and for business to resume quickly. Despite research showing that the potential impact of a hazard on livelihoods affects risk perception and willingness to undertake mitigation actions (Bishop, Paton, Syme, & Nancarrow, 2000), this type of preparation is relatively under-explored in the earthquake context.

This thesis explores different ways of designing risk communications so as to increase support for mitigation actions, and in particular support for strengthening buildings. As well as adding to knowledge about mitigation behaviours, this thesis also examines how people perceive the importance of this preparation in comparison to other risks.

Comparative risk. One reason for a low level of motivation to prepare for earthquakes is the prioritization of other risks (Solberg et al., 2010). Earthquakes are somewhat unusual in that they have a low probability compared to risks such as traffic accidents, but they have comparatively extensive outcomes. For example, individuals may perceive the risk of a car accident, where the negative extent of the outcome is limited but the probability of the risk occurring is relatively high, differently than they would the risk of an earthquake, where the probability is low but the outcome can be huge in terms of damage and loss. This difference in perception supports the application of theories to specific risks, even if those theories have been used in other contexts. Due to this potential variability in how people perceive risks, this thesis also examines earthquake risk perceptions in comparison to other risks (namely traffic accidents; see Study 1), to see whether tolerance of that risk differs depending on the particular hazard.

Influencing factors. As well as the influence of comparisons to other hazards, perceptions of risk and preparation behaviours are affected by individual factors such as earthquake experience, sense of community, age, and action-outcome expectancies (Paton & Johnston, 2001; Solberg et al., 2010). However, findings about the influence of these factors are inconsistent. For example, age has been shown to relate to both higher (e.g., Armas, 2006) and lower earthquake risk perceptions (e.g., Spittal, McClure, Siegert, & Walkey, 2005). Solberg et al. (2010) suggest that more research is needed to further our understanding of what affects risk perceptions and behaviours in regards to this issue. To properly examine the effects of risk communications, it is necessary to understand the context of the information presented and the relevance of the risk to the audience. While risk communications can be relatively cost-effective, variability of individual differences

within audiences reduces their impact and delivering researched, targeted information is often not feasible (Paton & Johnston, 2001). Therefore, policies and interventions should try to make risk communication effective for the largest proportion of a community as possible. Although this means not everyone will benefit, the alternative of highly targeted approaches is impractical. The present thesis explores a range of earthquake-related perceptions while taking into account several individual factors shown to influence risk judgments such as earthquake experience, community identification, and age. These individual factors are examined in relation to people's judgments of a specific piece of governmental legislation regarding earthquake preparation.

Research context.

New Zealand earthquake history. Since 1840, four large, damaging earthquakes have struck Wellington, NZ. The city is located dangerously on three major fault lines with a potentially fatal earthquake expected every 120 years (Smith, 2015). Despite the common knowledge of Wellington's risk of seismic activity (Khan, Crozier, & Kennedy, 2012), it was a devastating earthquake in what was thought to be a comparatively safer city in NZ that caused an upsurge in the conversation about preparation. On September 4th, 2010, a 7.1 magnitude earthquake struck the region of Canterbury. Fortunately, this occurred in the early hours of the morning, so no lives were lost but the damage to property was extensive. Six months later, however, a magnitude 6.3 aftershock struck closer to the main city of Christchurch in the middle of the day. As well as adding to the physical damage to the region from the previous earthquake, 185 people were killed. Over half of the total deaths were caused by the collapse of a single building, later shown to be structurally flawed. Further, buildings known to be earthquake-prone but that had not been strengthened accounted for 42 of the deaths, the majority of which occurred because of external fixtures such as balconies collapsing on people on the street outside (Brower, 2013).

The earthquake in Canterbury was devastating and has had a lasting toll on the city and its residents. At the time, however, the risk posed to Christchurch was seen as comparatively lower than that posed to Wellington. Indeed, a fatal earthquake is expected in Wellington six times more frequently than in Christchurch, and 80% of future earthquake deaths are predicted to occur in the capital city (Smith, 2015). Despite this perceived high risk, had an event the same magnitude as that in Christchurch struck Wellington, the death toll could have been up to 1,500, nearly ten times higher ("Earthquake-prone buildings in Wellington", 2011).

Earthquake-strengthening legislation. New building standards for earthquake resilience have been in place since 1935 after a 7.8 magnitude quake killed at least 256 people in Napier, NZ in 1931. These standards have been significantly revised in 1965, 1976, and in 2004 with the introduction of The Building Act requiring local councils to create earthquake-strengthening policies. The Wellington City Council (WCC) instigated their Earthquake-Prone Buildings Policy in 2006, revised once in 2009. Following the destruction in Christchurch, the NZ government began work on a nationwide legislation in an effort to reduce similar destruction in the future. This legislation defines an earthquake-prone building as one which:

“...will have its ultimate capacity exceeded in a moderate earthquake” and which “if the building were to collapse in a moderate earthquake, the collapse would be likely to cause-

- (i) Injury or death to persons in the building or to persons on any other property; or
- (ii) Damage to other property.” (Building (Earthquake-prone Buildings) Amendment Bill 2013, section 133AB)

A “moderate” earthquake is defined as “of the same duration as, but that is one-third as strong as, the earthquake shaking...that would be used to design a new building at that site” (Building Amendment Bill 2013, section 43). Given that “buildings with less than one-third of the strength of a new building have about 10 to 20 times the risk of serious damage or collapse when compared to a new building” (mbie.govt.nz, as cited in Wellington City Council, n.d.), carrying out this strengthening work is an important step for reducing loss in future seismic events.

The legislation initially allowed 10 years for owners to reach this standard or demolish their buildings; however, following a royal commission into the Canterbury earthquakes which suggested that 10 years was too short, the time frame was extended to 15 years (“Measuring the cost of time”, 2013). The legislation has only recently been finalized, so this research has potentially direct relevance for creating communications aimed at increasing support for work which could incur a significant cost on the taxpayers. There have been several revisions since the first proposal, including sectioning the country into low, moderate, and high risk zones (Smith, 2015). High-risk zones saw no change to the 15-year limit, but the lower risk areas were allowed more time for the strengthening work.

As well as prioritizing some regions based on geological risk, schools, hospitals and emergency buildings saw their timeframe for strengthening halved (Smith, 2015). With these buildings excluded, a total of 5,380 public buildings in Wellington are affected by the strengthening requirements described in the legislation (H. Moselen, personal communication, 18th September, 2015). All but 80 of these buildings had been assessed at the time we received our information, and of the 5,300 which had been assessed, 703 were found to be below 34% of the new building standard and therefore deemed earthquake-prone (Wellington City Council, 2015). The legislation itself was under review by a select committee following the first reading when Studies 1 and 2 of this thesis were conducted. Amendments to the bill were made on the basis of both public submissions and the suggestions of the royal inquiry into the Canterbury earthquakes. The bill had its third and final reading on the 10th of May, 2016, and received royal assent to become an Act of Parliament on the 13th of May, 2016.

The current research

Given the outcome that the collapse of even one building can have, as seen in Christchurch and multiple earthquakes around the world, strengthening buildings could greatly reduce losses in a future seismic event. By specifically focussing on perceptions of earthquake-strengthening legislation, this thesis aimed to investigate whether different methods of risk communication increase support for strengthening and make the task seem more effective and worthwhile. Knowing how to garner the support of the public will prove useful if the council increases financial assistance which could be spent elsewhere. As well as direct benefits for the communication of this particular legislation, the findings of this research will likely be transferrable to other preparation actions both in and beyond the earthquake risk domain.

The thesis reports three experimental studies. Study 1 used the information regarding the number of earthquake-prone buildings in Wellington to test framing effects on a range of judgments relating to the strengthening legislation. It did this by manipulating whether the phrasing was positively or negatively valenced, and whether the number of buildings was expressed as a percentage or a frequency. Study 2 used the most effective passage from Study 1 as a stem and added different types of social norm information to examine whether particular normative message would influence support for the strengthening work. Study 3 replicated Study 2 with a larger, online sample and compared results from a Wellington sample to a second, more neutral sample composed of Palmerston North residents.

Chapter 2: Study 1

Introduction

Research has shown that perceptions of risk can be influenced by wording identical information in different ways, termed ‘framing effects’ in the psychological literature (Levin, Gaeth, Schreiber, & Lauriola, 2002). Research on two types of framing effects, valence and numerical format, is reviewed in relation to health risks and natural hazards. The potential effects of individual differences on these framing effects are also discussed. Given the many potential applications for framing effects, understanding how and when they occur can help to increase the effectiveness of risk communications.

Valence framing effects.

Valence framing effects refer to influences on perceptions and judgments by presenting information that is otherwise identical in either a positive way or a negative way (Levin et al., 2002). For example, Levin and colleagues demonstrated that describing beef as 80% lean, and so describing a positive aspect, increased judgments of taste and quality compared to when they described the beef as 20% fat, describing the same aspect negatively. These results demonstrate attribute framing, where a key attribute of an object, event, or risk is presented either positively or negatively. Other types of framing effects include goal framing, where the message presents either a positive result of a behaviour or a negative result of failure to perform that behaviour, and risky choice framing, where negative and positive outcomes affect whether people choose a sure or a risky option (e.g., Tversky & Kahneman, 1981). These effects are often used in communications about risk, primarily in the health and disaster domains, to encourage positive or discourage negative behaviours.

Health domain. Framing effects are often used in the health domain in attempts to reduce harmful behaviour. Yang (2013) found that communications promoting smoking cessation were more effective if the information presented to smokers explained the benefits to quitting than if it explained negative outcomes of smoking, but found no difference among non-smokers. Block and Keller (1995) found the opposite, that negative frames were more effective at increasing intentions to follow recommended behaviours to reduce the chance of developing skin cancer. However, this difference only emerged in ‘low efficacy’ conditions, where participants were uncertain whether following the suggested behaviour would significantly help prevent cancer.

Applying framing effects to a positive, preventative health behaviour, Gesser-Edelsburg, Walter, Shir-Raz, and Green (2015) found that negative framing led to greater support of mandatory HPV immunization. Mitchell, Bakewell, Jackson, and Heslin (2015) demonstrated a similar effect of valence framing in the context of consumer behaviour in a food crisis. They presented the number of people who had developed health issues such as cancer due to eating potato and cereals either positively, using ‘only’ or ‘as few as’, or negatively, using ‘already’ or ‘as many as’. Positively worded messages led to lower perceived risk, while negatively worded messages led to higher perceived risk.

Natural hazard domain. Research on valence framing effects in the health domain is somewhat conflicted given the wide range of behaviours and risks examined. Valence framing effects produce more consistent results in the context of natural hazards, such as flooding and earthquakes. As with health risks, actions and outcomes can be presented negatively (describing what should not be done and the consequences of not preparing) as well as positively (describing what can be done to prepare and the benefits of doing so). Terpstra, Zaalberg, de Boer, and Botzen (2014), researchers in the flood risk domain, argue that communication messages are more successful if they induce negative attitudes towards a hazard as this strengthens risk perceptions. Among an at-risk community living on a river delta in the Netherlands, people who were prevention-focused were more affected by risk communication because they were more worried about the risk of flooding (De Boer et al., 2014). Further, prevention motivation was higher in frames where only the risk of floods, not reassurance about measures to deal with them, were provided. This suggests that negative frames are more effective in increasing support for actions to prevent damage from natural disaster, possibly because they increase concern about the risk and therefore motivate desire to prevent those negative outcomes.

A nascent area of natural risk research is that of climate change. Bertolotti and Catellani (2014) demonstrated increased support for climate change policies when the outcomes of those policies were expressed positively as benefits, rather than as the avoidance of negative outcomes. However, a second study showed that this effect was influenced by the participants’ concern for prevention. Positive frames were more effective for promotion-focused individuals, but as with the study of de Boer et al. (2014), negative frames were more effective in increasing policy support among those who were prevention-focused. Because the earthquake strengthening legislation is focused on

preventing damage and injury in an earthquake, the finding implies that negative frames should be more effective in increasing support than the positive frames.

Earthquake risk domain. McClure, White, and Sibley (2009) varied the valence of both earthquake preparation actions and the outcomes of those actions. Negatively framed outcomes increased intentions to carry out general preparation actions and judgments of the importance of preparing. This difference was larger when the action frame was positive, so that people intended to make more general preparations when the action was framed positively but the outcome was framed negatively. However, a negative action frame paired with a negative outcome frame led to the highest support for specific preparation actions. In this research, the authors showed that the valence framing effect can depend on whether it is the outcome or action being manipulated and therefore the importance of distinguishing different types of framing.

McClure et al. (2009) manipulated goal framing, which alters the valence of the outcome depending on whether a behaviour is or is not performed. Another type of framing involves variation in the attributes of the information, such as the study of Levin et al. (2002) mentioned above which described beef either in terms of how lean it is, or how much fat it contains. Levin and colleagues argue that goal framing effects tend to be strongest with negative outcomes because people are more motivated to avoid a loss than to make a gain. In terms of risks, attribute framing also demonstrates stronger effects when the information is negative because of what Levin et al. term a ‘valence consistent shift’, where a negative attribute leads to a negative perception of the object or risk, and vice versa for positive. These suggestions are supported by the findings of McClure and Sibley (2011) who manipulated attribute framing. Negative framing increased intention to prepare for earthquakes, showing consistency with the goal framing effects found by McClure et al. (2009).

Numerical format effects.

As shown with valence framing effects, a proportion of a total can be presented in semantically different but logically identical ways (Tversky & Kahneman, 1981). The numerical format of information can also be varied. Effects of this type of framing have been demonstrated with decisions in financial and consumer contexts, such as understanding nutritional information on food packaging (Tangari, Burton, & Davis, 2014), donation decisions (Dickert, Kleber, Peters, & Slovic, 2011), and lottery gambling (Oudhoff & Timmermans, 2015). There is less research applying numerical format framing to natural risk contexts. Most studies manipulate how the probability of the risk

occurring is expressed (see Visschers, Meertens, Passchier, & de Vries, 2009, for a review).

Research using a similar manipulation to the current study generally demonstrates that a frequency format increases risk perceptions more than a percentage format. Peters, Hark, and Fraenkel (2011) presented the chance of developing a negative side effect of a medication either as a frequency or as a percentage. Even though both pieces of information were logically the same, the frequency format produced higher judgments of that medicine's risk compared to the percentage format. A similar effect was found on recidivism risk perceptions, where presenting the chance of psychiatric patients re-offending upon release as a frequency led to higher risk judgments than a percentage (Slovic, Monahan, & MacGregor, 2000). The same pattern of percentages producing lower risk perceptions has been demonstrated in the context of coronary heart disease (Fair, Murray, Thomas, & Cobain, 2008).

Despite these findings, numerical format effects are not often used in the context of natural hazards. The present study sought to address this, by applying a similar design comparing frequencies and percentages to the risk of harm and damage from earthquakes.

Interaction of framing effects.

A further issue is whether valence framing effects interact with numerical format effects. Based on the findings that numbers lead to higher risk judgments, it could be predicted that the main effect of valence framing will be smaller in the frequency conditions than in the percentage conditions. However, Mitchell et al. (2015) suggested that it is easier to mentally calculate the inverse of a percentage than it is of a frequency, which means that participants presented with the percentage of earthquake-prone buildings will be more likely to also consider the percentage of resilient buildings, and vice versa. Because framing effects occur when a person has to make a decision without all of the information, (De Martino, Kumaran, Seymour, & Dolan, 2006), this would result in a smaller difference between the positive and negative frame in the percentage conditions because participants are more likely to make their judgments using both pieces of information regardless of with which one they were presented.

A third possible interaction arises from research on gambling, based on Tversky and Kahneman's Asian disease problem, such as the experiment of De Martino and colleagues (2006). When the outcome of a gamble is framed as a gain, the sure option is preferred over the gamble option, showing risk aversion. When the outcome is a loss, the gamble is preferred, showing risk-seeking. This difference in preference is suggested to

be partly caused by a difference in concreteness. Like a percentage, a gamble is seen as less concrete than a certain number, and so is preferred in negative frames but not in positive frames. Following this idea, positive framing would increase support for the legislation in the number condition compared to the percentage condition, whereas negative framing would increase support in the percentage condition compared to the number condition.

Predictions.

Based on the findings of previous research, participants in negative frame conditions will have lower risk tolerance than participants in positive frame conditions, demonstrated by higher support for the earthquake-strengthening legislation, judgments of the expense as more appropriate, and the time frame and standard as less sufficient. Further, it was expected that participants who are presented with the frequency of buildings would show more support for the legislation than those presented with the percentage, because a frequency should result in enhanced judgments of the risk posed by earthquakes.

The first and second possible predictions for interactions contradict each other, and so the suggested effects might counterbalance. Therefore the interaction is predicted to arise from the often-replicated differences in preference between risk-aversion and risk-taking. Risk tolerance will be lower when participants are presented with a frequency compared to a percentage in the positive framing conditions, but lower for the percentage compared to frequency condition in the negative framing conditions.

Other factors.

As well as considering the effects of manipulations such as framing on risk perception, it is also important to consider the effects of individual differences, which could influence how risks ought to be communicated to different groups.

McClure, Willis, Johnston, and Recker (2011) demonstrated a positive relationship between earthquake preparation and perception of risk, using a NZ sample. This finding suggests that those who personally prepare do so because they perceive the risks of earthquakes as higher, and will therefore likely support legislation intended to mitigate damage from earthquakes. A relationship between personal preparation to prevent damage and support for larger-scale further prevention actions has been shown in the context of flood risk in the Netherlands (de Boer et al., 2014). The current study seeks to investigate whether experience and preparation predict support for government legislation.

Another example of the importance of considering individual differences is the ‘White male’ effect (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000b), which proposes that dominant social groups (European men in most Western countries) perceive themselves and their community to be less at risk from natural threats. High social dominance orientation has been associated with less concern for the environment (Milfont, Richter, Sibley, Wilson, & Fischer, 2013) and higher support for a potential mining project, when the project would benefit the wealthy and therefore enforce social inequality (Milfont & Sibley, 2014).

In relation to natural hazards, socially dominant groups believe more strongly that society is capable of managing threats such as earthquakes because they want to deny risks to the status quo that benefits them (Feygina, Jost, & Goldsmith., 2010). Finucane et al. (2000b) presented a US sample with a list of hazards (e.g., crime, natural disasters, motor vehicles) and found that women gave higher risk judgments for all items than did men. Spittal et al. (2005) demonstrated this effect in the context of earthquakes, where females felt more at risk of negative effects than did males. Spittal and colleagues also found that age was negatively correlated with earthquake risk perception, suggesting that this was due to older people having made it through more earthquakes unharmed than younger people.

Connected to this effect of surviving earthquakes unharmed, Solberg et al. (2010) presented a review of earthquake research which demonstrates that experience of earthquakes has a potentially curvilinear relationship with risk perceptions. Those with little to no experience are less likely to be concerned about earthquakes than those with some experience, who in turn are likely to be more concerned as well than those with a lot of experience, especially if the earthquakes experienced did not cause significant negative effects.

Some research shows that those who live in structures which they perceive to be vulnerable to earthquakes also perceive their risk of harm as higher than those who felt that their homes were safe (Armas & Avram, 2008). This relationship is lacking support due to the limited number of significant findings and other research which found a non-significant relationship between building vulnerability and perceived risk. Solberg et al. (2010) suggested that further research into the relationship between material risk and perceived personal risk is required. Findings consistent with those of Armas and Avram (2008) would demonstrate more support for earthquake-strengthening legislation from

those who live or work in earthquake-prone buildings, as their material risk should heighten their perceived risk.

These demographic factors presented above were tested as predictors for support of the legislation as well as concern about earthquakes, and were examined as potential interaction variables influencing the effects of framing on earthquake judgments. These interactions were exploratory in nature and so no predictions were made.

Method

Design

Study 1 used a 2 (valence frame; positive or negative) x 2 (numerical format; percentage or frequency) between-groups design in which participants were presented with a questionnaire containing one of four experimental conditions. The questionnaire also obtained demographic information to allow for interaction analyses and regressions.

Participants

A priori calculations using the statistical programme G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) with a predicted moderate effect size ($F = 0.25$, $p = .05$) gave a required sample size for this study of 280 participants. Questionnaires were administered until this number of usable questionnaires was reached, with unusable data excluded as it was collected. In total, 350 participants were recruited from public spaces in Wellington, NZ. However, 70 questionnaires were excluded from the analysis because participants answered one or both of the manipulation check questions incorrectly, indicating that they had not remembered or had incorrectly interpreted the key information from the passage. An additional eight participants who were under the minimum age of 18 were also excluded. All participants were asked prior to commencing the questionnaire whether they lived in Wellington. Those who did not ($n =$ approximately 30) were thanked and informed that the study was only for Wellington residents.

Of the total 272 valid participants, 148 were females and the remaining 124 participants were male. Ages ranged from 18 to 80, with a mean age of 36.33 ($SD = 14.17$). Length of time lived in Wellington ranged from one week to 75 years, with an average of 16.49 years ($SD = 16.11$). The majority of participants reported that they did not work or live in an earthquake-prone building (68.4% and 60.7% respectively). Forty-three participants reported that they work in a prone building, 33 that they live in one, and the remainder were unsure.

Materials

Within all conditions, the questionnaire presented basic information about the earthquake-strengthening legislation such as the percentage of the current building standard required and the number of buildings affected under the legislation, using information provided by the WCC (H. Moselen, personal communication, September 18, 2015). This information which all participants received was:

“The government is currently working on legislation which would require the strengthening of earthquake-prone commercial, multilevel apartment, and public buildings. In high-risk zones such as Wellington, this legislation would allow 15 years for the owner to get the building up to at least a third of the current building code. They can do this either by strengthening or demolishing the building. Of the 5,300 buildings in Wellington assessed under this legislation, approximately [one of four framing messages as below]”

For the experimental manipulation, the scenario continued to present the proportion of those assessed buildings which required strengthening work in four different ways, varying the format of the number (percentage or frequency) and the valence (prone/negative or resilient/positive):

Percentage prone/negative: *“13% have been deemed earthquake prone (i.e. they do not meet the required standard)”*;

Percentage resilient/positive: *“87% have been deemed acceptably resilient (i.e. they do meet the required standard)”*;

Frequency prone/negative: *“700 have been deemed earthquake prone (i.e. they do not meet the required standard)”*;

Frequency resilient/positive: *“4,600 have been deemed acceptably resilient (i.e. they do meet the required standard).”*

Participants received these framing passages on the reverse side of the questionnaire so that they had to recall the information from memory when responding. The questionnaire commenced with two manipulation check questions, the first about the number or percentage of buildings affected by the legislation mentioned in the passage, and the second about whether those buildings were above or below the required benchmark of 34% of the current standard for new buildings.

The manipulation checks were followed by ten questions regarding support for the legislation and general earthquake judgments, each with a seven-point Likert-type scale. Table 2.1 presents these questions, as well as the anchor labels, and the variable type.

Table 2.1.

Questions in the Study 1 survey.

Number	Question	'1' Anchor	'4' Anchor	'7' Anchor	Variable
3	Before reading the above information, how much did you already know about the legislation?	Nothing	Some	A lot	Subject
4	Overall, how much do you support this legislation?	Not at all	Partly	Completely	Dependent
5	How possible do you think it is to strengthen all earthquake-prone building in Wellington?	Impossible	Unsure	Very possible	Dependent
6	How appropriate do you think the 15 year timeframe is?	Not long enough	About right	Too long	Dependent
7	How appropriate do you think the standard set out in the legislation (34% of current building code) is compared to legislation on other risks (e.g. Vehicle Warrant of Fitness)?	Not firm enough	About right	Too firm	Dependent
8	Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?	Fully justified	About right	Excessive	Dependent
9	How concerned are you about the issue of earthquake-prone buildings in Wellington?	Not at all	Moderately	Extremely	Dependent
10	How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?	Not at all	Some	A lot	Subject
11	How much experience do you have of earthquakes?	None	Some	A lot	Subject
12	How much preparation have you made for the event of a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?	None	Some	A lot	Subject

Note. Questions 1 and 2 were manipulation checks and are not included here

A series of demographic questions followed which asked the participants' age, gender, how long they have lived in Wellington, and whether they live or work in an earthquake-prone building. For the full questionnaire, see Appendix B.

Procedure

The researcher used an intercept survey method, approaching potential participants in public spaces around the Wellington central business district (CBD) during lunch times and at weekend markets in December, 2015 and January, 2016. Participants were first asked if they lived in Wellington, and those who did were then asked if they would like to complete a short survey about earthquakes in return for a chocolate bar. Consent was indicated by agreement to participate. Information sheets were available if the participant wished to know more before consenting (see Appendix A).

Participants received a single sheet of paper with one of the four framing passages printed on one side and the questionnaire on the other. The surveys were in a randomized order, but printed in quantities so as to produce roughly equal numbers of participants in each condition. The experimenter gave verbal instructions to carefully read the passage and the answer the questions on the other side of the page. Written prompts on the questionnaire asked participants to respond by circling a number. Once the participants completed and returned the questionnaire, they received their chocolate bar and the experimenter debriefed them about the purpose of the study. Participants then had the opportunity to ask any questions, make any comments, and leave their email address with the researcher in order to hear back about the results of the research. A debrief sheet was available if they wished to know more about the purpose of the research (see Appendix C)

This study was granted ethical approval by the School of Psychology Human Ethics Committee under delegated authority of Victoria University of Wellington's Human Ethics Committee (approved: 10th November, 2015; Reference number: 0000020938).

Results

Descriptive statistics.

The frequency-negative condition included 67 participants, the frequency-positive condition included 69, and the percentage-negative and percentage-positive conditions both included 68 participants. The conditions did not differ on any demographic or subject variable such as mean age, gender distribution, earthquake experience, preparation, or knowledge, or number who live or work in earthquake-prone buildings.

Participants reported fairly low knowledge about the earthquake-prone buildings legislation ($M = 2.92$, $SD = 1.67$; difference from the midpoint, $t(271) = 10.70$, $p < .01$, $d = 1.30$). Participants' reports of preparation behaviour ranged from 'None' (1) to 'A lot' (7), with the mean significantly below the midpoint of 4 ($M = 3.73$, $SD = 1.75$; $t(271) = 2.57$, $p = .01$, $d = .31$). Reported experience of earthquakes also fell between both extremes of the scale, however the mean was significantly higher than the midpoint ($M = 4.31$, $SD = 1.67$; $t(269) = 3.02$, $p < .01$, $d = .37$).

Table 2.2.

Mean scores for risk tolerance variables with standard deviations below in parentheses.

Variable	Frequency Negative	Frequency Positive	Percentage Negative	Percentage Positive
Support	5.63 (1.11)	5.55 (1.29)	5.35 (1.41)	5.35 (1.41)
Feasibility	4.34 (1.72)	4.74 (1.51)	4.10 (1.58)	4.18 (1.56)
Time Frame	3.55 (1.22)	3.63 (1.28)	3.88 (1.28)	3.85 (1.41)
Comparative Risk	3.26 (1.04)	3.18 (1.08)	3.40 (1.02)	3.60 (1.09)
Concern	4.88 (1.52)	4.94 (1.28)	4.46 (1.35)	4.46 (1.56)

Table 2.2 presents the means for each of the five questions assessing risk tolerance and judgments. The variables measuring opinions about the appropriateness of the building standard ('Standard') and of the expense of the work ('Expense') were combined to create the variable 'Comparative risk', as both questions explicitly required participants to indicate their risk tolerance for earthquakes compared to other risks. Scores on the 'Time frame' variable were reverse coded so that the direction of the anchors was consistent with the other variables. By observation, there is support for the legislation in general ($M = 5.47$, $SD = 1.31$; difference from the midpoint, $t(269) = 18.45$, $p < .01$, $d = 2.25$), although participants are less sure of the feasibility of the work ($M = 4.34$, $SD = 1.60$; difference from the midpoint $t(270) = 3.32$, $p < .01$, $d = .43$).

Tests of framing effects.

A series of univariate 2 (valence: positive and negative) x 2 (format: percentage and frequency) Analyses of Variance (ANOVAs) examined the effects of the two framing manipulations on each of the target questions. No significant interactions of the main effects of valence frame and numerical format emerged for any of the dependent variables. The prediction that a frequency would lead to lower risk tolerance in positive conditions than a percentage but the inverse in negative conditions, is therefore unsupported. As there was no interaction, the main effects were then interpreted.

Valence framing effects. There was a marginally significant main effect of valence frame for the composite variable ‘Comparative risk’, $F(1, 272) = 2.82, p = .09, \eta_p^2 = .01$, where participants demonstrated slightly higher risk tolerance when the buildings were described as acceptably resilient and meeting the required standard ($M = 3.37, SD = 1.03$) than when the buildings were described as earthquake-prone ($M = 3.15, SD = 1.14$), partially supporting the first hypothesis that negative framing would lead to lower risk tolerance².

However, the valence frame did not show a main effect for the variables ‘Support’, $F(1, 274) = .09, p = .76$, ‘Feasibility’, $F(1, 275) = 1.02, p = .31$, ‘Time frame’, $F(1, 273) = .08, p = .77$, ‘Concern’, $F(1, 276) = .00, p = .97$, or ‘Efficacy’, $F(1, 275) = 1.08, p = .30$. Overall, the valence framing had little effect on risk judgments, so the first hypothesis that negative frames would produce lower risk tolerance is mostly unsupported.

² This main effect became significant, $F(1, 235) = 4.67, p = .03, \eta_p^2 = .02$, when participants who had lived in Wellington for less than a year were excluded from the analyses.

Numerical format effects.

Figure 2.1. Mean ratings of 'Feasibility' and 'Concern' for frequency and percentage formats, averaged over both valence frame conditions. Higher scores indicate higher judgments.

A significant main effect for numerical format was found for 'Feasibility', $F(1, 275) = 5.25, p = .02, \eta_p^2 = .02$. As shown on the left side of Figure 2.1, participants judged the feasibility of the strengthening work significantly higher when the number of buildings was presented as a frequency compared to a percentage, supporting the prediction that presenting participants with the number of buildings would lead to higher judgments of the feasibility of the work than presenting the information as a percentage.

Figure 2.1 also shows a main effect of numerical format for concern, $F(1, 276) = 6.99, p = .01, \eta_p^2 = .03$, where participants also expressed more concern when the number of buildings was presented as a frequency than as a percentage. This supports the prediction that the frequency format would lead to lower risk tolerance than the percentage format.

No main effect of numerical format emerged for 'Support', $F(1, 274) = 2.57, p = .11$, 'Time frame', $F(1, 273) = 2.52, p = .11$, 'Comparative risk', $F(1, 272) = 0.02, p = .89$, or 'Efficacy', $F(1, 275) = 1.46, p = .23$.

Exploratory analyses.

Demographic interactions.

Figure 2.2. Interaction of gender with valence frame on support for the legislation

Valence frame interacted with gender, $F(1, 266) = 4.67, p = .03, \eta_p^2 = .02$, with male participants showing higher support for the legislation ($M = 5.75, SD = 1.30$) than females ($M = 5.25, SD = 1.36$) when the frame was positive, $t(135) = 2.17, p = .03, d = .37$, while there was no significant difference when the frame was negative, $t(131) = .85, p = .40, d = .15$ (see Figure 2.2). This interaction shows that valence framing effects may differ between genders.

To allow for univariate ANOVAs, all continuous subject and demographic variables were split into levels using percentiles. Of these variables, only earthquake experience interacted with either of the types of framing. Given previous research showing that both a low and a high amount of earthquake experience can decrease risk perceptions (Solberg et al., 2010), this variable was split into three levels, with the ‘Low’ group indicating between 1 and 3 on the scale, the ‘Medium’ group responding 4 or 5, and the ‘High’ group responding 6 or 7.

Figure 2.3. Interaction of numerical format frame and earthquake experience on support for the legislation.

Figure 2.3 presents the interaction of earthquake experience with the effect of numerical format on support for the legislation, $F(2, 262) = 3.39, p = .04, \eta_p^2 = .03$. Among those with less earthquake experience, the frequency format led to significantly higher support for the legislation ($M = 5.65, SD = 1.25$) than the percentage format ($M = 4.52, SD = 1.60; t(62) = 3.17, p < .01, d = .81$). However, the framing format had no effect on support among those with a moderate level of earthquake experience, $t(136) = .82, p = .42, d = .07$, or among those with more experience, $t(64) = 1.09, p = .28, d = .27$. This interaction demonstrates that a frequency frame is more effective than a percentage frame, but only among those participants with little to no previous experience of earthquakes.

Regressions.

Table 2.3.

Regression of subject and demographic variables on support for the earthquake-strengthening legislation.

Predictors	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Age	-.01	.01	-.05	.50
Gender	.15	.15	.06	.31
Years in Wellington	.00	.01	-.02	.81
Work	.39	.14	.17	.00**
Live	-.11	.13	-.05	.37
Knowledge	.11	.05	.14	.03*
Efficacy	.40	.05	.44	.00**
Experience	.00	.05	.00	.95
Preparation	.06	.05	.08	.27

Note. * = significant at the level of $p < .05$. ** = significant at the level of $p < .01$.

Table 2.3 presents the simultaneous linear regression of possible predictor variables for support of the earthquake-strengthening legislation. Belief in the efficacy of strengthening buildings to reduce earthquake damage positively predicted support for the legislation ($\beta = .44, p < .01$), as did prior knowledge of the legislation ($\beta = .14, p = .03$). Whether the participant worked in an earthquake-prone building ($\beta = .17, p < .01$) also predicted support. However, contrary to the prediction that objective risk would increase support for strengthening legislation, those who do work in an earthquake-prone building showed lower support ($M = 4.95, SD = 1.45$) compared to those who do not ($M = 5.55, SD = 1.26$), $t(231) = -2.73, p < .05$ and living in an at-risk building had no effect on support in either direction. The prediction that higher material risk, that is living or working in an earthquake-prone building, would lead to more support for the strengthening legislation, was therefore not supported.

Contrary to the hypothesis, age did not predict support for the legislation. Neither did previous earthquake preparation predict support for the legislation, suggesting that

there is no connection between motivations to personally prepare for an earthquake and to support legislation which requires others in society to prepare. Previous earthquake experience also did not predict support for the legislation. Given that many of the earthquakes in Wellington are non-damaging, this finding supports the suggestion of previous research that earthquakes which cause damage are more effective at motivating preparation behaviour.

Judgments of efficacy also predicted comparative risk ($\beta = -.27, p < .01$), where those who saw strengthening as more effective at reducing damage in an earthquake were less tolerant of earthquake risk, compared to those who saw strengthening as less effective. Knowledge was the only other variable to marginally predict comparative risk ($\beta = -.12, p = .08$), suggesting that those who knew more about the legislation were less tolerant of earthquake risk. These shared predictors for both support and risk tolerance suggest that, beyond using framing manipulations, risk communications should focus on dispersing more information and targeting that which conveys the effectiveness of strengthening to reduce damage.

As with the previous regressions, beliefs about efficacy was the strongest predictor of judgments of the feasibility of the strengthening work ($\beta = .40, p < .01$) suggesting that those who perceive the work as having more of an effect also perceive the work as more achievable. Unlike support and risk tolerance, knowledge did not predict concern. However, earthquake preparation was a positive predictor ($\beta = .19, p = .01$), suggesting that those who are more prepared themselves see the strengthening work as more feasible.

Similarly, judgments of efficacy was the strongest predictor of concern about earthquake-prone buildings ($\beta = .38, p < .01$) suggesting that those who perceive the work as having more of an effect are also more concerned about the danger of those prone buildings. Again, earthquake preparation was a positive predictor ($\beta = .18, p = .01$), suggesting that those who are more prepared themselves are more concerned about the danger of earthquake-prone buildings. Although the prediction that women would demonstrate higher support for the legislation than would men was unsupported, gender was, as expected, a marginal predictor of concern ($\beta = -.11, p = .06$). Independent samples *t*-tests showed the predicted greater concern among women ($M = 4.84, SD = 1.33$) than men ($M = 4.50, SD = 1.55$), $t(270) = 1.93, p = .05, d = .24$.

Discussion

Study 1 tested two types of framing effects, valence and numerical format. The aim was to identify the most effective way of presenting information to increase support for legislation requiring the strengthening of earthquake-prone buildings in Wellington. Other judgments such as the feasibility of the work and risk tolerance were also explored, as were the influences of various demographic factors.

Framing effects

Numerical format affected both judgments of the feasibility of the strengthening work and concern about earthquake-prone buildings, with the frequency frame leading to higher judgments than the percentage frame, in line with predictions and previous research (e.g., Peters et al., 2011; Slovic et al., 2000). Although there was no effect of numerical format on support for the legislation, these findings have important implications. In practical terms, these results suggest that communications about the earthquake-strengthening legislation will be most effective at increasing concern about a risk and belief that a task aimed at reducing damage from that risk is achievable when the information is presented as a frequency rather than as a percentage.

The hypothesized lower risk tolerance for negative conditions compared to positive conditions emerged when participants were required to directly compare the risk of earthquakes to other hazards. Participants who were told the number of earthquake-prone buildings (i.e., negative frame) judged the expense of the work as more justifiable and the standard as less sufficient than did those who were told the number of resilient buildings (i.e., positive frame). This supports the implications of previous research that negative expressions lead to higher judgments of risk (e.g., Mitchell et al., 2015; McClure & Sibley, 2011). Given that the council encourages building owners to strengthen beyond the 34% required, and that the general public might incur some of the cost of the work (Forbes, 2016), this difference between a negative and positive frame has important implications for real-world practices.

Factors influencing framing effects

Hasseldine and Hite (2003) reported no framing effects in their study on tax compliance, but they did find an interaction of valence frame and gender. The positive frame expressing a gain due to tax compliance increased intention to comply with tax laws among women, whereas a negative frame expressing a loss due to non-compliance was more effective in increasing correct tax behaviour among men. While the interaction

found in this study was in the opposite direction, with the positive frame increasing support among males more than the negative frame, the influence of gender demonstrates the importance of considering a range of demographic variables when examining valence framing. Likewise, the interaction of earthquake experience and numerical format, where the frequency frame increased support compared to the percentage frame, but only among those with little to no experience, demonstrates the importance of considering differences within the audience of a risk communication using numerical format framing

Previous research suggests several other possible factors which may have mitigated the framing effects. For example, Block and Keller (1995) found that negative frames worked better than positive frames at increasing intent to undertake suggested behaviours to avoid developing skin cancer, but only when the efficacy of the behaviour was low or uncertain. They suggested that when the efficacy of the behaviour was high, participants did not need to process the information as deeply to make their decision, and therefore that framing effects work better when in-depth processing is required. It is possible that participants view strengthening buildings as obviously effective, so they did not have to engage deep processing and therefore the framing effects were reduced.

This idea is supported by the finding that framing manipulations lead to an increase in activity in areas of the brain associated with emotion such as the amygdala, suggesting that framing effects are stronger when the issue at hand is complex and requires intensive processing (De Martino et al., 2006). Further, pre-existing negative affect (Finucane, Alhakami, Slovic, & Johnson, 2000a), as well as personal involvement with the issue presented (Gesser-Edelsburg et al., 2015), have both been shown to diminish valence framing effects. The participants in the current study may have already felt too negatively about earthquakes and been too familiar with the issues around the strengthening legislation for the framing manipulations to have a strong effect.

Predictors of support for strengthening legislation

Although some research has shown no relationship between earthquake preparation and knowledge (e.g., Hurnen & McClure, 1997), merely providing information has been shown to increase the perception of risk (e.g., Terpstra et al., 2014). The finding in the current study that knowledge of the legislation predicted support for the legislation and earthquake risk tolerance aligns with the research of Terpstra and colleagues (2014) which showed that presenting information about flood risks increased

risk perception, regardless of whether that information was framed positively or negatively.

Support for the legislation and risk tolerance were also strongly predicted by belief in the efficacy of strengthening, as were concern and judgments of feasibility, suggesting that communications ought to not only convey information about the legislation but also emphasize the capacity of strengthening buildings to reduce damage in an earthquake. Neither experience nor individual preparation predicted support for the legislation, although preparation did predict concern and judgments of feasibility. The effect of material risk on judgments of personal risk theorized by Solberg et al. (2010) did not appear, with no difference in support for the legislation, risk tolerance, or concern among those who live in an earthquake-prone building and those who do not, and an opposite effect to that predicted where working in a prone building negatively predicted support for the legislation. Participants in this study might be demonstrating the effect described by Lehman and Taylor (1987), where those who live in more dangerous buildings judge their own risk lower. This suggests that information might need to target fatalistic attitudes by emphasizing that steps can be taken to reduce the risk posed by earthquakes. Lastly, women did show the predicted higher concern about earthquake-prone buildings than did men (Spittal et al., 2005), although gender did not predict support for the strengthening legislation.

Applications

Given the objective risk posed to Wellington by earthquakes, and the damage experienced during the Canterbury earthquakes due to poor building structure, getting people on board with the strengthening legislation is an important task. While framing effects only appeared for three of the target variables, they suggest that the best way of communicating the value of strengthening work is to provide the number of earthquake-prone buildings (i.e., negative frequency), rather than the number which are acceptably resilient (i.e., positive frequency) or either prone or resilient as a percentage (i.e., negative percentage or positive percentage). This finding directly applies to communications about the legislation, but also contributes to other applications of framing research such as communications about other risks in the field of natural hazards and in areas such as the health domain. These applications are explained in more detail in the general discussion (Chapter 5)

Limitations and strengths

While these findings have interesting and useful implications and applications, there are areas where the design of the study might be improved. One is that a large portion of participants ($n = 70$) incorrectly answered the second manipulation check question regarding the status of earthquake-prone buildings. These responses appeared in all conditions, but were more frequent in positive frame conditions describing buildings mentioned above the standard. It is possible that they misinterpreted the question as asking about the buildings in general which would need to be strengthened under the legislation, rather than about the specific number mentioned in the passage. While this misinterpretation would not affect the numerical format effects, as only a few participants remembered this information incorrectly ($n = 4$), it might have weakened the valence framing effects by prompting participants in the positive conditions to think about buildings which were below the standard, not above. Participants who answered incorrectly were excluded from analysis, but the issue suggests that perhaps the framing information was not sufficiently salient.

While there were issues with the study, there were also unique strengths. First is the generalizability of the results. Unlike many studies which use a university sample because of the ready availability of participants, this study considered participants recruited from the general community around the Wellington CBD. This resulted in a large age range which would not have been attained with a university sample. Although information such as profession was not collected, it can be assumed that factors such as the employment status and education level of a non-student sample would be more diverse and representative than a sample consisting entirely of university students. The sample size ($N = 272$, $n \sim 68$ for all conditions) also means that the study was well-powered to detect effects, yielding reliability to the findings.

The second main strength of the study lies in its applicability. The issue used is highly relevant, with articles frequently appearing in the media and signs of strengthening work visible throughout the city. While this use of a real-world situation poses challenges, such as those mentioned above, it also increases the applicability of the findings of the study, given that the experiment directly tests responses to the actual legislation. Further limitations and strengths relevant to all studies of this thesis are presented in the general discussion (Chapter 5).

Future studies

Many possibilities exist to both develop this study and to address the various issues raised by framing effects research, such as testing the finding that risk perception can be increased by presenting objective risk information (Terpstra et al., 2014). A future study could compare the effects of providing more detailed information about the strengthening legislation to test whether simply increasing knowledge will increase support.

The problem of issue involvement could be addressed by using a similar framing manipulation and target questions, but presenting a hypothetical issue in an unnamed town, such as in the study of Henrich, McClure, and Crozier (2015) who presented the chances of earthquake fatalities to a Wellington sample, but did not name a city in their scenarios. Without previous opinions to use, participants would be required to process the information more deeply to make their judgments, and so stronger framing effects might appear.

Other research suggests that when designing communications aimed at encouraging people to prepare for earthquakes, it might be beneficial to invoke memories of damaging events, such as the 2013 Seddon earthquakes or the 2011 Canterbury earthquake. Bubeck, Botzen, and Aerts (2012) found that experiencing negative consequences of floods increased the intention to prepare for future events. An interesting comparison would be between a communication which makes no mention of previous earthquakes to one which does, either through verbal or visual representations of damage. Given the danger posed by earthquakes, preparation is an important behaviour to encourage, so it would be beneficial to understand the best way of achieving this. Additional future directions relevant to all studies are presented in the general discussion (Chapter 5).

By describing the number of buildings that either are or are not earthquake-prone, the information in Study 1 may have inadvertently used an implicit descriptive social norm. These norms work by describing the prevalence of a behaviour, beneficial or harmful, within a society (Cialdini, Reno, & Kallgren, 1990). Given that the number of buildings at or above code represent the majority, this information might imply that there is a social norm of having resilient buildings. This could possibly increase support for the legislation, if participants do indeed perceive strengthening buildings as a normative behaviour within their society. The second study extends findings from Study 1 by

making this implicit norm explicit, to test another set of common effects used in risk communications.

Chapter 3: Study 2

Introduction

Although the information given to participants in our first study represented factual data about the number of earthquake-prone buildings, we deliberately manipulated the framing of those facts in order to influence judgments. This design therefore reflects one of Deutsch and Gerard's (1955) types of social influence: informational. Informational social influence works by manipulating information given to an individual to alter their decision-making. In the case of Asch's (1951) well-known line perception study, the participant often followed the incorrect judgments of the confederates, even though doing so led to them to give an inaccurate answer, because of their belief that a majority of peers are likely to be correct. Past research designed to make communications more effective, as well as our findings in Study 1, shows that there is not a straightforward connection between information and action (Paton & Johnston, 2001). Therefore, it is of interest to test a second type of social influence, normative influence, in the same context.

Normative social influence, as described by Deutsch and Gerard (1955), refers to the drive to align one's own thoughts and behaviours with those of peers. Since the 1950s, this concept of normative social influence has been developed more specifically into *social norms* (hereafter referred to as norms). There are two main types of norms: descriptive and injunctive.

Descriptive norms

Descriptive norms convey information about what is commonly done, or not done, by members of a social group (Cialdini, Reno, & Kallgren, 1990). Theoretically, this information provides a cognitive shortcut when deciding on one's own behaviour. If many similar others behave in a certain way in a certain situation, then people infer that this behaviour is likely to be beneficial (Goldstein, Griskevicius, & Cialdini, 2007) even though people often are not aware of the influence that this norm information exerts (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). For example, Goldstein et al. (2007) increased the number of hotel patrons who re-used their towels by informing them that a majority (almost 75%) of other guests did this (see also Terrier & Marfaing, 2015). With this simple manipulation, the researchers showed a way for hotels to reduce costs as well as benefit the environment.

Descriptive norms can also be conveyed through cues in a particular situation. Cialdini et al. (1990) conveyed a descriptive anti-littering norm by conducting their research in a clean environment. Participants could see that littering was not often done in that area, and so inferred that littering was not the norm. Similarly, whether a person switches off the light in a public bathroom as they leave can be manipulated by altering whether the light was already on or off when they entered (Dwyer, Maki, & Rothman, 2015). Descriptive norm effects have been shown with other environmental behaviours such as buying eco-friendly products (Demarque, Charalambides, Hilton, & Waroquier, 2015) and consumer decisions about which song to download (Salganik, Dodds, & Watts, 2006).

Injunctive norms

In comparison, *injunctive norms* convey information about whether a behaviour is approved of by a social group (Cialdini, 2007). Rather than informing an individual about what type of behaviour is most common in a situation, as with descriptive norms, injunctive norms imply either the reward of social approval for aligning with one's group, or the punishment of social disapproval for failing to do so. People's motivation to fit with a group's morals has been shown to exert a strong effect on behavioural decisions. For example, Cialdini et al. (2006) used injunctive norms to reduce the theft of petrified wood from an American National Park. Upon arriving, visitors saw a sign asking them to not take wood from the park or asking them to leave the wood where it was. These messages therefore conveyed the information that the theft of wood was not an approved behaviour, and in most cases served to reduce the amount of wood taken.

Using norms in communications is an effective strategy for targeting behaviours (Cialdini, 2003), both to reduce maladaptive behaviours such as excessive alcohol consumption (e.g., Neighbors et al., 2010) and to increase adaptive behaviours such as organ donation (e.g., Park & Smith, 2007) and pro-environmental decisions (e.g., Dwyer et al., 2015; Hamann, Reese, Seewald, & Loeschinger, 2015). By communicating norm information, researchers have successfully applied psychological knowledge to real-world issues. However, Cialdini (2007) argued that norms are still underestimated and underutilized, particularly given his opinion that policies ought to be informed by psychological research. While many studies have used norms in the decade since he made that argument, there are still areas where the benefits of using this type of social influence have not been properly explored. As with research into framing effects, the areas in which

norm applications are made tend to be either health-related or environmental, with a deficit of risk-based research (Solberg et al., 2010). By testing these norm effects in the context of earthquake-strengthening legislation, we therefore aim to evaluate their potential in the area of seismic risk, and by extension, the area of natural hazards in general.

Combining norms

Although the effects of descriptive and injunctive norms are discrete (e.g., Park & Smith, 2007), both types of norm are often used in conjunction to address an issue called the boomerang effect (Schultz, Nolan, Cialdini, Goldstein, & Griskveicius, 2007). Cialdini et al. (2006), in their study using norms to reduce the theft of petrified wood, demonstrated this effect by presenting a descriptive norm that conveyed the negative behaviour of taking wood as unfortunately common. Informing participants that previous visitors to the park had stolen wood led to the highest rates of theft even though the message implied disapproval of the behaviour. Schultz et al. (2007) found a similar problem in their study on energy use where they provided households with information about average energy consumption in their neighbourhood, and that household's own usage. This descriptive norm caused a decrease in energy use within the households that were above the average, but a slight *increase* in those below the average. The boomerang effect, therefore, occurs when people shift their behaviour toward the norm, even if that means decreasing a desirable or increasing an undesirable behaviour. To counter this effect, Schultz and colleagues paired the descriptive norm with an injunctive norm; a smiley face for those households with below average energy use, and a frowny face for those above the average to convey the norm of energy conservation. This injunctive norm increased energy reductions in those households above the average more than the descriptive norm alone, and eliminated the boomerang effect in the households below the norm.

As well as addressing the boomerang effect, descriptive and injunctive norms are often used together because they target different types of motivation: behavioural in the former and social in the latter (Hamann et al., 2015). Therefore, while it makes sense to see which type of norm is more effective, it is also logical to use them in conjunction to test whether their combined effectiveness exceeds their individual effects.

Given that norms can be applied to simple actions with long-term benefits (e.g., Hamann et al., 2015; Allcott, 2011), they offer compelling possibilities for the natural risk

domain. To date, there is a dearth of research examining the role of social influence in earthquake perceptions and preparedness (Becker, Paton, Johnston, & Ronan, 2014). In an interview-based study with NZ participants, participants freely volunteered social norms as influencing earthquake preparation (Becker et al., 2014). Becker et al. (2014) therefore demonstrated that norms can have an influence on preparation but did not experimentally test the effects of those norms. Self-identification of norms shows the importance of this type of social influence, as people tend to underestimate the influence of norms (Nolan et al., 2008) and therefore their impact on people's earthquake-related behaviour may be more extensive than Becker et al.'s (2014) study demonstrated.

McIvor and Paton (2007) found a positive relationship between subjective norms (similar to injunctive) and earthquake preparation, although this relationship occurred indirectly through perceptions of the efficacy of preparation behaviours. They argued that less passive communication strategies ought to be explored, including social influences. However, earthquake risk remains an area where norms have been underutilized (Becker et al., 2014). Given the relative cost-effectiveness of using norm information to encourage desirable behaviour, such as supporting earthquake-strengthening legislation, this application has the potential to add a new tool to the repertoire of risk communication about natural hazards.

Social and perceived norms

As well as distinguishing between descriptive and injunctive norms, there are two levels at which these norms can be present: *social* (also termed *collective*; Lapinski & Rimal, 2005), as referred to above, or *perceived*. Social norms refer to what is objectively done or approved of by a social group, whereas perceived norms refer to an individual's perception of the social norm, usually based on what they observe from close others; the two types, therefore, are seldom identical (Lapinski & Rimal, 2005). In the research mentioned above by Park and Smith (2007), they found descriptive and injunctive norms to be discrete, at both the social and perceived levels, creating four different types of norms (see also Lee, Geisner, Lewis, Neighbors, & Larimer, 2007; Park, Klein, Smith, & Martell, 2009).

Social norms are easier to use in experiments as they can be objectively measured and communicated, compared to perceived norms which are identified by the participant. Still, some research has examined the role of perceived norms. Studies looking at problematic drinking among college students in particular tend to examine perceived

interpersonal beliefs about behaviours rather than objective social norm information. For example, those who perceive their friends to be heavy drinkers, and to approve of such behaviour, also tend to consume more alcohol (Lee et al., 2007). This association between a perceived norm and behaviour is affected by relationships and behaviours within the college community (e.g., Real & Rimal, 2007).

While the association between perceived drinking norms and drinking behaviour has also been shown with norms using a country as the reference (Park et al., 2009), Neighbors et al. (2010) found that this relationship was stronger when the individual more closely identified with the group presented in the norm information. They argued, based on social identity theory (Terry & Hogg, 1996), that when the referent group described in the norm is both more proximal and more salient, then that group's perceived behaviour will have a stronger effect on the individual's behaviour. Their research supports this idea, and also suggests that making a person's communal identity salient increases the effects of that community's norms on support for a mutually beneficial behaviour.

Interpersonal norms

A specific type of perceived norms, *interpersonal norms*, refer to perceptions of the prevalence and approval of particular behaviours among an individual's close others. In their cross-cultural research on environmentally responsible behavioural intentions, Smith et al. (2012) found those who read a social descriptive norm were more likely to report that the same norm was held by those close to them, and that these interpersonal descriptive norms were significantly associated with intentions to reduce energy consumption. While they did not report an effect of interpersonal injunctive norms, this may be due to a difference in perceptions of these norms and of behavioural intentions between the Chinese and British participants.

The association found by Smith et al. (2012) between descriptive norms at the social and interpersonal level, and the impact that this association had on encouraging environmentally-responsible behaviour, provides an interesting possibility for the use of social norms in hazard communications. Another possible association with social norms is connection to one's community, particularly when that community is the referent group used in the norm information.

Community identification

Several studies examining norms have found them to be more effective among those who identify with a particular in-group or community. For example, Neighbors et

al. (2011) used marketing advertisements which conveyed both descriptive and injunctive norms to decrease drinking in light-drinking students, or maintain abstinence in those who do not drink. Importantly, the intervention was more effective among those with a closer identification to fellow students. More broadly, community connectedness can also affect behavioural intentions. Forsyth, van Vugt, Schlein, and Story (2015) showed that community identification correlated with willingness to engage in environmentally responsible behaviours for the benefit of that community, such as cleaning rivers and streams.

Social identities potentially influence earthquake preparation (e.g., Mulilis, 1999). If preparing is the common behaviour in a social group, those who place more importance on their membership in that group are more likely to follow that behaviour. This decisional shortcut is more useful when the risk is uncertain, as is the case with earthquakes given their unpredictability. In a US study, having lived in a community for longer increased earthquake preparation (Duval & Mulilis, 1999). Solberg and colleagues (2010) suggest a middle step in this link whereby community identification increases the chances of following the behavioural example of that community and therefore preparation. Our study tests this middle step by exploring the relationship between community identity and the influence of norms on support for earthquake preparation.

To do this, we substitute the multi-item scale used by Forsyth et al. (2015) with a single-item pictorial measure called the Inclusion of Community in Self (ICS) scale (Mashek, Cannaday, & Tangney, 2007). The ICS is a derivative of the Inclusion of Other in the Self (IOS) scale developed by Aron, Aron, and Smollan (1992) as a way of measuring closeness to another particular individual. The IOS scale was shown to have a high test-retest and alternate form reliability, and high convergent, discriminant, and predictive validity compared to more detailed questionnaires such as the Relationship Closeness Inventory (RCI; Berscheid, Snyder, & Omoto, 1989) which included 75 items over three subscales. The IOS scale was later extended to measure the relationship between an individual and a group, such as with the Inclusion of Ingroup in the Self (IIS) scale developed by Tropp and Wright (2001) which again showed high reliability and validity. Mashek et al. (2007) then developed the scale into the form used in the current study measuring community identification. The ICS scale showed high test-retest reliability and validity, as well as distinction from the IOS scale, demonstrating that it

assesses a different type of connectedness than that between an individual and a close other.

Current study

A design similar to that of Study 1 tested the effects of norms on support for the earthquake-strengthening legislation, and the same related judgments. In Study 2, the negative frequency condition from Study 1 was used as a stem for the information passage and different norm messages were added to create four conditions. This information consisted of a descriptive norm, an injunctive norm, a combination of the two, and information about the risk of earthquake-prone buildings collapsing. We added measures of interpersonal descriptive and injunctive norms and community identification to test the relationship between these judgments and norm information.

Predictions. We hypothesized that providing participants with descriptive or injunctive norms would increase their support for the earthquake-strengthening legislation and lower their risk tolerance compared to the condition providing no norm information. Based on the suggestion of Kallgren, Reno, and Cialdini (2000) that injunctive norms are effective across more behaviours and in more contexts than descriptive norms, we expected support to be higher in the injunctive (rather than descriptive) condition. We also included a condition which contained both a descriptive and injunctive norm. We predicted that this condition, containing the two discrete but aligned norms, would lead to the highest levels of legislation support (e.g., Hamann et al., 2015).

Interaction predictions. By measuring interpersonal norms and community connectedness, we were able to examine two potential influences on norm effects. We made several predictions for interactions with our experimental manipulation. We expected that those who perceive strong interpersonal norms would be more affected by the congruent social norm, and the reciprocal effect whereby presenting participants with a norm would lead them to report stronger interpersonal norms (Smith et al., 2012). While the direction of this relationship might be hard to determine, we judged that any findings would provide valuable insights for future research to examine the relationship between social and interpersonal norms more closely. Further, we expected that those who report a stronger connection to the Wellington community would be more influenced by the norm manipulation than those with a weaker connection (Neighbors et al., 2011).

In line with the findings of Study 1, we expected demographic factors to interact with norm effects on support measures. Given research arguing that norms have a

stronger effect when there are weaker opinions about the behaviour already held (Myers, 2002; Goldstein et al., 2007), we expected these factors to interact in such a way that norm effects would be stronger among those who are less likely to have an opinion about the issue, such as those who are younger, know less about the legislation, or are less connected with their community. Lastly, based on the findings of McIvor and Paton (2007), we expected that those who judged the efficacy of strengthening earthquake-prone buildings as high would be more influenced by the norm information than those who judged it low.

Method

Design

This study used a between-groups experimental design which presented each participant with a questionnaire containing one of four conditions (descriptive norm, injunctive norm, both norms, and information about the risk of earthquake-prone buildings collapsing, hereafter 'risk-prone'). As in Study 1, the questionnaire obtained demographic information to allow for interaction and regression analyses.

Participants

A priori calculations using the statistical programme G*Power (Faul et al., 2009), with a predicted effect size slightly above 'moderate' ($F = .30$, $p = .05$) based on effect sizes found in previous research using norms, gave a recommended sample size of 196 for this study. Questionnaires were administered with the goal of approaching this pre-calculated sample size and achieving an equal gender distribution. Unusable data was excluded as it was collected. In total, 238 participants were recruited from public spaces or at a community market in Wellington, NZ. Data from 38 participants were excluded from the analyses due to incorrect answers to one or both of the manipulation check questions, indicating that they had not properly retained or understood the key information from the passage. Seven participants under the age of 18 were also excluded. As with Study 1, all participants were asked prior to being handed a questionnaire whether they lived in Wellington. Approximately 25 people asked were tourists, and so told that they were unable to complete the research. Of those eligible, approximately 5% chose not to respond, citing time constraints.

This left a total of 192 usable questionnaires, including 112 female and 80 male participants, with one person stating their gender as neither. The mean age was 34.80 (*SD*

= 16.16), ranging from 18 to 78 years. Length of time living in Wellington ranged from one week to 60 years, with a mean of 12.61 years ($SD = 14.73$). As with Study 1, the majority of participants did not work or live in an earthquake-prone building (59.60% and 55.40% respectively), with 28 participants reporting that they work in an earthquake-prone building, 29 that they live in one, and the remainder unsure.

Materials

The study adapted the questionnaire used in Study 1 by adding normative information to the passages and replacing several questions (explained below; see Appendix E for full questionnaire). The passage presented the same background information about the earthquake legislation as in Study 1, and stated that 703 buildings have been deemed earthquake-prone, thereby approximating the negative frequency frame which was found to be the most effective. For the norm manipulation, we then presented information about the legislation in four different ways, varying the type and presence of norms:

Descriptive norm: *“Currently, Wellingtonians are strengthening an average of 72 earthquake-prone buildings a year to at least this standard, which means that at least 80% of these buildings will be strengthened within the 15 year time frame if this rate continues”*;

Injunctive norm: *“In a recent survey, 76% of Wellingtonians said they support this legislation requiring the strengthening of earthquake-prone buildings”*;

Risk-prone: *“The chance of these buildings collapsing or sustaining serious damage in an earthquake is about 10 to 20 times that of a new building at the same location.”*

The combined norm condition included both the descriptive and injunctive norms. In all four versions, the varied information was bolded to increase its salience and impact. In line with the typical method for norm research (Demarque et al., 2015), the norm information was calculated from actual data rather than fabricated. The strengthening rate for the descriptive norm was calculated by comparing two versions of the publicly available list of earthquake-prone buildings (Wellington City Council, 2015) and averaging the number of buildings which had been removed from the list over a four-month period in 2015. Some of these buildings might have been demolished or reassessed rather than strengthened, but that level of specificity was not necessary for this study. The percentage of buildings which will be strengthened in the time frame is an

estimate based on the rate described above, although given that the 15-year time frame starts from when the building was assessed, and extensions are given in some cases, calculating the exact percentage was not possible. The injunctive norm represented the number of responses of 5 or higher to the question on support for the legislation in Study 1. A WCC (n.d) pamphlet on earthquake-prone buildings provided the information for the risk-prone condition.

As with Study 1, participants received one of these four passages and first completed two manipulation check questions asking about the norm (or risk) information. Correct answers indicated that the participant had read and remembered the key information. As noted above, 38 participants (16%) incorrectly answered one or both of the manipulation check questions and were excluded from the analyses.

The manipulation checks were followed by nine questions using a seven point Likert-type scale, presented in Appendix D. Seven of these questions were similar to those used in Study 1, with minor re-wording to enhance clarity. The questions measuring earthquake experience and preparation were removed as they were not directly relevant to the aim of Study 2. Instead, we added two questions aimed at measuring interpersonal norms, one descriptive (“How much preparation have your family/friends made for a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?”) and the other injunctive (“How often do your family/friends tell you that you should prepare for a large earthquake?”). Lastly, we added the ICS scale to test community connectedness. The instructions for this scale read: “Circle the pair which best describes your connection with the Wellington community (C = Community, S = Self)”, which was followed by pairs of circles that overlapped to differing degrees (see Appendix D). We used the same demographic questions as in Study 1.

Procedure

The researcher conducted the surveys in April, 2016, using an identical intercept procedure to that of Study 1. The information sheet was also identical to that used in Study 1 so is not presented in this thesis. Appendix F presents the debrief sheet available to participants upon completion of the survey. This study was granted ethical approval by the School of Psychology Human Ethics Committee (approved: 23rd March, 2016; Reference number: 0000020938).

Results

Descriptive statistics

The descriptive norm condition (hereafter descriptive condition) included 49 participants, the injunctive norm condition (hereafter injunctive condition) included 47, the combined condition 48, and the risk-prone condition 49. It should be noted that the risk-prone condition in this study may not be an ideal control, in that it contained information about the risk posed by earthquake-prone buildings which the other conditions did not contain. This information was included so that the control scenario would be the same length as the norm scenarios. However, the possibility existed that this non-normative condition was not an ideal control, as some research suggests that any extra information about a hazard can increase risk perception (Terpstra et al., 2014). Because of this, we included the frequency negative condition from Study 1 (703 earthquake-prone buildings) as a proxy control (hereafter referred to as ‘control’). As the information in that passage was used as the base for the norm passages in Study 2, with only minor wording changes, it serves as a suitable control proxy.

Unlike Study 1, there were some differences between groups. The control condition showed greater knowledge of the legislation ($M = 3.31$, $SD = 1.82$) than the descriptive condition ($M = 2.47$, $SD = 1.43$; $t(113.36)^3 = 2.80$, $p = .01$, $d = .53$), but did not differ on knowledge from any of the other conditions. However, years lived in Wellington differed across conditions. In the control condition, participants had lived in Wellington for longer ($M = 18.12$, $SD = 18.91$) than had those in the descriptive condition ($M = 11.62$, $SD = 13.28$; $t(112.70) = 2.17$, $p = .03$, $d = .41$) and the combined condition ($M = 8.67$, $SD = 11.98$; $t(109.69) = 3.25$, $p < .01$, $d = .62$). Participants in the combined condition had also lived in Wellington for less time than in the injunctive condition ($M = 15.13$, $SD = 16.30$; $t(82.58) = 2.17$, $p = .03$, $d = .48$) and the risk-prone condition ($M = 15.00$, $SD = 16.36$; $t(88.00) = 2.17$, $p = .03$, $d = .46$)⁴.

As in Study 1, participants reported a relatively low level of knowledge about the earthquake-prone buildings legislation ($M = 2.93$, $SD = 1.66$; difference from midpoint,

³ All t -tests with degrees of freedom that are not integers reflect that equal variances could not be assumed and therefore results were taken from the second row of the SPSS output

⁴ The ANOVAs presented below were also run controlling for the variation in length of time lived in Wellington, but this did not affect the overall pattern of results.

$t(192) = 10.59, p < .01, d = 1.53$) and strong support for the legislation ($M = 5.68, SD = 1.17$; difference from midpoint, $t(191) = 19.70, p < .01, d = 2.85$).

Table 3.1.

Mean scores for risk tolerance variables with standard deviations below in parentheses.

Variable	Descriptive	Injunctive	Combined	Risk-prone	Control
Support	5.82 (1.18)	5.70 (1.33)	5.65 (1.12)	5.61 (1.15)	5.63 (1.11)
Feasibility	4.63 (1.42)	4.53 (1.63)	4.63 (1.33)	4.34 (1.44)	4.34 (1.52)
Comparative Risk	3.38 (1.31)	3.27 (1.26)	3.59 (1.36)	3.20 (1.26)	3.34 (1.23)
Concern	5.00 (1.31)	4.70 (1.43)	4.33 (1.48)	4.58 (1.43)	4.71 (1.45)

Table 3.1 presents the means for each of the four target variables assessing risk tolerance and related judgments. As with Study 1, the two judgments about the appropriateness of the building standard and the expense of the work were combined to create a comparative risk variable. The means for the Study 1 frequency negative condition are reported here again as the control for ease of comparison.

Tests of norm effects

A series of one-way ANOVAs examined the effects of norm-type (descriptive, injunctive, combined, risk-prone, and the control) on each of the target questions reported above, as well as on reported interpersonal descriptive and injunctive norms, and community identification. None of the ANOVAs produced significant results (all p values $> .16$), suggesting that overall, the conditions did not differ and that the experimental manipulation had little effect.

To check this interpretation, a series of independent samples t -tests were run to directly compare each condition to the others. Interpersonal injunctive norms were marginally higher in the descriptive norm condition than the risk-prone condition, $t(96) =$

1.94, $p = .06$, $d = .40$, and the combined norm condition, $t(95) = 1.78$, $p = .08$, $d = .37$. Concern was also significantly lower in the combined condition than the descriptive condition, $t(95) = .90$, $p = .05$, $d = .19$, and marginally lower than the control condition, $t(113) = 1.92$, $p = .06$, $d = .36$.

Two groups were created for further follow-up analyses; one group contained participants from all conditions which included normative information, and the second group comprised those who were not presented with normative information. These two groups were then compared to test whether norm information, regardless of type, had an effect. No significant differences emerged for any of the dependent variables.

Interactions

A range of demographic variables interacted with the effect of norms on several judgments. These interaction factors were analysed by splitting them into 'Low' and 'High' using the median response. These interactions are presented in full in Appendix G. A summary of overall findings is presented below.

Age. As predicted, age interacted with norm-type on concern, with descriptive norms producing the highest concern about earthquake-prone buildings among young participants, with no differences among older participants. Age also interacted with norm-type on interpersonal injunctive norms, with the descriptive norm producing the highest reports of interpersonal norms compared to all other conditions, again among younger participants. This is contrary to the prediction that presenting a norm would increase perceptions of the same type of interpersonal norm. However, there were no differences between norm-types among the older group, supporting the prediction that norm effects would be larger among younger participants, indicating that they held weaker pre-existing opinions and therefore relied more on the norm information when making their decisions.

Knowledge. Knowledge interacted with the effect of norm-type on feasibility, with the combined norms producing the highest judgments among the group with high knowledge (above 3 on the scale), counter to predictions that norms would have a greater effect on those with less previous knowledge of the legislation and therefore weaker pre-existing opinions. However, this predicted effect did appear in the interaction of condition and knowledge on interpersonal norms. As expected, the descriptive norm information produced the highest reports of interpersonal descriptive norms but only among those participants who knew less about the legislation. Among those with more knowledge of the legislation, only the combined and risk-prone conditions differed, with reports of

stronger interpersonal descriptive norms among those who received both norms compared to neither.

Community identification. Lastly, participants who identified less with the Wellington community were more affected by norms when reporting their concern about earthquake-prone buildings, with the descriptive norm leading to the highest concern and the combination of both norm-types to the lowest. This findings is contrary to the prediction that stronger community identification would increase the effect of norms because of a parallel increase in the importance placed on conforming to the behaviour of that community. It is possible that being connected to one's city increases the likelihood of already having opinions about local issues which can be used when making judgments about those issues rather than conforming to norms.

Overall, these interaction effects suggest that the experimental manipulation (and the use of normative information about the earthquake legislation) is more effective in influencing earthquake-risk judgments among those less likely to be involved with the issue. As predicted, norms had more effects on participants who are younger and less concerned about the danger of earthquake-prone buildings. However, knowledge related to both weaker and stronger norm effects, and those higher in community identification were less affected by norms. The implications of these interactions, for future research and the use of norms in risk communications, are considered in the discussion.

Regressions

Table 3.2.

Regression of subject and demographic variables on support for the earthquake-strengthening legislation. (EQP = Earthquake-prone)

Predictors	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Age	-.01	.01	-.18	.02*
Gender	-.14	.14	-.06	.32
Years in Wellington	.01	.01	.14	.06
Work in EQP building	.16	.11	.09	.17
Live in EQP building	-.00	.11	.00	.99
Knowledge	.10	.04	.14	.03*
Efficacy	.32	.05	.36	.00**

Note. * = significant at the level of $p < .05$. ** = significant at the level of $p < .01$.

Table 3.2 presents the linear regression of predictor variables for support of the earthquake legislation. As in Study 1, efficacy showed the most predictive power ($\beta = .36$, $p < .01$), followed by knowledge of the legislation ($\beta = .14$, $p = .03$). The finding of lower support among those who work in an earthquake-prone building did not appear again, although in this study, dissimilar to Study 1, age negatively predicted support ($\beta = -.18$, $p = .02$). These findings suggest that younger participants, who know more about the legislation, and see the strengthening work as effective at reducing damage in an earthquake are more likely to support the legislation.

Efficacy also predicted concern, ($\beta = .32$, $p < .01$), as did gender, ($\beta = -.17$, $p = .01$). As in Study 1, independent samples *t*-tests showed greater concern among women ($M = 4.93$, $SD = 1.32$) than men ($M = 4.45$, $SD = 1.56$), $t(217.95) = 2.60$, $p = .01$, $d = .35$). Only efficacy predicted comparative risk judgments ($\beta = -.16$, $p = .01$), and judgments of the feasibility of the strengthening work ($\beta = .23$, $p < .01$), suggesting that those who see strengthening buildings as effective at reducing damage in an earthquake also have less tolerance for earthquake risk and see the work as more achievable.

Discussion

Study 2 tested the effects of two types of norm: descriptive and injunctive. The aim was to identify whether using one, the other, or both in a communication about the earthquake-strengthening legislation would increase support for the legislation and other judgments of the importance of the work. We included measures of interpersonal descriptive and injunctive norms, and community connectedness. The study also examined predictors of support for the legislation and related judgments.

Predictors of support variables

Study 2 replicated several findings of Study 1, again showing that beliefs about the efficacy of the strengthening work for reducing damage was the strongest predictor of support for the legislation. The relation of working in an earthquake-prone building to reduce support found in Study 1 was not found in this study, although knowledge of the legislation again predicted support and age appeared as a negative predictor. Efficacy also significantly predicted comparative risk judgments, concern, and judgments of feasibility, supporting the implication of Study 1 that communications about earthquake preparation might be more successful if they emphasize the effectiveness of the preparation behaviour.

Norm effects

Overall, the norm manipulations did not have the predicted effects. Comparing the four norm conditions showed no differences between those who read the descriptive norm, the injunctive norm, both, or non-normative information about the risk posed by earthquake-prone buildings. The passages in Study 2 used the negative frequency information from Study 1 as a stem, so any effect of the norm information should have been evident in comparison to the proxy control (i.e., Study 1 negative frequency passage).

Even with this control to use as a comparison, however, few norm effects were found in a direct comparison of the conditions. The descriptive norm message, both on its own and within the combined norms, had a marginal effect on reports of interpersonal injunctive norms. The combined condition also produced the highest levels of concern, although this was only significantly different to the descriptive condition and marginally different to the control condition. These findings suggest that the combination of the descriptive and injunctive norms was, as predicted, the most successful. Yet, this success was limited. There are two possible reasons for this lack of findings. First, judgments

relating to the importance of preparing for earthquakes, such as viewing the expense of strengthening as worthwhile, may be only weakly affected by norm information.

Secondly, as with Study 1, the relevance of the issue of earthquake-prone buildings to the sample used may have meant previous opinions and beliefs reduced or complicated the norm effects,

Norms and earthquake risk

Park and Smith (2007) argue that norm effects depend on the context of the behaviour and that certain actions are less likely to be influenced by norm messages. While they made this argument when comparing two different types of behaviours in relation to the same context, either signing up to an organ donor registry or talking with family about organ donation, their findings suggest that norm effects may differ depending on the nature of the behaviour involved. However, given that the current research is novel, as norm effects have seldom been tested in the earthquake domain or in relation to an actual government policy, these weak results do not rule out earthquake preparation as a context where norms apply. What research does exist, whether looking at personal norms (McIvor & Paton, 2007) or using norms to predict judgments and behaviour rather than to influence them (Becker et al., 2014), suggests that norms in relation to earthquakes should be researched further. Norms have been robustly demonstrated to increase environmentally responsible behaviour (e.g., Schultz et al., 2007; Dwyer et al., 2015; Hamann et al., 2015), and so their potential in the natural hazard domain, such as earthquake preparation, is too important to be discounted.

Factors influencing norm effects

This study demonstrated that the age of participants affected the influence of the norms on a range of judgments. Younger participants' reports of concern about earthquake-prone buildings and interpersonal injunctive norms were affected by the experimental manipulation while older participants' reports were not. This suggests that, as expected, those who are younger and therefore perhaps have less set beliefs about earthquakes were more likely to draw on the norm information when responding. Interestingly, descriptive norms led to the highest concern about earthquake-prone buildings within the younger age bracket. The injunctive norm, therefore, appears to not only be less effective at increasing concern but to reduce the positive effect of the descriptive norm, as shown by the lower scores in the combined condition.

Knowledge about the legislation also interacted with norm-type in that the norm manipulations had a stronger effect on participants with more knowledge. The combination of both norm-types increased judgments of feasibility only within this high knowledge group. This finding is contrary to our prediction based on the argument that norms have a greater effect when people hold no opinions about the behaviour (Myers, 2002), or when the situation is ambiguous or new (Goldstein et al., 2007). We expected that people's judgments would be influenced by normative information more when they had no previous information on the issue to make their decisions about whether to carry out a behaviour. Our findings disconfirm this prediction. As a possible explanation for the lack of norm effects in the low-knowledge group, previous research has shown that 98% of Wellington citizens are aware of the earthquake risk in their city (Johnston et al., 2013). Therefore, participants who knew less about the specific legislation were likely aware of danger of earthquakes to Wellington, which they used to make their decision about supporting the legislation, rather than heeding the norm information. This however does not explain why those participants with more knowledge of the legislation demonstrated norm effects. Knowledge also interacted with the effect of norm-type on reports of interpersonal descriptive norms. Among those with low knowledge, the descriptive social norm led to higher interpersonal descriptive norms than the injunctive norm, as expected based on Smith et al.'s findings (2012).

Finally, community identification did, as predicted, interact with the effect of norm-type on concern. Contrary to the prediction that those with a stronger identification would be more susceptible to norm information using that community as a referent group, no differences among the higher identification bracket reached significance. Within the lower bracket, the combined norms decreased concern more than either individual norm-type. This interaction suggests that more norm information is not necessarily beneficial. Perhaps the knowledge that strengthening work is underway and that a majority already support the work leads participants to believe that they do not need to be concerned. Further, people who are more connected to their community may be more likely to have already formed an opinion about the danger of earthquake-prone buildings and therefore draw on norm information less.

Other influencing factors. Park et al. (2009) argue that a range of factors influence norm effects, including a large quantity which are not tested here. For example, the specificity of the norm referent can influence the effects of the norm, although results

are inconsistent as to whether specific (Goldstein et al., 2007) or general references (Hamann et al., 2015) are better. Other factors that can influence the effects of norms include ethnicity (Walker, Corneya, & Deng, 2006), norm salience (Kallgren et al., 2000), elaboration (Kredenster, Fabrigar, Smith, & Fulton, 2012), personal beliefs about the behaviour (Crawford & Novak, 2010), and mortality salience (Jonas & Fritzsche, 2012). Further, several dispositional traits such as personal norms (Kallgren et al., 2000), action coping (i.e., problem solving; McIvor & Paton, 2007), impulsivity (Jacobson, Mortensen, Jacobson, & Cialdini, 2015), and control orientation (Lee et al., 2007) can influence the effect of norms. It is possible that any number of these variables contributed to the lack of straightforward norm effects on judgments not explained by the interactions found in this study.

Limitations and strengths

Approximately 16% ($n = 38$) of participants failed one or both of the manipulation check questions, despite changes made from Study 1 to reduce errors. The key normative information in the scenario was printed in bold so as to be more salient, and the questions were worded to be less ambiguous. More mistakes were made in the descriptive and combined norm conditions, both of which included a question regarding the number of buildings a year which are being strengthened in Wellington. Participants may have misread this question as asking about the number of buildings which *require* strengthening. As with Study 1, participants who failed the manipulation check were excluded from analyses so this feature did not impact on the results.

The use of a general community sample increases the generalizability and relevance of the results. The use of *a priori* sample size calculation, based on the effect sizes found in previous research, means that this study ought to have had enough power to find effects similar to those found in previous studies if they existed. Therefore, the small number of significant findings for the norm manipulations suggests either that norm effects are not occurring at all, or that they are weaker than the effects found in previous research and used in the *a priori* calculation. Together these strengths mean that the lack of findings of norm effects support the expected role of either contextual issues or variables such as age and knowledge which qualify the effect of norm information. While we cannot comprehensively say, based on our findings, which type of norm is best to use in risk communications, the results do suggest that norm effects need to be studied in the sort of real-world situations to which they are applied.

Future directions

A large number of factors have been shown to influence norm effects, and so a wide range of possibilities exist for future research. Extensions could collect data on various dispositional influences such as action coping in an attempt to replicate previous findings in the context of earthquake risk. Differences found between cultures also suggest an interesting area of norm research that is relatively under-studied yet highly relevant given NZ's ethnic diversity.

Given that the same potential problem of issue-involvement that may have affected results in Study 1 may have also affected results in Study 2, the most logical next step would be to attempt to assess and possibly reduce this influence. One way would be to test norm effects using a different, less relevant issue, with a sample from the same Wellington population. Significant findings would support the suggestion that issue-involvement reduces norm effects, while non-significant findings would suggest there is some aspect of the residents which makes them less susceptible to normative influences.

A second way to test issue-relevance would be to use the same context of the earthquake-strengthening legislation with a sample from a relatively seismically inactive city where both earthquakes and the legislation should be less prevalent in the social consciousness. While not all differences in the interactions in Study 2 were significant, the overall trends suggest the importance of considering demographic variables such as age and knowledge when examining norms. Further research, with a larger sample, is desirable to strengthen the interpretations made from the interactions in this study. To that end, as well as addressing the potential impact of variables such as age and knowledge by using a less-involved population, Study 3 closely replicated Study 2 with a larger sample of Wellington citizens. Further, we ran the same questionnaire with a sample from Palmerston North, a city also located on the North Island of NZ and in the same objective high risk category as Wellington, but where participants have relatively low earthquake-risk perceptions (McClure, Johnston, Henrich, Milfont, & Becker, 2015).

Chapter 4: Study 3

Introduction

Given that one of the aims of social psychological research in the risk domain is to inform public education campaigns, it is important to understand how different methods of risk communication work in practice. While the influence of various interacting factors (e.g., age and knowledge) potentially mitigated the main effects of norms, there are several other potential reasons why the social norms used in Study 2 did not have the predicted effect.

One possibility is the role of previously-held opinions. Both the effects of knowledge about the legislation and age in Study 2, and the conclusions of previous researchers (e.g., de Martino et al., 2006; Myers, 2002) imply that participants who are already invested in the issue favour previously-held opinions to make decisions rather than responding to presented information, and are therefore more difficult to manipulate through strategies such as framing and norm effects.

Because participants from Wellington were likely to have already had an opinion about earthquake risk (Khan et al., 2012), they may have used those opinions when making their judgments on whether to support the earthquake-strengthening legislation rather than relying on the provided information as intended in the experiment. In order to explore this idea, Study 3 replicated Study 2 using a sample from another city in NZ (Palmerston North), where earthquakes are generally seen as less of a risk (McClure et al., 2015) despite being in the same risk-category as Wellington (Smith, 2015). It follows that the citizens should have weaker and more easily over-ridden opinions about strengthening earthquake-prone buildings than a Wellington sample. We therefore expected participants in Palmerston North to show generally lower involvement in the issue, demonstrated by lower knowledge of support for the legislation, as well as lower concern about the danger of earthquake-prone buildings.

We also expected to find an interaction of location and norm-type, with more significant norm effects in the Palmerston North sample than the Wellington sample on support for the legislation, risk tolerance, and judgments of feasibility. As with Study 2, we expected that the use of both norm-types in conjunction would produce the most favourable judgments in regards to the legislation, followed by the injunctive norm, and then the descriptive. Lastly, we expected to replicate the interactions of norm-type and

demographic variables such as age and knowledge found in Study 2, and the predictors of support found in both previous studies.

Survey medium

An online replication of Study 2 also allowed an exploration of potential differences between paper-based and digital survey methods in response patterns to earthquake-risk judgments. Online surveys offer appealing benefits over paper-based surveys, such as being cheaper and faster to run (Teo, 2013) and producing better response rates (Lonsdale, Hodge, & Rose, 2006). However, there is inconsistent support for equivalence between the two media. Ritter, Lorig, Laurent, and Matthews (2004) found equivalent scores on a range of 16 health-related scales, although they recruited both samples online and so did not compare differences between Internet-using populations and the more general populations from which paper-based data may be collected face to face, as with Study 2 of the present research.

Lonsdale and colleagues (2006) also found no difference in scores on a questionnaire measuring burnout between athletes who answered on paper or online. However, participants for their paper-based survey were also not recruited face to face but via the post. A recent study found that participants are more willing to answer sensitive questions online than on paper (Wood, Mosko, Desmarais, Ross, & Irvine, 2006). Wood and colleagues claimed this occurred because of the absence of the researcher, which reduces social desirability bias. While these authors demonstrated that the presence of a researcher did not influence response patterns, they established this with a self-report social desirability measure rather than comparing actual scale scores. In contrast, Chang (2004) found that students gave better evaluations of their teachers when responding on paper compared to online. However, while the teacher was not present during responding, they completed the survey in their classroom and so might have experienced situational influences or lower perceptions of anonymity similar to those driving the social desirability bias.

Previous research around questionnaire equivalence is largely biased in the health area, where differences between scale responses might be important for clinical diagnoses (Whitehead, 2011). Comparing equivalence is important in this area to determine if the easier and cheaper method of online surveying is a valid option to get similar data to a paper-based survey. However, there is both theoretical and practical interest in media differences within the risk perception context, as communications can be both paper-

based and digital. This means that understanding whether people respond to an online survey about earthquake risk differently to a paper survey might indicate whether interpretations of risk communications also differ by media.

Replicating Study 2 in an online format provided the opportunity to examine differences in responding between paper-based surveys conducted face-to-face and online surveys with Internet recruitment, as well as minimizing cost and time for data collection. Study 3 uses the same experimental material as Study 2 but converted into an online survey using the website Qualtrics. We expected residents from each city to differ on a range of perceptions, but any differences between Palmerston North participants in Study 3 and Wellington participants from Study 2 cannot be confidently attributed to survey method. Therefore, Study 3 includes a second Wellington sample. This allows for a direct comparison between the responses to a paper survey with those of an online survey as well as the ruling out of a media influence in differences between Wellington and Palmerston North participants. Given the inconsistency in the literature as to the influence of medium, these comparisons are exploratory and no predictions as to differences in responses are made.

An added benefit to repeating Study 2 in Wellington with an online survey is that we can recruit a larger sample. Although *a priori* calculations indicated that Study 2 was sufficiently powered to detect effects ($F = .30$, slightly above moderate), the fact that we did not find differences implies that the effects we might expect in our present context are weaker than those found in previous research, and used for the *a priori* calculation. A larger sample therefore means that significant differences are more likely to be found if indeed the expected effects are weaker. Null results would imply that norm information does not have an influence on people from Wellington, or that this influence is extremely weak. Increasing the sample also allows for a clearer exploration of interaction effects, as sufficient power should remain even after the sample is split in two to analyse demographic influences (e.g., younger and older).

Method

Design

This study used a 2 (location: Wellington and Palmerston North) by 4 (condition: descriptive, injunctive, combined, and risk-prone) between-groups experimental design which presented each participant with a questionnaire containing one of four conditions.

As in the previous studies, the questionnaire obtained demographic information to allow for interaction and regression analyses.

Participants

Participants were recruited through posts on public Facebook groups directed towards both Wellington and Palmerston North audiences. Further, the researcher shared the link on her personal Facebook account and a paid advertisement on the website directed Palmerston North users to the survey. One thousand, one hundred and seventy-nine participants commenced the online survey, but 155 of them did not provide answers to a majority of the questions and so were excluded from the analyses. A further 17 participants were under the required age of 18. Of the remaining 1,012 participants, 285 (28%) failed one or both of the manipulation check questions and so were excluded from the analyses. These errors were approximately equivalent in the descriptive ($n = 70$) and the injunctive conditions ($n = 68$). However, the combined condition produced fewer errors ($n = 55$) while the risk-prone condition produced more ($n = 92$). Five-hundred and sixteen participants were from Wellington, 164 from Palmerston North, and 47 from a different location. Of those 47, ten lived in the same region as Palmerston North and were therefore included in this sample to increase sample size.

In total, the data from 690 participants were used, comprising 111 males, 553 females, two participants who reported another gender identity and 24 who did not report their gender. The mean age of this sample was 26.71 years ($SD = 9.40$) with a range of 18 to 62 years. Time lived in their current city ranged from a week to 63 years, with a mean of 12.37 years ($SD = 11.65$).

Materials

The study used the same questionnaire and experimental conditions as in Study 2. The same passages were presented, and to encourage participants to read the information thoroughly, they were not able to move on to the manipulation check questions until a minute had elapsed. Participants were randomly allocated one of the four experimental passages (descriptive, injunctive, combined, or risk-prone) followed by the corresponding manipulation check questions. These were then followed by a question asking where the participant lived. They could select Wellington, Palmerston North, or Other. If they chose the latter, they could report where they lived. This question allowed the presentation of subsequent questions tailored to the specific participant. For example, a question was added which asked the participant, "How concerned are you about the danger of

earthquakes [in Wellington/in Palmerston North/where you live]”, with the response scale ranging from 1 (Not at all) to 7 (Extremely). The same customization was used for the ICS scale question and the question asking how long they had lived in their current city (see Appendix H for the full question table).

To measure possible links to Wellington, the questions “Do you have many family members and/or close friends currently living in Wellington” (1 = None, 7 = A lot) and “Have you ever lived in Wellington” (Yes/No) were added. If a participant indicated ‘Yes’ to having lived in Wellington, they were also asked how long they had lived there. This questionnaire is presented in full in Appendix I. The participant information sheet for this study is not provided, as the only information that differed from Study 2 was the reward and the inclusion of the researcher’s university email address so that participants could still ask for more information before undertaking the survey. Similarly, the debrief sheet is not provided here as the only difference to that used in Study was the inclusion of the following sentence: *We are also interested to see whether these norms have more of an effect on people who don't live in Wellington, and so aren't likely to know as much about the legislation already or be invested in the issue.*

Procedure

The survey could be completed on any internet-enabled device, and closed after one week from the first time the participant followed the link. Once they had submitted a page of questions they were not able to go back and change their answers. Participants were presented with general information at the start of the survey and a more detailed debriefing at the end which explained the point of the research. Upon reaching the end of the questionnaire they were able to follow a link to a separate survey and enter personal details to go into the draw for an \$80 grocery voucher⁵. This identifying information could not be matched to their questionnaires. The survey was run in July, 2016.

Results

Descriptive statistics

Wellington sample. The descriptive condition included 130 participants, the injunctive condition included 120, the combined norms condition included 139, and the risk-prone condition included 127. There were no differences between these norm conditions on any of the demographic variables. Within the Wellington sample, the age of

⁵ This reward was increased from \$50 after the survey was launched

participants ranged from 18 to 60 years, with a mean of 25.09 years ($SD = 8.07$) and time lived in Wellington ranged from a week to 50 years, with a mean of 11.77 years ($SD = 11.26$). As with the first two studies, Wellington participants reported a relatively low level of knowledge about the legislation ($M = 2.38$, $SD = 1.55$; difference from the midpoint: $t(514) = 23.71$, $p < .01$, $d = 2.09$). Reports of preparation ranged from ‘None’ to ‘A lot’, with the mean (3.11 , $SD = 1.62$) significantly below the midpoint ($t(508) = 12.44$, $p < .01$, $d = 1.10$) even though reported earthquake experience ($M = 4.53$, $SD = 1.50$) was slightly above the midpoint ($t(509) = 7.92$, $p < .01$, $d = .70$).

Table 4.1

Mean scores for risk tolerance variables with standard deviations below in parentheses.

Variable	Wellington				Palmerston North			
	Desc	Injun	Comb	Risk	Desc	Injun	Comb	Risk
Support	5.82 (1.24)	5.98 (1.18)	5.94 (1.18)	5.62 (1.22)	5.38 (1.70)	5.76 (1.21)	5.96 (1.41)	5.31 (1.19)
Feasibility	5.07 (1.26)	4.67 (1.38)	5.06 (1.27)	4.56 (1.42)	4.48 (1.42)	4.66 (1.24)	5.07 (1.42)	4.47 (1.58)
Comparative Risk	2.70 (1.10)	2.82 (1.11)	2.97 (1.20)	2.88 (1.11)	2.95 (1.22)	3.27 (1.20)	2.94 (1.25)	3.03 (1.34)
Concern EQP	4.69 (1.29)	4.68 (1.30)	4.74 (1.20)	4.74 (1.28)	4.74 (1.50)	4.61 (1.64)	4.57 (1.82)	5.08 (1.38)
Concern EQ	4.65 (1.37)	4.55 (1.30)	4.49 (1.45)	4.50 (1.49)	3.83 (1.50)	3.78 (1.56)	3.85 (1.62)	3.97 (1.46)

Note. Desc = Descriptive, Injun = Injunctive, Comb = Combined, Risk = Risk-prone. ‘Concern EQP’ refers to concern about earthquake-prone buildings in Wellington. ‘Concern EQ’ refers to concern about the risk of earthquakes to the place in which the participant lives.

Table 4.1 presents the means for each of the five target variables assessing risk tolerance and judgments for this sample. As with Studies 1 and 2, a combined comparative risk variable was calculated. The participants report overall high support for

the legislation ($M = 5.84$, $SD = 1.21$; difference from the midpoint: $t(515) = 34.64$, $p < .01$, $d = 3.05$), moderate judgments of the feasibility of the work ($M = 4.85$, $SD = 1.35$; difference from the midpoint: $t(515) = 14.28$, $p < .01$, $d = 1.26$), low risk tolerance ($M = 2.85$, $SD = 1.13$; difference from the midpoint: $t(515) = 23.15$, $p < .01$, $d = 2.04$), and moderate concern both about earthquakes in Wellington generally ($M = 4.55$, $SD = 1.40$; difference from the midpoint: $t(509) = 8.80$, $p < .01$, $d = .78$) and earthquake-prone buildings ($M = 4.71$, $SD = 1.26$; difference from the midpoint: $t(509) = 12.76$, $p < .01$, $d = 1.13$).

Palmerston North sample. The descriptive condition included 42 participants, the injunctive condition included 50, the combined condition included 46, and the risk-prone condition included 36. This smaller sample for the risk-prone condition was due to the increased number of manipulation check errors rather than issues with the randomization of conditions which were assigned by the survey programme. There were no differences between the conditions within the Palmerston North sample on any of the demographic or subject variables. The age of Palmerston North participants ranged from 18 to 62 years, with a mean significantly higher than the Wellington sample ($M = 31.90$, $SD = 11.13$; $t(233.45) = 8.61$, $p < .01$, $d = 1.13$). Participants had lived in Palmerston North for between a week and 63 years, with an average significantly longer than Wellington participants ($M = 14.28$, $SD = 12.62$; $t(668) = 2.30$, $p = .02$, $d = .18$). As expected, Palmerston North participants indicated a lower level of knowledge about the legislation ($M = 2.11$, $SD = 1.46$) than the Wellington participants ($t(687) = 2.00$, $p = .05$, $d = .15$). Table 4.1 presents the means for each of the five target variables assessing risk tolerance and judgments. As with the Wellington sample, there is strong support for the legislation ($M = 5.63$, $SD = 1.40$; difference from the midpoint: $t(173) = 15.29$, $p < .01$, $d = 2.33$), moderate judgments of the feasibility of the work ($M = 4.68$, $SD = 1.41$; difference from the midpoint: $t(173) = 6.38$, $p < .01$, $d = .97$), and low risk tolerance ($M = 3.06$, $SD = 1.25$; difference from the midpoint: $t(173) = 10.02$, $p < .01$, $d = 1.52$). Concern about the risk of earthquakes to Palmerston North ($M = 3.85$, $SD = 1.53$) is lower (difference from the midpoint: $t(174) = 1.29$, $p = .20$, $d = .20$) than concern about earthquake-prone buildings in Wellington ($M = 4.73$, $SD = 1.61$; difference from the midpoint: $t(172) = 5.96$, $p < .01$, $d = .91$).

Paper versus online comparisons

When compared to the Wellington sample from this study, participants in the Study 2 paper-based survey reported higher knowledge about the legislation ($M = 2.79$, $SD = 1.58$) than those who completed the online survey ($M = 2.36$, $SD = 1.53$; $t(883) = 3.48$, $p < .01$, $d = .23$). The paper-based sample also gave lower judgments of feasibility ($M = 4.53$, $SD = 1.45$) than those in the online Wellington sample ($M = 4.80$, $SD = 1.37$; $t(884) = 2.42$, $p = .02$, $d = .16$) and higher risk tolerance ($M = 3.36$, $SD = 1.30$ and $M = 2.94$, $SD = 1.15$; $t(277.90) = 4.40$, $p < .01$, $d = .58$). The online sample reported weaker interpersonal descriptive and injunctive norms ($M = 3.49$, $SD = 1.49$ and $M = 2.78$, $SD = 1.56$, respectively) than the paper-based sample ($M = 3.74$, $SD = 1.62$; $t(869) = 2.07$, $p = .04$, $d = .14$, and $M = 3.24$, $SD = 1.66$; $t(869) = 3.55$, $p < .01$, $d = .24$, respectively). There was also a marginal trend for the paper-based sample to report a stronger connection to the Wellington community ($M = 3.46$, $SD = 1.39$) compared to the online sample ($M = 3.25$, $SD = 1.39$; $t(862) = 1.84$, $p = .07$, $d = .13$).

The strongest difference between the two groups, however, is in the age distribution. The online sample was significantly younger ($M = 25.35$, $SD = 8.36$) than the paper-based sample ($M = 34.80$, $SD = 16.16$; $t(222.31) = 7.83$, $p < .01$, $d = 1.05$). Further, a chi-square test of independence showed that the gender distributions differed significantly between the two groups ($\chi(2) = 114.28$, $p < .01$). Roughly similar numbers of males (58.0%) and females (41.5%) participated in the paper-based, intercept-method survey. In contrast, only 19% of the participants in the online sample were male, while 80.5% were female, with the remaining participants either not reporting gender or reporting a non-binary gender.

Controlling for the variability in age by introducing it as a covariate in an ANCOVA caused the differences between survey methods in knowledge and interpersonal descriptive norms (described above) to become non-significant. Controlling for gender reduced the difference in community identification to a p value of .64, although no main effects of gender appeared. This suggests that younger participants are more likely to respond to online surveys than older participants and differ in some aspects, namely that they know less about the legislation and perceive interpersonal descriptive norms to a lesser extent. Females are also more likely to respond to online surveys, although this did not appear to have an effect on response scores. While most of the differences in responses between the survey methods were small, the large difference

in age suggests that online recruitment leads to a younger sample compared to an intercept method which can impact other factors and therefore is an important consideration. As the two samples differed, the Study 2 data was not used in any subsequent analyses.

Location differences in risk tolerance

Support for the legislation was marginally higher in the Wellington sample ($M = 5.84$, $SD = 1.21$) than the Palmerston North sample ($M = 5.63$, $SD = 1.40$; $t(264.79) = 1.82$, $p = .07$, $d = .22$). Participants in Wellington had lower risk tolerance ($M = 2.85$, $SD = 1.13$) than Palmerston North participants ($M = 3.06$, $SD = 1.25$; $t(688) = 2.06$, $p = .04$, $d = .16$) and had higher concern about the risk of earthquakes to their city (Wellington: $M = 4.55$, $SD = 1.40$, Palmerston North: $M = 3.85$, $SD = 1.53$; $t(682) = 5.52$, $p < .01$, $d = .42$). However, the two groups did not differ in concern about earthquake-prone buildings in Wellington. Lastly, Wellington participants reported stronger interpersonal descriptive norms ($M = 3.50$, $SD = 1.51$) than Palmerston North participants ($M = 3.13$, $SD = 1.53$; $t(676) = 2.78$, $p = .01$, $d = .21$).

Interactions of location and norm effects on earthquake risk judgments

A series of 2 (location: Wellington or Palmerston North) x 4 (condition: descriptive, injunctive, combined, or risk) factorial ANOVAs compared the effect of norm conditions between participants from different locations. Contrary to predictions, norm condition did not interact with the location of participants for any target variables. As location did not significantly interact with norm-type on any of the dependent variables, the two samples were merged for the following one-way ANOVAs and regressions.

Figure 4.1. Effect of norm-type on support for earthquake-strengthening legislation with samples merged.

A one-way ANOVA testing the effect of norms on support for the legislation showed an overall significant difference, $F(3, 689) = 3.69, p = .01, \eta_p^2 = .02$ (see Figure 4.1). Follow up independent samples t -tests showed that, as predicted, the combined norms led to significantly higher support ($M = 5.95, SD = 1.24$) than did risk-prone information ($M = 5.55, SD = 1.22; t(346) = 2.99, p < .01, d = .32$). Further, the injunctive norm also produced higher support ($M = 5.92, SD = 1.19$) than did the risk-prone condition, $t(331) = 2.77, p = .01, d = .31$, but the descriptive norm did not. This suggests that information about approval of the legislation (Injunctive norm) is more effective at increasing support than information about the rate of strengthening work (Descriptive norm).

Figure 4.2. Effect of norm-type on judgments of the feasibility of earthquake-strengthening with samples merged.

There was also a significant effect of norms on judgments of feasibility, $F(3, 689) = 1.05$, $p < .01$, $\eta_p^2 = .02$ (see Figure 4.2). As predicted, both the descriptive norm ($M = 4.92$, $SD = 1.32$) and the combination of both norms ($M = 5.06$, $SD = 1.30$) led to higher judgments of the feasibility of the strengthening work than the risk-prone condition ($M = 4.54$, $SD = 1.45$; $t(333) = 2.54$, $p = .01$, $d = .27$ and $t(346) = 3.52$, $p < .01$, $d = .38$, respectively). Feasibility judgments were higher in the combined norm condition than the injunctive ($M = 4.66$, $SD = 1.34$; $t(353) = 2.82$, $p = .01$, $d = .30$) but no higher than the descriptive. This lack of difference between using the descriptive norm alone or both types together suggests that the descriptive norm is the more effective of the two types.

Figure 4.3. Effect of norm-type on reports of community identification with samples merged.

Norm information also significantly affected reports of community identification, $F(3, 675) = 6.40, p = .02, \eta_p^2 = .02$ (see Figure 4.3). Identification was significantly lower among participants presented with the injunctive norm ($M = 2.98, SD = 1.18$) compared to both the descriptive norm alone ($M = 3.41, SD = 1.59; t(307.48) = 2.84, p = .01, d = .32$) and the combination of both types ($M = 3.33, SD = 1.38; t(345.79) = 2.58, p = .01, d = .28$). This suggests that descriptive norms increased reported community identification, although not significantly more than the risk-prone condition.

Follow-up independent samples t -tests were also run for ANOVAs which did not reach significance when comparing all four conditions. These showed two further differences between norm conditions. The combined norms led to higher judgments of the efficacy of strengthening buildings ($M = 5.57, SD = 1.20$) than did the descriptive norm alone ($M = 5.29, SD = 1.30; t(353) = 2.14, p = .03, d = .23$), suggesting, in line with the above findings and with predictions, that the use of both norms is the most beneficial. Lastly, the risk-prone condition led to higher reports of interpersonal descriptive norms ($M = 3.62, SD = 1.53$) than did the injunctive norm ($M = 3.25, SD = 1.55; t(322) = 2.15, p = .03, d = .24$). No other differences between conditions were significant.

Interactions of subject variables and norm-type

A range of demographic variables interacted with the effect of norms on several judgments. These interaction factors were analysed by splitting them into ‘Low’ and ‘High’ using the median response. These interactions are presented in full in Appendix J. A summary of overall findings is presented below.

Age. Similar to Study 2, when age was split into two levels using the median, participants’ age significantly interacted with the effect of norm-type on concern about earthquakes. However, there were no differences between conditions among the low age group, contrary to the findings of Study 2 and predictions that norm effects would be stronger among younger participants because they are less likely to have formed an opinion about earthquakes. Among older participants, the descriptive norm and combination of both types produced higher concern about earthquakes than did the injunctive norm. This interaction shows that age had an influence on norm effects opposite to that predicted, and that descriptive norms are more effective at increasing concern about earthquakes than injunctive norms.

Efficacy. Unlike the previous studies, judgments of the efficacy of strengthening buildings, when split using the median, interacted with the effect of norm-type on support for the legislation. Among those who judged the efficacy as low, there were no differences in support between norm types. Among those who judged the efficacy as high, all norm conditions produced higher support for the legislation. This supports the prediction that norms would increase support for the legislation, and is consistent with the prediction from Study 2 that those with higher beliefs in the efficacy of strengthening buildings to reduce damage would be more affected by norms.

Experience. Unlike Study 1, earthquake experience did not interact with norm-type on any of the dependent variables when split into three levels. However, there was a marginal interaction with norm-type on concern about earthquake-prone buildings when experience was split using the median. The only difference between conditions was, as predicted, at the low level of experience, although counter to predictions the injunctive norm produced *lower* concern about earthquake-prone buildings than did the risk-prone condition.

Community identification. As with Study 2, when split using the median, community identification interacted with the effect of norm-type, although on judgments of the feasibility of strengthening rather than concern about earthquake-prone buildings.

Among those who are less connected with their community, all norm conditions increased judgments of feasibility compared to the risk-prone condition. Among those who are more connected, only the combined norms led to marginally higher judgments of feasibility than the risk-prone condition, and the injunctive norm led to the lowest judgments. This supports a combination of both norms as being the most effective, and fits with the findings of Study 2 that norms have effects at both levels of community identification but that those effects differ at each level.

Family living in Wellington. Number of family and close friends living in Wellington marginally interacted with the effect of norm-type on support for legislation. Among those with fewer close others living in Wellington, the injunctive and combined norms led to higher support than the descriptive norm. Among those with more close others in Wellington, all norm conditions produced higher support than the risk-prone condition. This interaction supports the prediction that having more close others in Wellington would increase the effect of norms as the referent group of that norm has more relevance to their decision.

Regressions

Table 4.2

Regression of subject and demographic variables on support for the earthquake-strengthening legislation.

Predictors	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Age	.00	.01	.01	.83
Gender	.00	.12	.00	1.00
Years in current city	-.01	.01	-.08	.05*
Knowledge	.09	.03	.11	.01*
Efficacy	.28	.04	.28	.00**
Experience	.09	.03	.11	.00**
Preparation	-.03	.03	-.04	.39

Note. ** = significant at the level of $p < .01$.

Table 4.2 presents the linear regression of predictor variables on support of the earthquake legislation. As with Studies 1 and 2, judgments of the efficacy of strengthening earthquake-prone buildings was the strongest predictor of support for the legislation ($\beta = .28, p < .01$). Knowledge about the legislation ($\beta = .11, p = .01$), and earthquake experience ($\beta = .11, p < .01$) were also significant, positive predictors of support. Finally, length of time lived in the current city was a negative predictor of support ($\beta = -.08, p = .05$).

Similarly to the regression on support, judgments of efficacy ($\beta = -.12, p < .01$) and earthquake experience ($\beta = -.13, p < .01$) negatively predicted comparative risk. That is, people who were more concerned and had more experience were less tolerant of the risk of earthquake-prone buildings. No other variables predicted comparative risk. As with Study 2, only efficacy predicted judgments of feasibility ($\beta = .23, p < .01$), suggesting again that those who see the strengthening work as effective at reducing damage in an earthquake are more likely to see the work as achievable.

As with Studies 1 and 2, concern about earthquake-prone buildings was positively predicted by efficacy ($\beta = .28, p < .01$) and gender ($\beta = .11, p < .01$), with females again showing higher concern ($M = 4.79, SD = 1.32$) than males ($M = 4.38, SD = 1.47; t(671) = 2.92, p < .01, d = .23$). Also consistent with Study 1, personal preparation positively predicted concern about earthquake-prone buildings ($\beta = .14, p < .01$).

Table 4.3

Regression of subject and demographic variables on concern about earthquakes in participant's city.

Predictors	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Age	-.01	.01	-.03	.49
Gender	.55	.15	.14	.00**
Years in current city	.02	.01	.14	.00**
Knowledge	.01	.04	.01	.84
Efficacy	.18	.05	.15	.00**
Experience	.03	.04	.03	.46
Preparation	.13	.04	.15	.00**

Note. * = significant at the level of $p < .05$. ** = significant at the level of $p < .01$.

Table 4.3 presents the linear regression of predictor variables on concern about earthquakes in general in the participant's city. As with the support regressions for all studies, judgments of efficacy positively predicted concern about earthquakes ($\beta = .15, p < .01$). Neither knowledge of the legislation nor earthquake experience predicted concern, while length of time that the participant had lived in their current city ($\beta = .14, p < .01$) and earthquake preparation ($\beta = .15, p < .01$) were positive predictors. Lastly, as with Studies 1 and 2 and the previous regression on concern about earthquake-prone buildings, gender predicted concern ($\beta = .14, p < .01$), whereby women expressed greater concern about earthquakes ($M = 4.46, SD = 1.41$) than did men ($M = 3.91, SD = 1.69; t(141.48) = 3.19, p < .01, d = .54$).

Discussion

Study 3 used the same norm messages as Study 2, but extended the previous research in several ways. The survey used a sample from Palmerston North to allow for comparisons with a city which should be less involved with the issue of earthquake-prone buildings, and therefore more influenced by social norms, and was conducted online, allowing for a larger sample to be collected from Wellington. While the expected interaction of location and norm-type was not found, this study demonstrated clear effects

of norms on a range of earthquake-related judgments, as well as replicating the predictors of risk perceptions found in the previous two studies.

As expected, participants in Wellington knew more about the legislation, were less tolerant of earthquake risk compared to other risks, were more concerned about earthquakes, and indicated marginally stronger support for the strengthening legislation than did the Palmerston North participants. Overall, these differences suggest that the inclusion of Palmerston North participants produced the desired sample who were less invested in the issue of earthquake resilience. The design of Study 3 therefore achieved the aim of testing whether reducing issue involvement and prior opinions would increase norm effects.

However, the predicted interaction between norm effects and participant location was not found, with the Palmerston North sample no more affected by normative information than the Wellington sample. This contradicts research showing that norms are more effective when the recipient is not already involved in the issue (Goldstein et al., 2007; Myers, 2002). Possibilities, such as the distance of the referent group, might explain why the predicted interaction between location and norm effects was not found in the present study. While residents of Palmerston North in general perceive themselves to be less at risk of earthquakes, the norms provided to this sample still used Wellington as the referent group which may have limited the impact of the information. Further, two serious events in Christchurch and two considerable shakes near Wellington over the past five years might still have led people from Palmerston North to form opinions about earthquake preparation, albeit weaker than those held by residents of Wellington. This idea is speculative, however. Similar research in future might include a question on the extent to which participants were personally impacted by earthquakes in other parts of the country.

Several effects of norm-type were identified independent of participant location. The combination of both norms led to the highest support for the legislation, judgments of the feasibility of the strengthening work, and community identification. Differences in the effects of the descriptive versus injunctive norms varied, with the injunctive more effective at increasing support but the descriptive more effective at increasing judgments of feasibility and community identification. However, as predicted, using both norms in conjunction produced the most positive judgments of the legislation. This is a much stronger result than those observed in Study 2, and it is possible that the sample size

required in Study 2 was calculated based on stronger previous effects than can be found in the context of this research. An important implication, therefore, is that expected effects ought to be underestimated when calculating sample sizes *a priori*.

Predictors of support for the legislation

Study 3 replicated the findings of Studies 1 and 2 that judgments of the effectiveness of strengthening earthquake-prone buildings was the strongest predictor of support for the earthquake strengthening legislation, as well as predicting risk tolerance, judgments of the feasibility of the work, and concern about both earthquakes in general and earthquake-prone buildings. Knowledge of the legislation also predicted support, while earthquake experience predicted both support and comparative risk. Length of time lived in their current city positively predicted participants' concern about earthquake-prone buildings but negatively predicted support. Personal earthquake preparation only predicted both types of concern. Lastly, as with the previous two studies, gender predicted concern whereby women were more concerned about earthquake-prone buildings and earthquake in general than were men.

These findings suggest that independent of the experimental manipulations, particular individual differences could be used to predict that individual's support for strengthening legislation, risk tolerance, judgments of feasibility, and concern about both earthquakes in general and earthquake-prone buildings. Together with the first two studies, the predictive power of efficacy suggests that targeting this judgment about the effectiveness of preparation measures may increase the success of risk communications attempting to encourage earthquake preparation.

Potential factors influencing norm effects

As with Study 2, a range of demographic and subject variables interacted with norm effects. Age again acted as an interaction factor, although in the opposite direction to that predicted, where norm effects on concern about earthquakes were found only among the older participants. This suggests that age does influence norm effects, but is not necessarily positively associated with issue-involvement. Unlike Study 2, norms increased support for the legislation compared to the risk-prone condition for those who had a high belief in the efficacy of strengthening buildings to reduce damage, while there were no differences among those with a low belief. This interaction shows the importance of considering beliefs about the actual task such as whether or not it will achieve its purpose. Community identification again interacted with norm-type, although on a

different measure: judgments of feasibility. As with Study 2, norm effects were demonstrated at both the low and high level, but those effects differed. Finally, as predicted, those with more family and close friends living in Wellington indicated stronger support for the legislation in all norm conditions compared to the risk-prone condition.

These interactions demonstrate that the effect of norms can be influenced by a range of individual differences within the audience of the communication. Although the interactions here do not clearly show the expected effect of increased issue-involvement reducing the effect of norms, they do support the use of a combination of both types as being the most effective.

Paper versus online survey methods

The extension of Study 2 by using an online survey for the same questionnaire in Study 3 allowed for a comparison with responses on these two formats. Unlike previous research (e.g., Lonsdale et al., 2006), the short questionnaire and use of an intercept method rather than mail recruitment for paper-based surveys did not allow for a comparison of some response data such as drop-out rates. The online recruitment for the digital survey elicited a sample with a younger age distribution and higher gender ratio, which in turned contributed to two differences on target variables: knowledge about the legislation and interpersonal descriptive norms. However, several other differences emerged independent of the age difference, such as the paper-based sample showing lower judgments of feasibility and higher risk tolerance than the online sample. These differences in target measures suggest that the format of surveys and how participants are recruited may influence judgments. The practicality of collecting data online means that this method ought not to be discounted (Teo, 2013), but the results suggest, in line with the observations of previous researchers (e.g., Wood et al., 2006), that the influences of the survey and recruitment method ought to be considered when designing and analysing research.

Limitations and strengths

One limitation of the study is the use of a Wellington reference group for both Wellington and Palmerston North samples. Because earthquakes are less prevalent an issue in Palmerston North, perceptions of the risk would have been different to those of the risk in Wellington. The aim was to test judgments of the same risk, that of earthquake-prone buildings in Wellington, and so the information was kept consistent between

locations. Norms have been shown to be more effective with a reference group congruent to the audience (Neighbours et al., 2010), and therefore Palmerston North participants may have responded differently had the norms referred to behaviours within their community. However, the results partially supported the predictions and therefore the impact of this limitation is likely small.

A second limitation of this study, the lower age of participants and gender ratio, stems from the online recruitment method employed, but this presents a useful insight into the suitability of this method. Participants who responded to the online survey were younger and more likely to be female than those completing the paper-based survey, and the differences in both subject and dependent measures between the media indicates that these factors are having an effect on responses. Studies 2 and 3 demonstrate an influence of age, but not of gender. However, both age (e.g., Wang, Wu, & Wang, 2009) and gender (e.g., Tarhini, Hone, & Liu, 2014) have been shown to moderate the effect of norms on behavioural intentions, although not in the area of risk behaviour and not consistently. While this issue may be mitigated by using emailing lists rather than social media, it is still likely that online samples will be different, and less representative of the general NZ population, compared to samples using an intercept method. This demonstrates the significant benefit of using paper questionnaires to obtain more representative samples.

Furthermore, the online sample differed from the paper sample on a range of responses including knowledge, judgments of feasibility, risk tolerance, and interpersonal norms. While the overall results from the Wellington samples in Studies 2 and 3 are fairly consistent, these differences support the view that comparisons ought to be made to paper-based research when converting to online methods.

As well as allowing comparisons between paper-based and online surveys, this study contributes to a further understanding of norms. The effects of norm information on support only within the Palmerston North sample supports the theory that norms work better when they are not competing with previous information (Myers, 2002). The large number of interactions reaffirms the importance of considering a range of individual differences and demographic variables when using norms and examining earthquake risks, while the larger Wellington sample allows these interactions to be understood more clearly. The results of the study show that norms could be a useful way to increase support for the legislation, and affect other risk judgments more generally.

Future directions

One potential follow-up to this study would be to repeat the experiment with a Palmerston North sample, but use a more congruent norm referent group to address the limitation of reference and audience consistency mentioned above. Similar findings would strengthen the suggestions made here. Another option would be to further explore the role of issue-involvement by repeating the study within a Wellington sample but with legislation of which participants are less likely to be aware, such as carbon tax. Climate change still presents a serious, large-scale issue and has often been used in applications of norms, but the associated risks may seem more distant to people from Wellington compared to the risk of earthquakes. Regardless of paradigms used to extend this research, the findings here suggest that a range of potential factors ought to be considered. Subsequent experiments could gather data on other differences such as ethnicity (Walker et al., 2006) to further understanding of what factors influence the effects of norm information on risk-related behaviour and decisions.

Chapter 5: General Discussion

This thesis applied two types of techniques used in risk communications to the context of earthquake-strengthening legislation. Study 1 examined attribute valence and numerical format framing, and Studies 2 and 3 examined descriptive and injunctive norms. The findings are summarized below, and then insights for both future research and practical applications are discussed.

Summary of overall findings

Framing effects. Study 1 tested how judgments about earthquake legislation were affected by two different types of message framing manipulation: valence and numerical format. Presenting the number of earthquake-prone buildings (i.e., negative frame) led to lower risk tolerance than did presenting the number of acceptably resilient buildings (i.e., positive frame). Further, presenting the number of buildings as a frequency led to higher concern about the issue and judgments of the feasibility of the strengthening work compared to presenting the number as a percentage.

While the two framing types did not interact, two demographic variables influenced the effect of the manipulations. Gender influenced the effect of valence framing, where males demonstrated higher support than females when presented with the positive frame but no difference when presented with the negative frame. Further, earthquake experience influenced the effect of numerical format, with higher support in the frequency condition compared to the percentage condition, but only among those participants with little to no earthquake experience.

Overall, these findings suggest that a message using a negative valence and frequency format is more effective at increasing support for earthquake-strengthening legislation than a positive percentage, but that individual differences such as gender and level of experience of the risk should be considered when deciding how to frame messages.

Norm effects. Studies 2 and 3 tested the effects of norms on the same judgments about earthquake legislation as Study 1. While Study 2 did not produce significant clear-cut effects, Study 3 demonstrated effects of norms on support for the legislation, judgments of the feasibility of the strengthening work, and community identification. There was some variation as to whether the descriptive or injunctive norms were more effective, but overall the results suggest that a combination of the two types of norm is preferable for targeting a wide range of judgments.

As with Study 1, a range of variables interacted with the effect of norms on earthquake judgments including age, knowledge about the legislation, and earthquake experience, adding to the idea that details of the intended audience of a risk communication ought to be considered in its design.

Predictors of support for the legislation. Across all three studies, the level to which participants viewed the strengthening work as effective in reducing potential damage in an earthquake predicted: their concern about earthquake-prone buildings, their risk tolerance for earthquakes, their judgments about the feasibility of the strengthening work, and their support for the legislation. This suggests that a key perception to target is the belief that strengthening work, and preparation in general, is effective at reducing damage in an earthquake. Knowledge of the earthquake-strengthening legislation also predicted support for the legislation in all studies, so another potential strategy for risk communications is to convey additional objective information about the legislation.

Comparison to previous framing research

The results of Study 1 are largely consistent with previous research. The frequency format led to lower risk tolerance than did the percentage format (Peters et al., 2011; Slovic et al., 2000) and the negative frame led to lower risk tolerance than did the positive frame (Mitchell et al., 2015; McClure et al., 2009), although the evidence for the latter is weaker. The majority of previous studies which use these two types of message framing focus on areas other than earthquake risk, such as the health domain (e.g., Peters et al., 2011). Research focusing on earthquakes which does look at message framing has used goal or outcome valence manipulations (e.g., McClure et al., 2009) rather than the attribute valence manipulation used here. Similarly, research testing numerical format framing in the risk domain tends to vary the expression of the likelihood of that risk (e.g., Visschers et al., 2009), rather than a specific detail such as the number of earthquake-prone buildings. Study 1 of this thesis therefore demonstrates consistency with the findings of previous research, but adds to those findings by applying the concepts of numerical format framing and attribute valence framing to the context of earthquake risk, to which they have seldom been applied previously.

As was demonstrated by Hasseldine and Hite (2003), positive and negative frames had a differential effect depending on gender. Although the difference found here is in an inverse direction to that found by these authors, this research extends their finding to an earthquake context, and shows that gender effects might apply to attribute valence as well

as goal valence manipulations. This result suggests that gender is important to consider when designing risk communication, particularly if the target audience differs in gender composition.

In sum, the framing effects shown in Study 1 demonstrate considerable consistency with previous research, but extend that previous research in novel ways which are both theoretically and practically useful.

Comparison to previous norm research

Studies 2 and 3 extend the well-replicated effects of norms on behaviours in diverse domains such as environmental (e.g., Goldstein et al., 2007; Demarque et al., 2015) and health (e.g., binge-drinking: Neighbors et al., 2012). The findings here are largely consistent with previous literature showing that a combination of the two types of norms, descriptive and injunctive, is the most effective at influencing judgments about behaviours (e.g., Hamann et al., 2015; Schultz et al., 2007). However, the current studies extend the previous research in three important ways. Firstly, the successful application of norms to increasing support for earthquake legislation extends these theoretical concepts beyond the application of subjective norms to individual earthquake preparation (McIvor & Paton, 2007) and the non-experimental identification of perceived norms (Becker et al., 2014). The current research suggests that these norm concepts, used frequently and successfully in a variety of domains, offer significant potential for both earthquake risk and natural hazards more generally.

Secondly, this research extends the type of behaviour to which norms have been applied. Norms previously have been tested with different types of behaviour, such as Park and Smith's (2007) study comparing talking with family about becoming an organ donor and signing the registry, but these are still specific behaviours which an individual might easily carry out. The use of earthquake-strengthening legislation meant that a specific behaviour was not targeted in the same way. Instead the norms referred to the behaviour of supporting a larger action (strengthening buildings). Therefore, the successful application of norms to influence judgments about the legislation identifies a new way in which these norm concepts can be used.

Lastly, as with the framing effects in Study 1, the current research took into consideration a range of factors which potentially impact the effect of norms. While findings for interpersonal norms and community connectedness did not support the predictions based on previous literature (e.g., Smith et al., 2012; Neighbors et al., 2011,

respectively), we identified several other relevant interaction factors such as age and knowledge. In addition, these interactions are consistent with the idea that norms have a greater effect in novel contexts (Goldstein et al., 2007) when there are no (or weak) previously-held opinions (Myers, 2002). The results therefore support the suggestion that issue-involvement influences norm effects, and contribute a clearer understanding of what factors drive these influences and how.

Applications

The use of a specific and real-world context means that the findings of this thesis have direct applications. This legislation was still in the process of being read and amended by the government when the first two studies of this thesis were conducted. The implications and ramifications of the Act are therefore currently and highly relevant. Given that many building owners in Wellington are struggling to pay for the work required by the earthquake legislation (Winter, 2016), knowing how to garner the support of the public will prove useful if the council increases financial assistance when that funding could be spent elsewhere. Further, the WCC is drafting a plan for dealing with earthquake risk that includes requiring homes which do not fall under the legislation to also be strengthened and carrying out more extensive preparation which could spend money from rate payers (Forbes, 2016). Implementing this strategy would likely require public consultation and support, to which this research therefore has direct benefits.

Additionally, the legislation targeted applies nationally, not just to Wellington. While Auckland, NZ's largest city, has a lower risk of earthquakes (see Figure 1.1), 4,932 buildings in Auckland are below the 34% standard (Brower, 2015). Once the legislation is finalized, it may be necessary to use taxpayer money for strengthening work throughout NZ, especially for public and heritage buildings. The present findings have a direct application in showing how to increase public support regarding this specific legislation. For conveying statistical information about a risk, Study 1 suggests that a negative frequency is most effective, although aspects of the audience such as gender and experience of the risk ought to be considered. Study 2, and more so Study 3, demonstrate that norms can be used to increase support for the legislation. A combination of both types, descriptive and injunctive, is likely the best option, however as with framing effects aspects of the intended audience ought to be considered.

The robustness of the effects tested in this thesis, demonstrated by the diverse domains in which they have been successfully applied previously, and which now

includes earthquake-strengthening legislation, suggests that these effects can also be extended to other issues in other areas. For example, all 120 of the Civil Defence centres in Wellington region will no longer stock survival supplies such as stretchers and blankets, with citizens urged to prepare so as to be self-reliant (Shadwell, 2016). This move has been met with some hesitancy, so both framing and norms offer potential ways of designing communications so as to increase public support for individual preparation rather than reliance on emergency services.

Both framing and norm effects have been infrequently applied in NZ research. While earthquakes pose a considerable risk, other hazards and legislation exists that could benefit from applying the current research findings. For example, climate change poses a serious risk to NZ, given factors such as the significant amount of coastline, and the large agricultural industry means that the nation's greenhouse gas emissions are considerable. As a result, the government is discussing an increase in emission taxes charged to polluting industries, which would translate into a negative financial impact on average citizens (Ministry for the Environment, 2016). Both the effects of framing and norms demonstrated in this thesis could be used to increase public support for this climate change legislation.

Limitations and strengths

Across all three studies, a significant number of participants failed the manipulation check questions. Even in Study 3, where the survey programme required participants to stay on the scenario page for at least 60 seconds, the error rate was around 20%. This suggests that the manipulated information may not have been sufficiently salient. Further, the surveys were kept short so as to maximize participation and minimize drop-out. While participants understood the questions, single-items may have not captured judgments as well as multi-item scales. Future research could increase salience in ways which are achievable for public messages, such as through repetition or increasing visual impact beyond the bolded text used here, and including more items to more accurately capture judgments.

Although the range of items used to measure judgments was limited, the studies tested for a variety of interaction variables identified in previous research. By examining these factors within a single sample, and repeatedly within the same population, the confounds entailed by comparing studies from different locations are reduced. Further, this thesis acts as its own replication, with the repetition of the experiment from Study 2

with a larger sample in Study 3, and several predictors showing consistent effects across all three studies. This also allowed for a comparison of paper versus online survey methods.

A significant strength of these studies is their applicability. By taking social-psychological concepts and applying them to a current real-world issue, the results become directly relevant to the context from which they were found. This direct linkage limits any discrepancies between how effects manifest in theoretical versus practical situations.

Future studies

Future research in risk on earthquakes and other hazards could extend the approach used in this thesis to address other factors such as socio-economic status, cultural influences, and location. For example, different risk perceptions might be found among rural communities compared to the urban ones used in this thesis. For these rural communities, earthquakes pose less material risk in terms of building collapse but significant risk to livelihoods (Morrissey & Reser, 2007), by incapacitating infrastructure such as roads which are used to transport out agricultural goods and transport in necessities such as food. A similar study applied in this context could extend the range of situations in which framing and norms can be used.

Further, the interaction effects of factors such as age and knowledge support the suggestion drawn from previous literature that message manipulations, both framing and norms, have a larger impact on audiences less involved with the target issue. As mentioned above, a new amendment to climate change legislation in NZ offers another practical, real-world issue to which the findings of this research might be applied. Not only will this strengthen the idea that the implications can be extended to other types of risk, citizens of Wellington are less likely to be aware of the current legislation or the proposed changes than they are of the earthquake legislation. An extension of this nature would add another area in which framing and norms may be used, as well as inform best practices for communicating another, also important, piece of legislation.

Chapter 6: Conclusion

Earthquakes pose a serious risk to the city of Wellington, NZ, as well as to many other cities and countries worldwide. Understanding how best to communicate the value of legislation aimed at increasing survival in seismic events is therefore an important endeavour. This thesis offers two potential methods: framing and norms. The effects demonstrated by these social-psychological concepts show that the way in which information is presented can alter judgments about earthquake legislation. The possibilities for applications of the knowledge contributed by this research are numerous, both within the earthquake domain and as a tool in risk communications more generally. The next step is to test those possibilities, so as to continue expanding both knowledge of how framing and norms work, and the contexts in which they can be successfully and beneficially applied.

References

- Allcott, H. (2011). Social norms and energy conservation. *Journal of Public Economics*, 95, 1082-1095. doi: 10.1016/j.jpubeco.2011.03.003
- Anonymous. (2011, March 15). Earthquake-prone buildings in Wellington. *The Dominion Post*. Retrieved from: <http://www.stuff.co.nz/dominion-post/topics/subjects/4764721/Earthquake-prone-buildings-in-Wellington>
- Anonymous. (2013, August 9). Measuring the cost of time. *The Dominion Post*. Retrieved from: <http://www.stuff.co.nz/dominion-post/comment/editorials/9018996/Editorial-Measuring-the-cost-of-time>
- Arlikatti, S., Lindell, M. K., & Prater, C. S. (2007). Perceived stake-holder role relationships and adoption of seismic hazard adjustments. *International Journal of Mass Emergencies and Disasters*, 25(3), 218-256.
- Armas, I. (2006). Earthquake risk perception in Bucharest, Romania. *Risk Analysis*, 26(5), 1223-1234.
- Armas, I. & Avram, E. (2008). Patterns and trends in the perception of seismic risk. Case study: Bucharest Municipality/Romania. *Natural Hazards*, 44(1), 147-161.
- Aron, A., Aron, E. N., Smollan, D. (1992). Inclusion of Other in the Self Scale and the structure of interpersonal closeness. *Interpersonal Relations and Group Processes*, 63(4), 596-612.
- Asch, S. E. (1951). Effects of group pressure upon the modification and distortion of judgments. *Groups, leadership and men; research in human relations*. (pp. 177-190). Carnegie Press, Oxford.
- Ballantyne, M., Paton, D., Johnston, D., Kozuch, M., & Daly, M. (2000). Information on volcanic and earthquake hazards: The impact on awareness and preparation. *Institute of Geological and Nuclear Sciences Report*, 2.
- Becker, J., Paton, D., Johnston, D., & Ronan, K. (2014). Societal influences on earthquake information meaning-making and household preparedness. *International Journal of Mass Emergencies and Disasters*, 32(2), 317-352.
- Berscheid, E., Snyder, M., & Omoto, A. M. (1989). The Relationship Closeness Inventory: Assessing the closeness of interpersonal relationships. *Journal of Personality and Social Psychology*, 57, 792-807.

- Bertolotti, M. & Catellani, P. (2014). Effects of message framing in policy communication on climate change. *European Journal of Social Psychology*, 44, 474-486. doi: 10.1002/ejsp.2033
- Bishop, B., Paton, D., Syme, G., & Nancarrow, B. (2000). Coping with environmental degradation: salination as a community stressor. *Network*, 12, 1-15.
- Block, L. G. & Keller, P. A. (1995). When to accentuate the negative: The effects of perceived efficacy and message framing on intentions to perform a health-related behaviour. *Journal of Marketing Research*, 32(2), 192-203.
- Brower, A. (2013, March 8). Time to put people before parapets. *The Dominion Post*, p. A13.
- Brower, A. (2015, August 11). Earthquake risk? Fix the parapets first. *New Zealand Herald*. Retrieved from: <http://www.nzherald.co.nz/opinion/news/article.cfm?c.id=466&objecid=11495333>
- Bubeck, P., Botzen, W. J. W., & Aerts, J. C. J. H. (2012). A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis*, 32(9), 1481-1495. doi: 10.1111/j.1539-6924.2011.01783.x
- Building (Earthquake-prone Buildings) Amendment Bill 2013, Government Bill 182-1, <http://www.legislation.govt.nz/bill/government/2013/0182/latest/DLM5616102.html>
- Chang, T-S. (2004). The results of student ratings: Paper vs. online. *Journal of Taiwan Normal University: Education*, 49(1), 171-186.
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12, 105-109.
- Cialdini, R. B. (2007). Descriptive social norms as underappreciated sources of social control. *Psychometrika*, 72(2), 263-268.
- Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., & Winter, P. L. (2006). Managing social norms for persuasive impact. *Social Influence*, 1, 3-15.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58 (6), 1015-1026.
- Crawford, L. A. & Novak, K. B. (2010). Beliefs about alcohol and the college experience as moderators of the effects of perceived drinking norms on student alcohol use. *Journal of Alcohol and Drug Education*, 54(3), 69-86.

- De Boer, J., Botzen, W. J. W., & Terpstra, T. (2014). Improving flood risk communication by focusing on prevention-focused motivation. *Risk Analysis*, 34(2), 309-322. doi: 10.1111/risa.12091
- Demarque, C., Charalambides, L., Hilton, D. J., & Waroquier, L. (2015). Nudging sustainable consumption: The use of descriptive norms to promote a minority behavior in a realistic online shopping environment. *Journal of Environmental Psychology*, 43, 166-174. doi: 10.1016/j.jenvp.2015.06.008
- De Martino, B., Kumaran, D., Seymour, B., & Dolan, R. J. (2006). Frames, biases, and rational decision-making in the human brain. *Science*, 313, 684-687. doi: 10.1126/science.1128356
- Deutsch, M. & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology*, 51(3), 629-636.
- Dickert, S., Kleber, J., Peters, E., & Slovic, P. (2011). Numeracy as a precursor to pro social behavior: The impact of numeracy and presentation format on the cognitive mechanisms underlying donation decisions. *Judgment and Decision Making*, 6(7), 638-650.
- Duval, T. S. & Mulilis, J. P. (1999). A person-relative-to-event (PrE) approach to negative threat appeals and earthquake preparedness: a field study. *Journal of Applied Social Psychology*, 29(3), 495-516.
- Dwyer, P. C., Maki, A., & Rothman, A. J. (2015). Promoting energy conservation behavior in public settings: The influence of social norms and personal responsibility. *Journal of Environmental Psychology*, 41, 30-34. doi: 10.1016/j.jenvp.2014.11.002
- Evans, L., Milfont, T. L., & Lawrence, J. (2014). Considering local adaptation increases willingness to mitigate. *Global Environmental Change*, 25, 69-75. doi: 10.1016/j.gloenvcha.2013.12.0123
- Fair, A. K., Murray, P. G., Thomas, A., & Cobain, M. R. (2008). Using hypothetical data to assess the effect of numerical format and context on the perception of coronary heart disease risk. *American Journal of Health Promotion*, 22, 291-296. doi: 10.4278/061030140R2.1

- Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Ferguson, E. & Gallagher, L. (2007). Message framing with respect to decisions about vaccination: The roles of frame valence, frame method and perceived risk. *British Journal of Psychology*, 98, 667-680. doi: 10.1348/000712607X190692
- Feygina, I., Jost, J. T., & Goldsmith, R. E. (2010). System justification, the denial of global warming, and the possibility of “system-sanctioned” change. *Personality and Social Psychology Bulletin*, 36(3), 326-338.
- Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000a). The affect heuristic in judgments of risks and benefits. *Journal of Behavioural Decision Making*, 13, 1-17.
- Finucane, M. L., Slovic, P., Mertz, C. K., Flynn, J., & Satterfield, T. A. (2000b). Gender, race and perceived risk: the ‘white male’ effect. *Health, Risk & Society*, 2(2), 159-172.
- Flynn, J., Slovic, P., Mertz, C. K., & Carlisle, C. (1999). Public support for earthquake risk mitigation in Portland, Oregon. *Risk Analysis*, 19(2), 205-216.
- Forbes, M. (2016, September 23). Wellington’s 30-point plan to deal with the devastation of a major disaster. Retrieved from: <http://www.stuff.co.nz/national/84690104/Wellingtons-30-point-plan-to-deal-with-the-devastation-of-a-major-disaster>
- Forsyth, D. R., van Vugt, M., Schlein, G., Story, P. A. (2015). Identity and sustainability: Localized sense of community increases environmental engagement. *Analyses of Social Issues and Public Policy*, 15(1), 233-252.
- Gesser-Edelsburg, A., Walter, N., Shir-Raz, Y., & Green, M. S. (2015). Voluntary or mandatory? The valence framing effect of attitudes regarding HPV vaccination. *Journal of Health Communication*, 20(11), 1287-1293. doi: 10.1080/10810730.2015.1018642
- Goldstein, N. J., Griskevicius, V., & Cialdini, R. B. (2007). Invoking social norms: A social psychology perspective on improving hotels’ linen-re-use programs. *Cornell Hotel and Restaurant Administration Quarterly*, 48(2), 145-150.

- Hamann, K. R. S., Reese, G., Seewald, D., & Loeschinger, D. C. (2015). Affixing the theory of normative conduct (to your mailbox): Injunctive and descriptive norms as predictors of anti-ads sticker use. *Journal of Environmental Psychology*, 44, 1-9.
- Hasseldine, J. & Hite, P. A. (2003). Framing, gender and tax compliance. *Journal of Economic Psychology*, 24, 517-533. doi: 10.1016/S0167-4870(02)00209-X
- Henrich, L., McClure, J., & Crozier, M. (2015). Effects of risk framing on earthquake risk perception: Life-time frequencies enhance recognition of risk. *International Journal of Disaster Risk Reduction*, 13, 145-150. doi: 10.1016/j.iidrr.2015.05.003
- Hurnen, F. & McClure, J. (1997). The effect of increased earthquake knowledge on perceived preventability of earthquake damage. *Australasian Journal of Disaster and Trauma Studies*. Available at: <http://www.massey.ac.nz/~trauma/issues/1997-3/mcclure.htm>
- Jacobson, R. P., Mortensen, C. R., Jacobson, K. J. L., & Cialdini, R. B. (2015). Self control moderates the effectiveness of influence attempts highlighting injunctive social norms. *Social Psychological and Personality Science*, 6(6), 718-726. doi: 10.1177/19485506115578463
- Joffe, H., Rossetto, T., & Adams, J. (eds.). (2013). *Cities at risk: Living with perils in the 21st century*. Dordrecht: Springer.
- Johnston, D., Becker, J., McClure, J., Paton, D., McBride, S., Wright, K.,... & Hughes, M. (2013). Community understanding of, and preparedness for, earthquake and tsunami risk in Wellington, New Zealand. In *Cities at risk: Living with perils in the 21st century*, (pp. 131-148). Dordrecht: Springer.
- Jonas, E. & Fritzsche, I. (2012). Follow the norm! Terror Management Theory and the influence of descriptive norms. *Social Psychology*, 43(1), 28-32. doi: 10.1027/18649335/a000077
- Kallgren, C. A., Reno, R. R., & Cialdini, R. B. (2000). A focus theory of normative conduct: When norms do and do not affect behavior. *Personality and Social Psychology Bulletin*, 26(8), 1002-1012.
- Khan, S., Crozier, M. J., & Kennedy, D. (2012). Influences of place characteristics on hazards, perception and response: a case study of the hazardscape of the Wellington Region, New Zealand. *Natural Hazards*, 62, 501-529. doi: 10.1007/s11069-012-0091-y

- Kredenster, M. S., Fabrigar, L. R., Smith, S. M., & Fulton, K. (2012). Following what people think we should do versus what people actually do: Elaboration as a moderator of the impact of descriptive and injunctive norms. *Social Psychological and Personality Science*, 3(3), 341-347. doi: 10.1177/1948550611420481
- Lapinski, M. K. & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, 15(2), 127-147.
- Lee, C. M., Geisner, I. M., Lewis, M. A., Neighbors, C., & Larimer, M. E. (2007). Social motives and the interaction between descriptive and injunctive norms in college student drinking. *Journal of Studies on Alcohol and Drugs*, 68, 714-721.
- Lehman, D. R. & Taylor, S. E. (1987). Date with an earthquake: Coping with a probable, unpredictable disaster. *Personality and Social Psychology Bulletin*, 13(4), 546-555.
- Levin, I. P., Gaeth, G. J., Schreiber, J., & Lauriola, M. (2002). A new look at framing effects: Distribution of effect sizes, individual differences, and independence of types of effects. *Organizational Behavior and Human Decision Processes*, 88(1), 411-429. doi: 10.1006-obhd.2001.2983
- Lonsdale, C., Hodge, K., & Rose, E. A. (2006). Pixels vs. paper: Comparing online and traditional survey methods in sport psychology. *Journal of Sport and Exercise Psychology*, 28, 100-108.
- Lucidi, F., Russo, P. M., Mallia, L., Devoto, A., Lauriola, M., & Violani, C. (2006). Sleep related car crashes: Risk perception and decision-making processes in young drivers. *Accident Analysis and Prevention*, 38, 302-309. doi: 10.1016/j.aap.2005.09.013
- Mashek, D., Cannaday, L. W., & Tangney, J. P. (2007). Inclusion of Community in Self Scale: A single-item pictorial measure of community connectedness. *Journal of Community Psychology*, 35(2), 257-275.
- McClure, J., Johnston, D., Henrich, L., Milfont, T. L., & Becker, J. (2015). When a hazard occurs where it is not expected: risk judgments about different regions after the Christchurch earthquakes. *Natural Hazards*, 75(1), 635-652. doi: 10.1007/s11069014-1338-6
- McClure, J., & Sibley, C. (2011). Framing effects on disaster preparation: Is negative framing more effective? *Australasian Journal of Disaster and Trauma Studies*, 1, 1-12.

- McClure, J., White, J., & Sibley, C. G. (2009). Framing effects on preparation intentions: Distinguishing actions and outcomes. *Disaster Prevention and Management: An international Journal*, 16(2), 187-199. doi: 10.1108/09653560910953252
- McClure, J., Willis, C., Johnston, D., & Recker, C. (2011). New Zealanders' judgments of earthquake risk before and after the Canterbury earthquake: Do they relate to preparedness? *New Zealand Journal of Psychology*, 40(4), 7-11.
- McIvor, D. & Paton, D. (2007). Preparing for natural hazards: Normative and attitudinal influences. *Disaster Prevention and Management*, 16(1), 79-88.
- Milfont, T. L., Richter, I., Sibley, C. G., Wilson, M. S., & Fischer, R. (2013). Environmental consequences of the desire to dominate and be superior. *Personality and Social Psychology Bulletin*, 39, 1127-1138.
- Milfont, T. L. & Sibley, C. G. (2014). The hierarchy enforcement hypothesis of environmental exploitation: A social dominance perspective. *Journal of Experimental Social Psychology*, 55, 188-193.
- Ministry for the Environment (2016, February). *The New Zealand Emissions Trading Scheme Evaluation 2016*. Retrieved from: [http://rma.govt.nz/sites/default/files/media/Climate %20Change/ets-evaluation-report.pdf](http://rma.govt.nz/sites/default/files/media/Climate%20Change/ets-evaluation-report.pdf)
- Mitchell, V. W., Bakewell, C., Jackson, P., & Heslin, C. (2015). How message framing affects consumer attitudes in food crises. *British Food Journal*, 117(8), 2200-2211. doi: 10.1108/BFJ-01-2015-0015
- Morrissey, S. A. & Reser, J. P. (2007). Natural disasters, climate change and mental health considerations for rural Australia. *Australian Journal of Rural Health*, 15, 120-125. doi: 10.1111/j.1440-1584.2007.00865.x
- Mulilis, J. P. (1999). Gender and earthquake preparedness. A research study of gender issues in disaster management: Differences in earthquake preparedness due to traditional stereotyping or cognitive appraisal of threat? *Australian Journal of Emergency Management*, 14(1), 41-50.
- Myers, D. G. (2002). *Social Psychology* (7th, International edition). New York, NY: McGraw-Hill.
- Neighbors, C., Jensen, M., Tidwell, J., Walter, T., Fossos, N., & Lewis, M. A. (2011). Social norms interventions for light and nondrinking students. *Group Processes & Intergroup Relations*, 14(5), 651-669. doi: 10.1177/1368430210398014

- Neighbors, C., LaBrie, J. W., Hummer, J. F., Lewis, M. A., Lee, C. M., Desai, S.,...Larimer, M. E. (2010). Group identification as a moderator of the relationship between perceived social norms and alcohol consumption. *Psychology of Addictive Behaviors*, 24(3), 522-528. doi: 10.1037/a0019944
- Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, 34(7), 913-923. doi: 10.1177/0146467208316691
- Oudhoff, J. P. & Timmermans, D. R. M. (2015). The effect of different graphical and numerical likelihood formats on perception of likelihood and choice. *Medical Decision Making*, 35, 487-500. doi: 10.1177/0272989X15576487
- Park, H. S., Klein, K. A., Smith, S., & Martell, D. (2009). Separating subjective norms, university descriptive and injunctive norms, and U.S. descriptive and injunctive norms for drinking behaviour intentions. *Health Communication*, 24, 746-751. doi: 10.1080/10410230903265912
- Park, H. S. & Smith, S. W. (2007). Distinctiveness and influence of subjective norms, personal descriptive and injunctive norms, and societal descriptive and injunctive norms on behavioural intent: A case of two behaviors critical to organ donation. *Human Communication Research*, 33, 194-218.
- Paton, D. & Johnston, D. (2001). Disasters and communities: Vulnerabilities, resilience, and preparedness. *Disaster Prevention and Management*, 10(4), 270-277. doi: 10.1108/EUM00000000005930
- Paton, D. & McClure, J. (2013). *Preparing for disaster: Building household and community capacity*. Springfield, IL: Charles C. Thomas, Publisher, Ltd.
- Peters, E., Hart, P. S., & Fraenkel, L. (2011). Informing patients: The influence of numeracy, framing, and format of side effect information on risk perceptions. *Medical Decision Making*, 31, 432-436. doi: 10.1177/0272989X10391672
- Real, K. & Rimal, R. N. (2007). Friends talk to friends about drinking: Exploring the role of peer communication in the theory of normative social behaviour. *Health Communication*, 22(2), 169-180
- Ritter, P., Lorig, K., Laurent, D., & Matthews, K. (2004). Internet versus mailed questionnaires: A randomized comparison. *Journal of Medical Internet Research*, 6(3), e29. doi: 10.2196/jmir.6.3.e29

- Salganik, M. J., Dodds, P. S., Watts, D. J. (2006). Experimental Study of Inequality and Unpredictability in an Artificial Cultural Market. *Science*, 311, 854-856. doi: 10.1123/science.1121066
- Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The destructive, and reconstructive power of social norms. *Psychological Science*, 18, 429-434.
- Shadwell, T. (2016, September 16). Wellington's Civil Defence Centres reformed into 'Community Emergency Hubs', which won't stock survival supplies. *The Dominion Post*. Retrieved from: <http://www.stuff.co.nz/dominion-post/news/84349936/wellingtons-civil-defence-centres-reformed-into-community-emergency-hubs-which-wont-stock-survival-supplies>
- Slovic, P., Monahan, J., & MacGregor, D. G. (2000). Violence risk assessment and risk communication: The effects of using actual cases, providing instruction, and employing probability versus frequency formats. *Law and Human Behavior*, 24, 271-296. doi: 10.1023/A:1005595519944
- Smith, N. (2015, May 10). *More targeted approach to earthquake-prone buildings*. Retrieved from <http://www.beehive.govt.nz/release/more-targeted-approach-earthquake-prone-buildings>
- Smith, J. R., Louis, W. R., Terry, D. J., Greenaway, K. H., Clarke, M. R., & Cheng, X. (2012). Congruent or conflicted? The impact of injunctive and descriptive norms on environmental intentions. *Journal of Environmental Psychology*, 32, 353-361. doi : 10.1016/j.envp.2012.06.001
- Solberg, C., Rossetto, T., & Joffe, H. (2010). The social psychology of seismic hazard adjustment: re-evaluating the international literature. *Natural Hazards and Earth System Sciences*, 10, 1663-1677. doi: 10.5194/nhess-10-1663-2010, 2010
- Spittal, M. J., McClure, J., Siegert, R. J., & Walkey, F. H. (2005). Optimistic bias in relation to preparedness for earthquakes. *Australasian Journal of Disaster and Trauma Studies*, 1. Available at: <http://www.massey.ac.nz/trauma/issues/2005-1/spittal.htm>
- Spittal, M. J., McClure, J., Siegert, R. J., & Walkey, F. H. (2008). Predictors of two types of earthquake preparation: Survival activities and mitigation activities. *Environmental Behaviour*, 40(6), 798-817. doi: 10.1177/0013916507309864

- Tangari, A. H., Burton, S., & Davis, C. (2014). Do they have your number? Understanding the moderating role of format effects and consumer numeracy for quantitative front of-package nutrition claim. *The Journal of Consumer Affairs*, 48, 620-633. doi: 10.1111/joca.12041
- Tarhini, A., Hone, K., & Liu, X. (2014). Measuring the moderating effect of age and gender on e-learning acceptance in England: A structural equation modelling approach for an extended technology acceptance model. *Journal of Educational Computing Research*, 51(2), 163-184. doi: 10.21190/EC.51.2.b
- Teo, T. (2013). Online and paper-based survey data: Are they equivalent? *British Journal of Educational Technology*, 44(6), e196-198. doi: 10.1111/bjet.12074
- Terpstra, T., Zaalberg, R., de Boer, J., & Botzen, W. J. W. (2014). You have been framed! How antecedents of information need mediate the effects of risk communication messages. *Risk Analysis*, 34(8), 1506-1520. doi: 10.1111/risa.12181
- Terrier, L. & Marfaing, B. (2015). Using social norms and commitment to promote pro environmental behavior among hotel guests. *Journal of Environmental Psychology*, 44, 10-15. doi: 10.1016/j.jenvp.2015.09.001
- Terry, D. J. & Hogg, M. A. (1996). Group norms and the attitude-behavior relationship: A role for group identification. *Personality and Social Psychology Bulletin*, 27, 585-600.
- Tropp, L. R. & Wright, S. C. (2001). Ingroup identification as the inclusion of ingroup in the self. *Personality and Social Psychology Bulletin*, 27(5), 585-600.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.
- Vischers, V. H. M., Meertens, R. M., Passchier, W. W. F., & de Vries, N. N. K. (2009). Probability information in risk communication: A review of the risk literature. *Risk Analysis*, 29(2), 267-287. doi: 10.1111/j.1539-6924.2008.01137.x
- Walker, G. J., Courneya, K. S., & Ding, J. (2006). Ethnicity, gender, and the Theory of Planned Behavior: The case of playing the lottery. *Journal of Leisure Research*, 38, 224-248.
- Wang, Y., Wu, M., & Wang, H. (2007). Investigating the determinants of age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92-118. doi: 10.1111/j.1467-8535.2007.00809.x

- Wellington City Council. (n.d.). *Earthquake-prone buildings*.
- Wellington City Council. (2015, November 20). *List of earthquake-prone buildings as at 20/11/2015*. Retrieved from: <http://wellington.govt.nz/~media/services/rates-and-property/earthquake-prone-buildings/files/eqp-building-list.pdf>
- Whitehead, L. (2011). Methodological issues in internet-mediated research: A randomized comparison of internet versus mailed questionnaires. *Journal of Medical Internet Research*, 13(4). e109. doi: 10.2196/jmir.1593
- Winter, C. (2016, May 19). Cost of keeping heritage buildings sage means they should be restricted – report. Retrieved from: <http://www.stuff.co.nz/business/80114202/quakerisk-heritage-buildings-costly-need-more-resourses>
- Wood, E., Nosko, A., Desmarais, S., Ross, C., & Irvine, C. (2006). Online and traditional paper-and-pencil survey administration: Examining experimenter presence, sensitive material and long surveys. *The Canadian Journal of Human Sexuality*, 15(3-4), 147-155.
- Yang, D. (2013). The communication effects of audience situation and message framing on smoking cessation. *International Journal of Management, Economics and Social Sciences*, 2(4), 252-264.

Appendix A: Study 1 information sheet

Information Sheet: Strengthening Earthquake Prone Buildings
Application ID Number: 0000020938

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What is the purpose of this research?

- This research will allow us to examine how people feel about proposed earthquake legislation to strengthen buildings in New Zealand; whether they think it can be done and if it is worth the cost.

Who is conducting the research?

- We are a team of researchers in the School of Psychology at Victoria University of Wellington. Professor McClure is supervising this project. This research has been approved by the School of Psychology Human Ethics Committee under delegated authority of Victoria University of Wellington's Human Ethics Committee.

What is involved if you agree to participate?

- If you agree to participate in this study, you will complete a short survey where you will read a brief passage about the legislation and then respond to questions such as "How possible do you think it is to strengthen all earthquake-prone buildings in Wellington?"
- We anticipate that the survey will take you no more than five minutes to complete.
- During the research you are free to withdraw at any point before your survey has been completed.
- You will be rewarded for your participation with a chocolate bar.

Privacy and Confidentiality

- This survey is completely confidential. We want to make your responses unidentifiable so please do not put your name anywhere on the sheet.
- We will keep your survey sheets for five years after publication at which point they will then be destroyed.
- In accordance with the requirements of some scientific journals and organizations, the information from your survey that does not identify you may be shared with other competent researchers.
- An electronic version of the data will remain indefinitely in the custody of Professor McClure at Victoria University of Wellington.

What happens to the information that you provide?

- The overall findings will form part of a Master of Science thesis that will be submitted for assessment and stored in the University's library.

If you would like to know the results of this study, they will be available in October, 2016. If you leave your email address with us we will email the results at that time. If you choose to provide an email address to receive feedback, this address will be kept separate from the survey data.

Thank you for considering participation in this research.

Lauren Vinnell

Appendix B: Study 1 questionnaire

Please read the following passage carefully and then answer the questions on the next page. Do not refer back to the passage when answering the questions.

The government is currently working on legislation which would require the strengthening of earthquake-prone commercial, multilevel apartment, and public buildings. In high-risk zones such as Wellington, this legislation will give owners 15 years to bring buildings up to at least 34% of the standard required by the current building code. Otherwise, the buildings will need to be demolished. Of the 5,300 buildings in Wellington assessed under this legislation, approximately

Followed by one of the four frames:

Frequency negative: 700 have been deemed earthquake prone (that is, they do not meet the required standard)

Percentage negative: 13% have been deemed earthquake prone (that is, they do not meet the required standard)

Frequency positive: 4,600 have been deemed acceptably resilient (that is, they do meet the required standard)

Percentage positive: 87% have been deemed acceptably resilient (that is, they do meet the required standard)

PART 1. Questions about the passage

1. How many buildings out of the 5,300 assessed were mentioned in the passage? ☐ 4,600 ☐ 700
2. Were these buildings above or below the required standard? ☐ Below ☐ Above

PART 2. Questions about the legislation

The following questions relate to the earthquake strengthening legislation. Please answer by circling a number.

3. Before reading the above information, how much did you already know about this legislation?						
1 = Nothing	2	3	4 = Some	5	6	7 = A lot
4. Overall, how much do you support this legislation?						
1 = Not at all	2	3	4 = Partly	5	6	7 = Completely
5. How possible do you think it is to strengthen all earthquake-prone buildings in Wellington?						
1 = Impossible possible	2	3	4 = Unsure	5	6	7 = Very
6. How appropriate do you think the 15 year timeframe is?						
1 = Not long enough	2	3	4 = About right	5	6	7 = Too long
7. How appropriate do you think the standard set out in the legislation (34% of current building code) is compared to legislation on other risks (e.g. vehicle Warrant of Fitness)?						
1 = Not firm enough	2	3	4 = About right	5	6	7 = Too firm
8. Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?						
1 = Fully justified	2	3	4 = About right	5	6	7 = Excessive

PART 3. Questions about earthquakes

The following questions relate to earthquake knowledge and preparation. Please answer by circling a number.

9. How concerned are you about the issue of earthquake-prone buildings in Wellington?						
1 = Not at all	2	3	4 = Moderately	5	6	7 = Extremely
10. How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?						
1 = Not at all	2	3	4 = Some	5	6	7 = A lot
11. How much experience do you have of earthquakes?						
1 = None	2	3	4 = Some	5	6	7 = A lot
12. How much preparation have you made for the event of a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?						
1 = None	2	3	4 = Some	5	6	7 = A lot

PART 4. General questions

11. How old are you?
12. What is your gender?
13. How long have you lived in Wellington?

_____ years

☐ Female

☐ Male

_____ years

14. Do you work in an earthquake-prone building? ☐ Yes ☐ No ☐ Unsure
15. Do you live in an earthquake-prone building? ☐ Yes ☐ No ☐ Unsure

Appendix C: Study 1 debrief sheet

Debriefing Sheet: Strengthening Earthquake Prone Buildings
Application ID Number: 0000020938

Thank you for participating in this experiment.

This study examines what people think about proposed earthquake legislation regarding the strengthening of buildings in Wellington: whether they think it can be done and if it is worth the cost given the relative risk posed by earthquakes. The aim is to understand how these perceptions change when the number of buildings affected is *framed* (i.e. expressed) differently.

Research has shown that the way information is presented in messages can affect people's attitudes towards risk and preparation behaviours. There are two main ways of varying the information in these communication messages. The first way is to vary the *valence* of the information (i.e. whether it is positive or negative). The second way is to present the information either as a number or as a percentage.

Whether people think that the work is possible and that it is worth the cost may be influenced by the framing of the number of buildings affected by the legislation. This study has four versions, which differ in two aspects. Two versions have the number expressed positively (acceptable resilient), and two negatively (earthquake prone). The second aspect is whether the information is presented in a percentage or as a number.

How people respond to different framings is important to know for agencies that need to inform the public of the requirements of the legislation to maximize co-operation and to secure the most positive public reaction in terms of cost incurred for the strengthening work.

Thank you again for participating in this research.

Lauren Vinnell

Appendix D: Study 2 question table

Number	Question	'1' Anchor	'4' Anchor	'7' Anchor	Variable
3	Before reading the above information, how much did you already know about this legislation?	Nothing	Some	A lot	Subject
4	Overall, how much do you support this legislation?	Not at all	Partly	Completely	Dependent
5	How possible do you think it is to strengthen all 703 of these earthquake-prone building in Wellington?	Impossible	Unsure	Very possible	Dependent
6	Do you think 34% of the current building code is an appropriate standard compared to legislation on other risks (e.g. Vehicle Warrant of Fitness)?	Not firm enough	About right	Too firm	Dependent
7	Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?	Fully justified	About right	Excessive	Dependent
8	How concerned are you about the issue of earthquake-prone buildings in Wellington?	Not at all	Moderately	Extremely	Dependent
9	How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?	Not at all	Moderately	Extremely	Subject
10	How much preparation have your family/friends made for a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?	None	Some	A lot	Subject
11	How often do your family/friends tell you that you should prepare for a large earthquake?	Never	Sometimes	A lot	Subject
12	Circle the pair which best describes your connection with the Wellington community (C = Community, S = Self)				Subject

Note. Questions 1 and 2 were manipulation checks and are only reported in the body of the thesis.

Appendix E: Study 2 questionnaire

Please read the following passage carefully and then answer the questions on the next page. Do not refer back to the passage when answering the questions.

The New Zealand government is currently working on legislation that will require the strengthening of earthquake-prone commercial, multilevel apartment, and public buildings. In high-risk zones such as Wellington, this legislation will give owners 15 years to either bring buildings up to at least 34% of the standard required by the current building code or demolish them. Of the 5,300 buildings in Wellington assessed under this legislation, 703 buildings are classified as earthquake-prone.

This passage is followed by one of four norm messages:

Descriptive: Currently, Wellingtonians are strengthening an average of 72 earthquake-prone buildings a year to at least this standard, which means that at least 80% of these buildings will be strengthened within the 15 year time frame if this rate continues.

Injunctive: In a recent survey, 76% of Wellingtonians said they support this legislation requiring the strengthening of earthquake-prone buildings

Combined: Descriptive sentence followed by injunctive sentence

Risk-prone: The chance of these buildings collapsing or sustaining serious damage in an earthquake is about 10 to 20 times that of a new building at the same location.

PART 1. Questions about the passage

- How many buildings a year on average are being strengthened in Wellington? ☐ 0–100 ☐ 100+
- How many Wellingtonians in the previous survey supported the legislation? ☐ 0–50% ☐ 50%+

PART 2. Questions about the legislation

The following questions relate to the earthquake strengthening legislation. Please answer by circling a number.

3. Before reading the above information, how much did you already know about this legislation?	1 = Nothing	2	3	4 = Some	5	6	7 = A lot
4. Overall, how much do you support this legislation?	1 = Not at all	2	3	4 = Partly	5	6	7 = Completely
5. How possible do you think it is to strengthen all 703 of these earthquake-prone buildings in Wellington?	1 = Impossible	2	3	4 = Unsure	5	6	7 = Very possible
6. Do you think 34% of the current building code is an appropriate standard compared to legislation on other risks (e.g. Vehicle Warrant of Fitness)?	1 = Not firm enough	2	3	4 = About right	5	6	7 = Too firm
7. Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?	1 = Fully justified	2	3	4 = About right	5	6	7 = Excessive

PART 3. Questions about earthquakes

The following questions relate to earthquake knowledge and preparation. Please answer by circling a number.

8. How concerned are you about the issue of earthquake-prone buildings in Wellington?	1 = Not at all	2	3	4 = Moderately	5	6	7 = Extremely
9. How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?	1 = Not at all	2	3	4 = Moderately	5	6	7 = Extremely
10. How much preparation have your family/friends made for a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?	1 = None	2	3	4 = Some	5	6	7 = A lot
11. How often do your family/friends tell you that you should prepare for a large earthquake?	1 = Never	2	3	4 = Sometimes	5	6	7 = A lot

PART 4. General questions

12. Circle the pair which best describes your connection with the Wellington community (C = Community, S = Self).

1	2	3	4	5	6	7

13. How old are you? 14. What is your gender? 15. How long have you lived in Wellington?

_____ years

☐ Female ☐ Male

_____ years

16. Do you work in an earthquake-prone building? ☐ Yes ☐ No ☐ Unsure
17. Do you live in an earthquake-prone building? ☐ Yes ☐ No ☐ Unsure

Appendix F: Study 2 debrief sheet

Debriefing Sheet: Strengthening Earthquake-Prone Buildings
Application ID Number: 0000020938

Thank you for participating in this experiment.

This study examines what people think about proposed legislation regarding the assessing and strengthening of earthquake-prone buildings in Wellington; whether they think it is feasible and if it is worth the cost given the relative risk posed by earthquakes. The aim is to understand how these perceptions change when people are presented with different *social norms* (i.e. information about what is considered normal and desirable in Wellington).

Research has shown that the information about the behaviour and opinions of a person's social group can affect how they perceive that behaviour. This information can either be a *descriptive social norm*, which describes how common the behaviour is, or an *injunctive social norm*, which conveys whether others approve or disapprove of the behaviour.

Whether people support the strengthening legislation may be influenced by these different social norms. This study has four versions, which compare the two types of social norms. One condition in the study has a descriptive norm, which describes how many buildings a year are being strengthened and what that means for how many will be completed within the time frame. A second condition contains an injunctive norm which states how many people in a previous survey approved of the strengthening legislation. The third contains both types of norm, and the fourth contains neither type but instead gives information about the risk posed by earthquake-prone buildings.

Knowing how people respond to social norm information will help agencies to better inform the public of the requirements of the legislation. This will help them to maximize co-operation and secure the most positive public reaction to the cost of the strengthening work.

Thank you again for participating in this research.

Lauren Vinnell

MSc Student

Victoria University of Wellington

Appendix G: Study 2 interactions

The appendix reports the interaction analyses examining the extent to which demographic and other relevant variables interacted with the experimental manipulation in relation to earthquake-risk judgments. Here we report the specific results of these interaction analyses for each variable.

Age.

Figure G1. Interaction of age with norm condition on concern.

Age interacted with the effect of norm type on concern, $F(4, 249) = 2.84, p = .03$, $\eta_p^2 = .04$. Figure G1 presents the breakdown of this interaction using the two-level age variable. With younger participants, concern was higher when given the descriptive norm ($M = 5.07, SD = 4.21$) than the injunctive norm ($M = 4.21, SD = 1.58; t(46) = 2.07, p = .04, d = .61$) or the combination ($M = 3.93, SD = 1.29; t(57) = 3.40, p < .01, d = .90$). Concern in the injunctive condition and the combined condition was also lower than in the control condition ($M = 5.19, SD = 1.36; t(44) = 2.24, p = .03, d = .68$, and $t(55) = 3.57, p < .01, d = .96$, respectively). Lastly, there was a marginally significant difference between the control condition and the risk-prone condition ($M = 4.40, SD = 1.60; t(51) = 1.92, p = .06, d = .54$). These findings suggest that injunctive norms are less effective at increasing concern than descriptive norms, to the extent of nullifying the effect of that descriptive norm when both are presented together. Further, the lower concern in the risk-prone condition than the control condition suggests that providing participants with information about the danger of earthquake-prone buildings collapsing *decreases*

concern, perhaps due to risk denial or fatalism. Among the older participants, there were no differences between norm conditions for concern.

Figure G2. Interaction of norm condition and age on interpersonal injunctive norms.

There was a main effect of age on reports of interpersonal injunctive norms, $F(2, 180) = 11.45$, $p < .01$, $\eta_p^2 = .11$, whereby older participants tended to report stronger norms than younger participants. Age also interacted with the effect of norm type on interpersonal injunctive norms, $F(3, 184) = 3.94$, $p = .01$, $\eta_p^2 = .06$, as shown in Figure G2. At the lower age bracket, stronger interpersonal injunctive norms were reported in the descriptive condition ($M = 3.52$, $SD = 1.48$) than the injunctive condition ($M = 2.00$, $SD = 1.41$; $t(46) = 3.54$, $p < .01$, $d = 1.04$), the combined condition ($M = 2.67$, $SD = 1.49$; $t(57) = 2.20$, $p = .03$, $d = .58$), and the risk-prone condition ($M = 2.35$, $SD = 1.26$; $t(53) = 3.14$, $p < .01$, $d = .86$). These findings support the prediction that there is an association between social and perceived norms, although this association is less straightforward than expected. At the higher age bracket, conditions did not differ significantly.

Figure G3. Interaction of knowledge with norm condition on feasibility.

The effect of norm-type on feasibility interacted with knowledge about the legislation, $F(4, 250) = 3.42$, $p = .01$, $\eta_p^2 = .05$. Figure G3 presents this interaction, with knowledge split into 'Low' and 'High' using the median response of 3 on the scale. At the low level of knowledge, feasibility scores did not differ by condition. At the high level, feasibility judgments were significantly higher in the combined condition ($M = 5.00$, $SD = 1.38$) than in the descriptive condition ($M = 3.93$, $SD = 1.21$; $t(34) = 2.38$, $p = .02$, $d = .82$) and the control condition ($M = 3.89$, $SD = 1.78$; $t(57) = 2.51$, $p = .02$, $d = .67$).

These findings are contrary to predictions that those with more knowledge about the legislation would be less influenced by norms as they already have information to use in making their decisions. The results show the opposite; norm-type produced no differences among the high-knowledge groups, but the information combining both norm types increased perceptions of feasibility, significantly compared to the descriptive norm alone or the control condition.

Figure G4. Interaction of legislation knowledge with condition on interpersonal descriptive norms.

Knowledge also showed a main effect on interpersonal descriptive norms, $F(1, 185) = 11.11, p < .01, \eta_p^2 = .06$, where those who knew more about the legislation reported stronger interpersonal descriptive norms. Figure G4 presents the interaction of knowledge with the effect of norm-type on interpersonal descriptive norms, $F(3, 185) = 3.66, p = .01, \eta_p^2 = .06$.

Among the participants with less knowledge of the legislation, the descriptive norm led to stronger interpersonal descriptive norms ($M = 4.09, SD = 1.46$) than did the injunctive norm ($M = 3.00, SD = 1.65; t(59) = 2.72, p = .01, d = .71$) and the combined norms ($M = 2.96, SD = 1.80; t(59) = 2.69, p = .01, d = .70$). This supports the prediction that social norm information increases perceptions of interpersonal norms of the same type. Among participants with more knowledge of the legislation, the only significant difference was between the combined condition ($M = 4.68, SD = 1.29$) and the risk-prone condition ($M = 3.71, SD = 1.43; t(44) = 2.42, p = .02, d = .73$).

Figure G5. Interaction of community identification with norm condition on concern.

The effect of norm-type on concern about earthquake-prone buildings interacted with the effect of community identification, $F(3, 181) = 5.48, p < .01, \eta_p^2 = .08$. Figure G5 presents the breakdown of this interaction, with community identification split into ‘Low’ and ‘High’ using the median response of 3 on the ICS scale.

At the low identification level, there was higher concern in the descriptive condition ($M = 5.48, SD = 1.16$) than the risk-prone condition ($M = 4.37, SD = 1.42; t(52) = 3.16, p < .01, d = .88$). Concern was also lower in the combined condition ($M = 4.04, SD = 1.26$) than both the descriptive condition, $t(53) = 4.43, p < .01, d = 1.22$, and the injunctive condition ($M = 4.89, SD = 1.51; t(52) = 2.25, p = .03, d = .62$). These findings suggest that using both norm types reduces the individual effects of each type on concern. The difference between the descriptive norm and the risk-prone conditions suggest that of the two norm-types, descriptive norms have more influence on concern.

At the high identification level, there were no significant differences between any of the groups, contrary to the prediction that those who more strongly identify with their community would be more influenced by norm information using that community as a reference. It is possible that those who see their identity as a Wellingtonian as more important are more invested in their city and therefore have already established to what extent earthquake-prone buildings concern them.

Appendix H: Study 3 question table

Number	Question	'1' Anchor	'4' Anchor	'7' Anchor	Variable
5	Before reading the above information, how much did you already know about this legislation?	Nothing	Some	A lot	Subject
4	Overall, how much do you support this legislation?	Not at all	Partly	Completely	Dependent
5	How possible do you think it is to strengthen all 703 of these earthquake-prone building in Wellington?	Impossible	Unsure	Very possible	Dependent
6	Do you think 34% of the current building code is an appropriate standard compared to legislation on other risks (e.g. Vehicle Warrant of Fitness)?	Not firm enough	About right	Too firm	Dependent
7	Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?	Fully justified	About right	Excessive	Dependent
8	How concerned are you about the danger of earthquakes where you live?*	Not at all	Moderately	Extremely	Dependent
8	How concerned are you about the issue of earthquake-prone buildings in Wellington?	Not at all	Moderately	Extremely	Dependent
9	How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?	Not at all	Moderately	Extremely	Subject
11	How much experience do you have of earthquakes?	None	Some	A lot	Subject
12	How much preparation have you made for the event of a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?	None	Some	A lot	Subject
10	How much preparation have your family/friends made for a large earthquake?	None	Some	A lot	Subject
11	How often do your family/friends tell you that you should prepare for a large earthquake?	Never	Sometimes	A lot	Subject
12	Do you have many family members and/or close friends currently living in Wellington?	None	Some	A lot	Subject
12	Circle the pair which best describes your connection with the community where you live (S = Self, C = community)*				Subject

*Note. Question 1 asked where participants lived. Questions 2 and 3 were manipulation checks and are only reported in the body of the thesis. * = form of question depended on where participants indicated they lived.*

Appendix I: Study 3 questionnaire

Thank you for considering taking part in this short survey. The purpose of this research is to examine how people feel about legislation requiring the strengthening of earthquake-prone buildings. You don't need to know anything about the legislation already, just read the following questions carefully and give the answer which best reflects your opinion. Please try to answer all of the questions. The survey is completely anonymous, so no individual's responses can or will be identified. We anticipate that this research will take you no more than five minutes to complete. At the end, you'll have the chance to go into the prize draw for a \$50 supermarket gift card. If you would like to know more about the study before proceeding, please open the link below in a new tab:

http://vuw.qualtrics.com/SE/?SID=SV_daGEhBhfWavSg97

If you are happy to participate, please click the 'next' button to start the survey.

Q1 Where do you live? Wellington Palmerston North Other

Q2 If you selected 'Other', where do you live?

[One of four norm passages identical to those in Study 2 was presented randomly, followed by the two corresponding manipulation check questions]

The following questions relate to the earthquake-strengthening legislation. Please answer by selecting a number from 1 to 7.

Q5 Before reading the above information, how much did you already know about this legislation?

Nothing (1) 2 3 Some (4) 5 6 A lot (7)

Q6 Overall, how much do you support this legislation?

Not at all (1) 2 3 Partly (4) 5 6 Completely (7)

Q7 How possible do you think it is to strengthen all 703 of these earthquake-prone buildings in Wellington?

Impossible (1) 2 3 Unsure (4) 5 6 Very possible (7)

Q8 Do you think 34% of the current building code is an appropriate standard compared to legislation on other risks (e.g. Vehicle Warrant of Fitness)?

Not firm enough (1) 2 3 About right (4) 5 6 Too firm (7)

Q9 Do you think the expense of this strengthening work is justified, given the risk of earthquakes compared to other risks (e.g. traffic accidents)?

Fully justified (1) 2 3 About right (4) 5 6 Excessive (7)

The following questions relate to earthquake knowledge and preparation. Please answer by selecting a number from 1 to 7.

Q10 How concerned are you about the danger of earthquakes where you live [in Wellington/in Palmerston North]?

Not at all (1) 2 3 Moderately (4) 5 6 Extremely (7)

Q11 How concerned are you about the issue of earthquake-prone buildings in Wellington?

Not at all (1) 2 3 Moderately (4) 5 6 Extremely (7)

Q12 How effective do you think strengthening buildings will be in reducing damage and injury in a large earthquake?

Not at all (1) 2 3 Moderately (4) 5 6 Extremely (7)

Q13 How much experience do you have of earthquakes?

None (1) 2 3 Some (4) 5 6 A lot (7)

Q14 How much preparation have you made for a large earthquake (e.g. secured fixtures such as TVs and bookshelves)?

None (1) 2 3 Some (4) 5 6 A lot (7)

Q15 How much preparation have your family/friends made for a large earthquake?

None (1) 2 3 Some (4) 5 6 A lot (7)

Q16 How often do your family/friends tell you that you should prepare for a large earthquake?

Never (1) 2 3 Sometimes (4) 5 6 A lot (7)

Q17 Do you have many family members and/or close friends currently living in Wellington?

None (1) 2 3 Some (4) 5 6 A lot (7)

Q18 Please select the pair of circles which best describes your connection with the community where you live [in Wellington/in Palmerston North] (S = self, C = community)

Q19 How old are you?

Q20 What is your gender? Male Female Other

Q21 If you selected 'Other', how do you identify?

Q22 How long have you lived where you currently are [in Wellington/in Palmerston North]?

Q19 Have you ever lived in Wellington?*⁶ Yes No

Q48 How long did you live in Wellington?*

⁶ Questions followed by an asterisk were only presented to participants not living in Wellington

Appendix J: Study 3 interactions

Age. Participants were split into ‘Low’ and ‘High’ age groups based on the median of 23 years. This split-level variable had a main effect on concern about earthquakes, $F(1, 667) = 9.11, p < .01, \eta_p^2 = .01$, where older participants showed higher concern. There was also a marginal interaction of age with norm-type on concern, $F(3, 667) = 2.23, p = .08, \eta_p^2 = .01$. Follow-up t -tests showed that the only differences between conditions were among the high age group, with the injunctive norm producing lower concern about earthquakes ($M = 4.23, SD = 1.35$) than both the descriptive norm ($M = 4.69, SD = 1.45; t(165) = 2.08, p = .04, d = .$) and the combination of both types ($M = 4.69, SD = 1.44; t(158) = 2.05, p = .04, d = .$). These findings are contradictory to the prediction that younger participants would be more affected by norms, and the findings of Study 2 demonstrating differences in concern about earthquake-prone buildings only among younger participants. They also suggest that injunctive norms are less effective at increasing concern than descriptive norms.

Efficacy.

Figure J1. Interaction of belief in efficacy of strengthening and norm condition on support for the legislation.

Belief in the efficacy of strengthening was split into ‘Low’ and ‘High’ using the median of 6. Figure J1 presents the interaction of this factor with norm-type on support for legislation, $F(3, 676) = 2.62, p = .05, \eta_p^2 = .01$. There was also a main effect of efficacy, $F(1, 676) = 50.74, p < .01, \eta_p^2 = .07$, demonstrating that support was higher among the high efficacy group than the low efficacy group. Follow-up independent

samples *t*-tests showed that there were no differences in level of support between conditions among the low efficacy group. Among the high efficacy group, the descriptive norm ($M = 6.20$, $SD = 1.12$), the injunctive norm ($M = 6.27$, $SD = 1.01$), and the combination of both types ($M = 6.28$, $SD = 1.07$) all produced stronger support for the legislation than did the risk-prone condition ($M = 5.67$, $SD = 1.26$; $t(156.43) = 2.84$, $p = .01$, $d = .45$; $t(149.59) = 3.36$, $p < .01$, $d = .55$; and $t(153.32) = 3.44$, $p < .01$, $d = .56$, respectively). This interaction suggests that those who believe that strengthening buildings will effectively reduce damage in an earthquake are more likely to support the legislation, but also that they are more affected by norms, although there is no clear indication of which type is the best.

Experience. Earthquake experience was split into ‘Low’ and ‘High’ using the median of 4. There was a main effect of earthquake experience, $F(1, 675) = 9.35$, $p = .02$, $\eta_p^2 = .01$, where concern about earthquake-prone buildings was higher among those with more experience of earthquakes. There was also a marginal interaction of experience and norm condition on concern, $F(3, 675) = 2.51$, $p = .06$, $\eta_p^2 = .01$. Follow-up *t*-tests showed that the only significant difference was at the low level of experience, with lower concern about earthquake-prone buildings in the injunctive condition ($M = 4.36$, $SD = 1.30$) compared to the risk-prone condition ($M = 4.85$, $SD = 1.25$; $t(179) = 2.59$, $p = .01$, $d = .39$). This interaction supports the prediction that those with less experience would be more affected by the provided information, but in the opposite direction to that predicted.

Community identification.

Figure J2. Interaction of community identification and norm condition on judgments of the feasibility of strengthening.

Community identification was split into ‘Low’ and ‘High’ using the median of 3 on the ICS scale. Figure J2 presents the interaction of this variable with norm-type on judgments of the feasibility of strengthening, $F(3, 668) = 2.80, p = .04, \eta_p^2 = .01$. Follow-up t -tests showed that at the low level of community identification, the combination of both norm types produced higher judgments of feasibility ($M = 4.95, SD = 1.24$) than the risk-prone condition ($M = 4.44, SD = 1.45; t(214) = 2.77, p = .01, d = .38$). Feasibility judgments were also marginally higher in both the descriptive condition ($M = 4.81, SD = 1.42$) and the injunctive condition ($M = 4.76, SD = 1.29$) compared to the risk-prone condition, $t(196) = 1.81, p = .07, d = .26$ and $t(226) = 1.76, p = .08, d = .23$, respectively.

Among the high community identification group, the descriptive norm produced higher judgments of feasibility ($M = 5.08, SD = 1.21$) than the injunctive norm ($M = 4.28, SD = 1.40, t(116) = 3.27, p < .01, d = .61$). The combination of both types also produced higher judgments of feasibility ($M = 5.25, SD = 1.33$) than did the injunctive norm alone, $t(113) = 3.71, p < .01, d = .70$, and marginally higher judgments than the risk-prone condition ($M = 4.76, SD = 1.50, t(124) = 1.94, p = .06, d = .35$). This interaction demonstrates that community identification has an effect on the influence of norm-types at both the low and high level, but that the effect differs. These findings are contrary to the prediction that norm effects would be larger among those who are more connected to their community. However, they suggest, as expected, that the combination of both norm-types is the most effective at increasing judgments of feasibility regardless of community identification.

Figure J3. Interaction of the number of family and friends living in Wellington and norm condition on support for the legislation.

The number of family members and close friends the participant knew in Wellington was split into ‘Low’ and ‘High’ using the median of 4 on the 7-point scale. This split-level variable marginally interacted with the effect of norm-type on support for the legislation, $F(3, 163) = 2.59, p = .06, \eta_p^2 = .05$ (see Figure J3). Among those participants with little or no close others in Wellington, both the injunctive norm ($M = 5.95, SD = 1.19$) and the combination of both norm-types ($M = 5.96, SD = 1.32$) produced higher support for the legislation than the descriptive norm ($M = 5.27, SD = 1.65$; $t(128.88) = 2.92, p < .01, d = .51$ and $t(135.94) = 2.93, p = .01, d = .50$). Among those with more family and friends living in Wellington, the descriptive norm ($M = 6.05, SD = 1.01$), the injunctive norm ($M = 5.90, SD = 1.16$), and the combination of both types ($M = 5.97, SD = 1.16$) all produced stronger support for the legislation than the risk-prone condition ($M = 5.48, SD = 1.17$; $t(174.79) = 3.54, p < .01, d = .54, t(168) = 2.34, p = .02, d = .36$, and $t(180) = 2.81, p = .01, d = .42$, respectively). This interaction supports the prediction that having more close others in Wellington would increase the effect of norms compared to the risk-prone condition, and that among those with fewer close others in Wellington the injunctive norm is more effective than the descriptive norm. However, the descriptive norm did not reduce the effect of the injunctive norm in the combined condition, so again these findings do not undermine the prediction that a combination of both types would be the best approach.