

Social Psychological Bulletin

Natural Hazard Versus Natural Disaster: Does Framing the Event Affect Preparedness Intentions, Attitudes, and Behaviour?

Lauren J. Vinnell¹ , Taciano L. Milfont² , John McClure³ 

[1] *Joint Centre for Disaster Research, Massey University, Wellington, New Zealand.* [2] *School of Psychology, University of Waikato, Tauranga, New Zealand.* [3] *School of Psychology, Victoria University of Wellington, Wellington, New Zealand.*

Social Psychological Bulletin, 2023, Vol. 18, Article e8357, <https://doi.org/10.32872/spb.8357>

Received: 2022-02-14 • **Accepted:** 2023-07-09 • **Published (VoR):** 2023-10-10



Handling Editor: Katarzyna Byrka, SWPS University of Social Sciences and Humanities, Wroclaw, Poland

Corresponding Author: Lauren J. Vinnell, Massey University, 104 Tasman Street, Mount Cook 6011, Wellington, New Zealand. E-mail: l.vinnell@massey.ac.nz

Abstract

Even when perception of risks such as earthquakes is high, preparation is generally low. Previous research shows relatively minor changes in the framing of target issues can impact decisions. In the area of risk, the terms “natural hazards” and “natural disasters” are used inconsistently. Using the Theory of Planned Behaviour as a framework, we conducted an online experiment with a large community sample from Wellington, Aotearoa New Zealand (N = 604) to examine possible framing effects. Half of the participants were asked about their attitudes and intentions regarding preparing for natural hazards and half about natural disasters. We found few significant differences in mean factor scores between the two groups, suggesting that people have attitudes and perceptions of similar strength for both natural hazards and natural disasters. However, half of the factors in structural equation modelling differed in significance or valence between the two conditions and intentions to prepare were positively associated with information-seeking behaviour only for the natural hazards frame, not the natural disaster frame. These findings suggest that the way in which these issues are framed meaningfully impacts how intentions form and translate to actual behaviour. It is possible that participants understood disaster as manifested, devastating impacts of a natural event rather than the potential for impact implied by the term hazard. Such interpretations could influence perceptions of preventability, and therefore preparation. These findings have critical implications for public information campaigns and interventions aimed at increasing preparedness for the risk posed by natural hazards.



This is an open access article distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/), CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Keywords

natural hazards, natural disasters, Theory of Planned Behaviour, preparation, framing effects

Highlights

- Previous research has shown that minor changes in wording can influence perceptions and behaviour, but little research has explored such framing effects in the space of natural hazard risk.
- This paper provides new evidence that the ongoing debate about using the term natural disaster should consider how the general public understands this term.
- There are subtle but meaningful differences in risk perception and behaviour depending on whether the risk refers to natural hazards or natural disasters.
- These findings suggest that communication efforts to increase risk reduction behaviour should refer to natural hazards.

The impacts of disasters are increasing through a combination of population growth, rendering more people and property vulnerable in risk-prone areas, and an increase in the frequency and severity of high-impact weather events, particularly those driven by climate change (Paton & Buergelt, 2019; Tippett, 2018). Every year, over US\$500 billion is lost from the global economy as a result, and between 1998 to 2017, over a billion people were impacted by disasters resulting from natural hazards, including over a million fatalities (Wallemacq & House, 2018). Aotearoa New Zealand (NZ) is not immune to these impacts. Following a period of relative quiescence, in the past decade the country has experienced several severe earthquakes, as well as storms, floods, droughts, wildfires, and volcanic activity. The Canterbury Earthquake Sequence in 2010/2011, which claimed 185 lives and caused billions of dollars of loss, motivated additional efforts to further mitigate such impacts (e.g., Vinnell, Orchiston, et al., 2019), including amendments to legislation around building codes (Vinnell et al., 2017).

Wellington, the capital city of NZ, has long been known to be at objectively high risk of a devastating earthquake (Smith, 2015), but preparation by residents is relatively low (Johnston et al., 2013). Events such as the 2016 Kaikōura earthquake, which caused strong tremors and severely damaged several buildings in Wellington, led to an increase in preparation (Vinnell, Milfont, et al., 2019b); however, these spikes in actions to reduce risk tend to drop off quickly (McClure et al., 2019). A major earthquake in Wellington could lead to as many as 1,500 deaths and 12,000 injuries (George, 2017), and months-long interruptions to key infrastructure such as power and water (Brown et al., 2019). Such an earthquake could potentially cause sufficient property damage and economic loss that the city would never fully recover. The same issues apply to many cities around the world.

The aim of the current research is, first, to broadly investigate what factors relate to intentions to prepare for events such as earthquakes in Wellington, NZ, and, second, to examine whether people respond differently if they are asked about natural *hazards* or natural *disasters*. The intent of this second aim is to contribute to an ongoing conversation in the field around the appropriateness of the term “natural disaster”, by providing evidence either in support of or against the term’s use in preparedness communication with the public.

Terminology and Framing Effects

The terminology in this field typically follows a specific causal chain: a natural process (e.g., earthquake) becomes a *natural hazard* when humans are vulnerable to its impacts (e.g., by living in unsafe buildings near a fault line) and becomes a *disaster* when such an event occurs and overwhelms the ability of the exposed area to cope with the impacts (UNISDR, 2009). The term disaster does not inherently convey whether the causal event or process (as distinct from the exposure and vulnerability which interact with the triggering event and lead to severe negative impacts) is natural or involves other triggers. Disasters can also be biological (e.g., pandemics and epidemics), anthropogenic/technological (e.g., nuclear plant meltdowns, terrorism), or socio-natural (i.e., an interaction of both natural and human cases; UNISDR, 2009). In order to differentiate between these types of disasters, the term “natural disaster” is often applied (appropriately or not) to indicate that the impacts are triggered by natural processes, particularly within public discussions and mainstream media reporting.

Little research has examined the impact of minor wording changes in the area of natural hazard risk; however, a similar argument on the importance of framing is taking place within the area of climate change. For example, statements referring to climate change, rather than global warming, led to stronger climate change-related beliefs and intentions to act (although only for political independents; Benjamin et al., 2017). Similarly, perceptions of the urgency and risk around climate change and willingness to act can be increased by referring to the *war*, rather than the *race*, against climate change (Flusberg et al., 2017).

This trend of considering and, importantly, *testing* the effects of relatively minor changes in wording within the area of climate change (e.g., war versus race) is not reflected in the sphere of disaster risk (e.g., hazard versus disaster). Although academic discussion of natural disaster as an inappropriate term started several decades ago (O’Keefe et al., 1976; Rochford & Blocker, 1991), with the argument itself dating back centuries (Chmutina & von Meding, 2019), limited empirical research has approached the topic. There is evidence that messages attributing earthquake damage to human causes such as building design and emphasizing distinctive damage increases perceptions that this damage can be prevented (McClure et al., 2001, 2007) while valence framing of preparation actions and outcomes can influence intentions (McClure et al., 2007, 2009).

The implication is that by referring to events as *natural* disasters, the responsibility for the impacts is shifted to uncontrollable aspects of the environment rather than human decisions, leading to the fatalistic belief that nothing can be done to prevent such events. Indeed, some researchers in the field of disaster risk reduction argue that the term natural disaster is inappropriate, as disasters result from decisions made by humans, such as to live in an area prone to natural hazards or to use poorly-constructed buildings (e.g., Blanchard, 2018; Kelman, 2018; Ras, 2017).

One argument against the term natural disasters proposes simply dropping the natural classifier and referring solely to disasters (e.g., Ras, 2017). According to this argument, using the term disaster would have the desired effect of leading people to attribute outcomes to human causes, and therefore perceive this damage as preventable (e.g., Blanchard, 2018). This perspective seems to assume that the default inference is towards human responsibility and that it is the natural classifier which alters causal attributions. A counter-argument emphasizes the changing meaning of disaster; over recent decades, the threshold for an event being a disaster has shifted, so that disasters can include more common events such as minor misfortunes and accidents (Furedi, 2007), which can lead to confusion, particularly among non-researchers (Kelman, 2018). Furedi (2007) argues: “As a growing range of human experiences are associated with disasters, the distinction between normal daily life and a disaster becomes ill defined...disaster ceases to possess any distinct features” (p. 487). Moreover, a range of synonyms for disaster have emerged, such as *emergency*, with no consensus about differences in meaning (Kelman, 2018).

The *natural* classifier, therefore, serves the important purpose of distinguishing disasters triggered by natural causes from events which historically would not have been labelled as disasters, as well as catastrophic events due to other causes. For example, technological disasters are typically ones that result from failures of human systems, such as nuclear plant meltdowns, or the failure of systems that were deliberately put in place to prevent or mitigate a natural hazard, such as flood gate failure (Rochford & Blocker, 1991). These types of risks lead to more negative affect (Kahlor et al., 2020) and are seen as more voluntary, more in need of management, and more of a public responsibility (as opposed to a private responsibility) than natural disasters (Brun, 1992).

The term natural disaster therefore appears to represent a distinct set of risks and outcomes compared to what can be covered with the term disaster alone (Furedi, 2007). Removing the natural descriptor would lose the distinction from other types of disasters and could lessen the impact of the term due to its broader scope. An alternative to removing the natural classifier is to replace the disaster label. While less commonly used by agencies and media than the term natural disaster, natural hazard is also used to refer to a range of risks and events involving natural processes. This phrasing retains the reference to nature, to ensure people differentiate these risks from technological or biological ones, while addressing the issues with the term disaster due to its shifting meaning and position in the causal chain. Given its occasional use in the public sphere,

natural hazard ought to be tested as a suitable alternative to natural disaster for non-academic communication.

Consumption of disaster films and other entertainment media in the US influences how much people believe they know about how people act during such events and the physical impacts of events such as earthquakes (Quarantelli, 1980). A resurgence of this genre began in the 1990s, with many pessimistic depictions of destructive and frightening disasters (Schröder, 2010). Research in NZ has demonstrated that people see earthquake damage as less preventable when presented with depictions of widespread destruction but see the damage as more preventable when it is specific and attributed to human decisions such as building design (McClure et al., 2001, 2007). These findings suggest that the term disaster may conjure images of extensive, widespread—and therefore “unavoidable”—damage (McClure et al., 2001, 2007), whereas people might see the term hazard as referring to a potential—and therefore preventable—risk, possibly learning from contexts such as health and safety in workplaces. However, evidence for this suggestion is limited, hence the aim of this study to test differences in perceptions between these two terms. The premise of this study, therefore, is that while “hazard” implies the *possibility* of negative outcomes, “disaster” implies that those negative outcomes have already occurred and therefore cannot be prevented, increasing fatalism and inhibiting preparation behaviour. However, there is no direct evidence that referring to events as natural disasters rather than hazards is detrimental to perceptions, attitudes, and behavioural intentions.

A search on the popular NZ news website stuff.co.nz on June 15th 2021 resulted in over 11,000 hits including the term natural disaster but fewer than 3,000 including the term natural hazard, suggesting that the NZ media tends to use disaster more than hazard (although this could be due to an understandable focus of media on events that have happened). Similarly, data from Google Trends and Google Ngram indicate that the term natural disaster is more commonly used in searches and in books (see [Figure A1](#) and [Figure A2](#) in the [Appendix](#)). Notably, the use of natural disaster in NZ extends beyond media to government organisations, with Toka Tū Ake EQC (the NZ Earthquake Commission) providing insurance and advice on natural disasters, although this agency also uses the term natural hazard (with an appropriate, nuanced distinction; [Toka Tū Ake, 2019](#)). A thorough review of existing communications was beyond the scope of this research. However, identifying implications of using one of these terms over the other (the aim of this study) could hold important lessons for how such issues are communicated at several levels.

Little to no research has considered the impact that particular terms have on preparation actions, or even whether the terms are interpreted in the way they are intended ([Kelman, 2018](#)). Insufficient evidence exists for formal hypotheses for these differences. Given the above discussion, however, we expected that those who were presented with the natural hazard frame rather than the natural disaster frame would hold more fa-

avourable attitudes and intentions to prepare, which is consistent with lower levels of fatalism. Either significant or non-significant findings would prove meaningful to the field. Non-significant findings would suggest that the reasons in the argument against using the term natural disasters do not extend to non-expert audiences, while significant findings would suggest that the terminology used to describe hazards and their effects is important to consider when attempting to influence preparation actions among members of the public. Particularly given the lack of empirical evidence on which to base this study, a well-established theory was used to provide a framework.

The Theory of Planned Behaviour

This study uses the framework of the Theory of Planned Behaviour (TPB; Ajzen, 2002) to measure and explain intentions to prepare for natural hazards and natural disasters. The TPB proposes that the primary determinant of behaviour is the intention to carry out that behaviour. Intention in turn is informed by attitudes about the behaviour, perception of relevant social norms, and perceptions of control over the behaviour (perceived behavioural control; PBC).

Intentions

The TPB frames intentions as the proximal predictor of behaviour as, with the exception of past behaviour, intentions tend to explain more variance in behaviour than other factors (Armitage & Conner, 2001; Armitage et al., 2013). One of the key purposes of the theory is to identify which and to what extent a limited range of factors explains intentions.

Attitudes

The attitude construct is differentiated into attitudes about the *experience* of enacting the behaviour (*experiential* attitudes) and attitudes about the outcomes of the behaviour (*instrumental* attitudes; Francis et al., 2004). Instrumental attitudes have several equivalents within the disaster literature; commonly, the terms response-efficacy or outcome expectancy are used (Becker et al., 2015). Much research has demonstrated the importance of this concept for disaster preparation behaviour (Becker et al., 2015; Johnston et al., 2013). For example, response-efficacy was the strongest predictor of support for public legislation to strengthen earthquake-prone buildings in Wellington (Vinnell et al., 2017).

Perceived Social Norms

Social norms relate to influences on an individual's behaviour based on what is "normal" within that individual's social group. *Injunctive* norms refer to whether a behaviour is approved of or not (e.g., Ajzen, 2002; White et al., 2009). In contrast, *descriptive* norms refer to the prevalence of the behaviour (Cialdini et al., 1990). Research has demonstrated that descriptive and injunctive norms are discrete concepts (e.g., Vinnell et al., 2019a)

with different motivational mechanisms (Hamann et al., 2015). Social norms have been used to influence judgments about earthquake-strengthening legislation in Wellington (Vinnell, 2016).

Perceived Behavioural Control

PBC refers to the level of control that individuals perceive they have over their own behaviour. Specifically, this refers to whether individuals are able to decide to carry out the behaviour, rather than the behaviour being seen as involuntary (*controllability*), as well as whether individuals have the capability of carrying out the behaviour in terms of individual factors such as time, knowledge, effort, and finances (*self-efficacy*). There exists a volume of evidence that self-efficacy is an important factor in people's actions to prepare for a disaster (see Becker et al., 2015).

Beliefs

The TPB includes a second level of belief factors which precede the explanatory components above; for example, attitudinal beliefs precede attitudes (Ajzen, n.d.). Some research suggests that, consistent with the theory, targeting these antecedent beliefs will more effectively lead to behaviour change (Darker et al., 2007; Elliott & Armitage, 2009).

The TPB in the Disaster Context

In relation to risks generally, the TPB has been applied in studies of health preparedness, such as donating blood during different risk stages of an outbreak of bird flu, intentions to get an influenza vaccine, and volunteering of nurses for patients with SARS (see Ejeta et al., 2015 for a review). However, the TPB has not yet been thoroughly applied to disaster preparedness despite the decades of research supporting its utility in predicting and understanding behaviour change (Ejeta et al., 2015).

There is some research moving in this direction. Claimed to be the first research to apply the TPB to “natural disasters”, Najafi et al. (2017) used the theory to predict and explain disaster preparation behaviours in Tehran. The authors used a set of seven survival actions and split participants into “prepared” (10% of sample) and “unprepared” categories. Those who had prepared had more positive attitudes, perceived more social pressure, had higher PBC, and stronger intentions than those who had not prepared. Work related to the current study found that instrumental and experiential attitudes, perceived descriptive norms, and self-efficacy were associated with intentions to prepare for natural hazards (Vinnell et al., 2021). However, these findings do not consider framing effects.

The Current Study

In this study, we employ an experimental survey design to examine whether intentions to prepare and the association of intentions with preparation behaviour differs between two groups: those for whom the issue is framed as preparation for natural hazards and those for whom it is framed as preparation for natural disasters. As this study is one of the first of its kind in this field (Kelman, 2018), it uses a simple measure of behaviour (information-seeking) in order to provide preliminary evidence to support a more extensive exploration of framing effects. Similarly, the terms compared are limited to two (natural hazards and natural disasters), although other terms such as emergency are commonly used by practitioners; for example, many national and international organizations devoted to responding to natural hazard events are emergency agencies, as this allows for a broader mandate (e.g., Federal Emergency Management Agency in the US, National Emergency Management Agency in NZ).

This study used a between-subjects experimental survey design to examine framing effects. Participants were randomly assigned to either a *natural disaster* condition or a *natural hazard* condition. Based on the above review, we expected to find that instrumental attitudes, injunctive and descriptive norms, and self-efficacy would be positively associated with intentions. No predictions were made for experiential attitudes or controllability. Key to the study aims, the full TPB model was compared between the natural hazard group and the natural disaster group to test whether the framing of the question affected mean scores on the TPB factors and how those factors relate to intentions. Finally, this study included a simple behavioural measure; participants were asked whether they would like to receive an earthquake-planning brochure. The ratio of participants who did versus did not request this brochure, treated as a proxy for future behaviour, was associated with intentions and compared between the two experimental groups.

Method

Participants

The study used a general population sample from the urban Wellington Region of NZ, comprising Wellington City (including the northern suburbs such as Johnsonville and Tawa), the Hutt Valley, and Porirua. Participants comprised a convenience sample recruited through social media platforms such as Facebook, so they could not be selected to obtain a representative sample of residents of the Wellington Region in terms of socio-demographic variables. Online recruitment is typically faster and less costly than other methods (Teo, 2013), and therefore suitable for an initial test of an effect. The online survey was presented using Qualtrics and participants were randomly assigned to the experimental conditions using the “Randomize” function. Ethical approval for this

study was granted by the School of Psychology Human Ethics Committee under the delegated authority of the Victoria University of Wellington Human Ethics Committee (approved: 23rd July 2018; reference number: 0000026244).

The analysis of the experimental manipulation used multigroup structural equation modelling (SEM), which requires large sample sizes (Breitsohl, 2019). Past sample sizes gathered using this method (Vinnell, 2016; Vinnell et al., 2019a; Vinnell et al., 2019b) are at the lower limit of being considered large and so no recruitment target was set; as many participants as possible were recruited, balancing the need for sufficient power with limits of available resources.

One thousand and ten participants started the survey. The drop out-rate was considerable (36%), possibly due to the length of the survey. One participant was removed as they were younger than 18 years old (the age of consent required by this study), 23 participants indicated they did not live in the urban Wellington Region or did not answer this question, one participant reported not understanding the presented definition of natural hazard, and a further 11 participants did not respond to the manipulation check question asking if they had understood the definition presented to them. These exclusions resulted in a data set of 603 participants where all participants had completed a useable amount of the survey: 300 in the natural disaster condition and 303 in the natural hazard condition.

Demographics

The hazard and disaster frame groups did not significantly differ on any of the demographic variables, so the following demographic information is for the total sample. Participants' ages ranged from 18 to 73 years old, with a mean of 32.89 years ($SD = 12.70$). There was a gender bias; of the 584 participants who reported their gender, 79 were men (13.5%), 502 were women (86.0%), and 3 indicated a non-binary gender (0.5%). Most (73.2%) identified as NZ European/Pākeha followed by Māori (NZ's Indigenous population; 7.9%). Roughly equal numbers of participants had a secondary school qualification (167; 28.7%) or an undergraduate degree (164; 28.2%). The modal level of annual income before tax was below \$20,000 (26.5%) and nearly half (44%) of respondents indicated that their household costs exceeded their incomes. A slight majority of respondents were renting (51.8%).

Materials

The online survey had two versions, presented randomly to participants. The majority of items had 7-point Likert or Likert-type responses. The full survey, which was tested with a small pilot group ($N = 10$) is available via the Open Science Framework (natural hazard version: 10.17605/OSF.IO/RZE2S). Descriptive analyses were conducted using SPSS and structural equation modelling using Mplus. For the experimental manipulation, one version solely referred to natural disasters while the other referred to natural hazards.

Therefore, we are not testing the effect of a single framing statement, but the effect of an entire questionnaire asking about either natural hazards or natural disasters.

Those participants in the disaster frame condition received the following definition (based on common dictionary definitions, as the goal is to understand the influence of common, rather than academic, understandings):

“This survey will ask a number of questions about **natural disasters**. For the purpose of this research, a natural disaster is an event or force of nature, such as an earthquake, flood, tsunami, landslide, wildfire, storm, and volcanic eruption, which has severely negative consequences such as causing a lot of damage, injury, and/or disruption to lifelines (e.g., roads, water, electricity, food and medical supplies).”

The participants in the hazard frame condition received the following definition:

“This survey will ask a number of questions about **natural hazards**. For the purpose of this research, a natural hazard is a process or force of nature, such as an earthquake, flood, tsunami, landslide, wildfire, storm, and volcanic eruption, which has the potential to cause negative consequences such as damage, injury, and/or disruption to lifelines (e.g., roads, water, electricity, food and medical supplies).”

As this study manipulated the term used, a question was added to ask whether participants understood the presented definition. If participants responded “No” they were presented with a simplified version of the definition¹, and again asked if they understood the definition. If they responded “No” again, they were taken to the end of the survey. Only one participant responded “No” to the first question; this participant also responded “No” to the second question and so was excluded from the dataset.

An online survey included a range of measures adapted primarily from two TPB questionnaire construction guides (Ajzen, n.d.; Francis et al., 2004). The development of this set of measures is presented more fully in Vinnell et al. (2021). This survey also included a risk perception scale, a disaster experience scale, a preparation behaviour question, and demographic questions. All questions, except those for demographics, used Likert or Likert-type scales.

1) “A natural disaster is something caused by nature, like an earthquake or a tsunami, which causes a lot of harm to humans or damage to property” or “A natural hazard is something caused by nature, like an earthquake or a tsunami, which might harm humans or damage property”

Risk Perception

This six-item measure was adapted from [Terpstra and Lindell \(2013\)](#). This scale demonstrated acceptable internal reliability of $\alpha = .86$, which would not be improved by removing any of the items. The first question assessed perceptions of the likelihood that where participants live “a natural disaster [hazard event] will occur in the next five years”. The five other items assessed the perceived likelihood of impacts occurring including damage to public facilities, disruption to supplies, damage to personal property, life-threatening situations, and prolonged disruption to daily life.

Disaster Experience

This three-item measure was adapted from [McClure et al. \(2011\)](#) and demonstrated acceptable internal reliability for a short scale ($\alpha = .64$). Corrected item-total correlations were also within an acceptable range (.385 to .537). Participants were asked if they had experienced damage, harm to themselves or someone close to them, or felt scared or vulnerable in a past natural disaster/hazard event.

Behaviour

Finally, participants were asked “Would you like to receive an Earthquake Planning Guide?” Those who answered “Yes” were provided a link to a downloadable step-by-step guide to preparing for an earthquake ([Wellington Region Emergency Management Office, n.d.](#)). Knowledge of preparation actions is a necessary prerequisite for behaviour, so information-seeking has been treated as a preparation action in its own right (e.g., the Earthquake Preparedness Scale: [Mulilis et al., 1990](#)), as well as suggesting that the individual will be more likely to undertake other actions than those who have not sought information.

Results

Descriptive Statistics

In the natural disaster group, the mean scores of the intention scale averaged 5.29 ($SD = .129$), which is significantly above the scale midpoint of 4 as shown by a one-sample t -test, $t(293) = 17.07$, $p < .001$, $d = 1.00$. Similarly, the mean intention score in the natural hazard group of 5.20 ($SD = 1.38$) was also significantly above the midpoint, $t(300) = 15.19$, $p < .001$, $d = 0.87$. These findings suggest that, overall, intentions to prepare are relatively strong irrespective of the experimental framing manipulation.

Inferential Statistics

Between-Group Comparisons

An independent samples *t*-test comparing the two groups on mean scores for intentions showed no significant difference ($p = .61$). This finding suggests that people hold equally strong intentions to prepare for natural disasters as for natural hazards. Latent means comparisons of TPB components between the two groups were non-significant, except for a marginally significant effect for the direct measure of injunctive norms, where the mean was higher in the disaster condition than the hazard condition (estimate = $-.202$, $SE = .103$, $p = .05$). This effect is driven by a difference between the two groups in the second item on the injunctive norms scale (“Most people like me approve of my preparing for a natural disaster”), with a higher mean in the disaster condition ($M = 5.43$, $SD = 1.42$) than the hazard condition, $M = 5.18$, $SD = 1.37$; $t(598) = 2.14$, $p < .05$, $d = 0.18$. While this is a weak effect, it demonstrates that participants perceived a stronger norm of approval among people like themselves for natural disaster preparation than for natural hazard preparation. This was the only item to use similar others as a referent group, while the rest of the items referred to people who are important to the participant as the referent group. It is important to note here that the number of comparisons made may have inflated the Type 1 error, so even the one significant finding should be considered cautiously.

With the exception of this difference in the direct injunctive norm measure, driven by a different mean for a single item, none of the means for the TPB scales differed between the two groups. Further, a chi-square test showed that the two groups did not have a different ratio of participants who did and did not request additional information about how to prepare for an earthquake. This lack of statistically significant differences between the experimental groups suggests that, on the whole, people have similar attitudes, norms, perceptions of control, and intentions for natural disaster and natural hazard preparation. Although this comparison of means is informative, given the structural nature of the theory being tested, it was also pertinent to test for differences in the structure of the latent paths between the two samples.

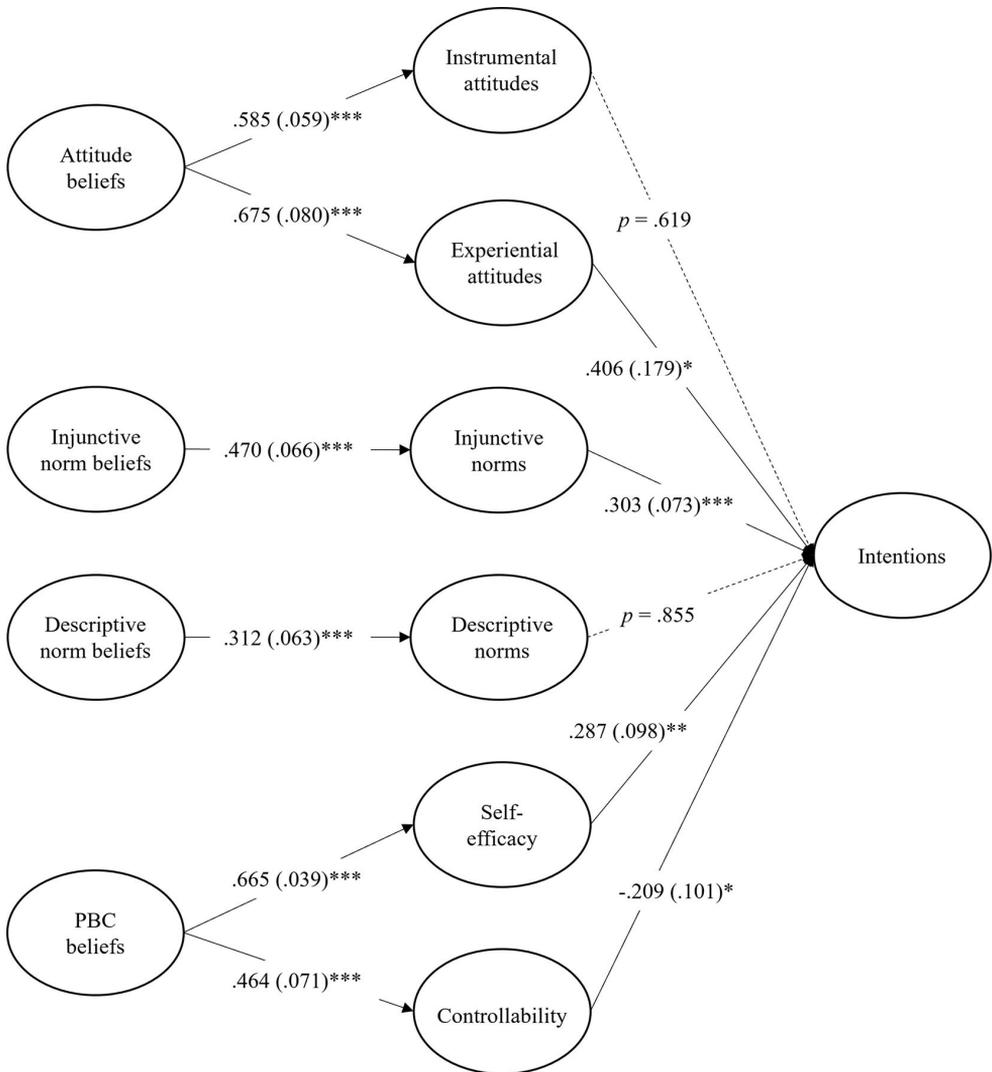
Multigroup SEM

A MSEM differs from a SEM as it tests for the same model in multiple (in this case, two) groups simultaneously. Given that the items differed in wording between the two groups, the means and intercepts are not directly comparable, so only configural invariance was tested (Gregorich, 2007). Figure 1 presents the SEM for the disaster condition, and Figure 2 presents the SEM for the hazard condition, produced using Mplus. Our two models demonstrated adequate model fit, $\chi^2(1763) = 3003.194$, $p < .001$; RMSEA = $.048$, CFI = $.900$, SRMR = $.081$ (Breitsohl, 2019), suggesting that there is little variance in the

overall structure between the groups and supporting a non-statistical comparison of the two models.

Figure 1

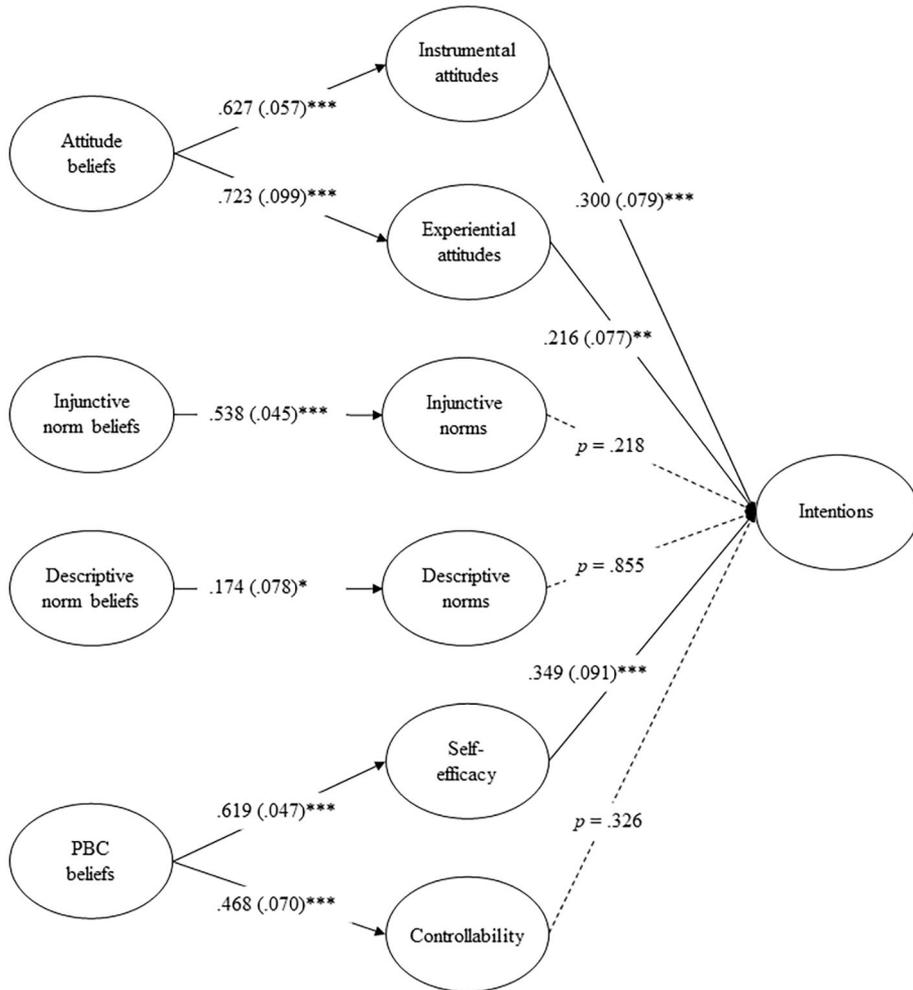
Structural Equation Model for Disaster Condition



Note. A dotted line indicates a non-significant path. For these paths, the associated numbers are the *p*-values. For significant paths, the numbers represent the standardized estimates, with the standard errors in parentheses. R^2 for intentions = .426. Adjusted R^2 for intentions = .414. **p* < .05. ***p* < .01. ****p* < .001.

Figure 2

Structural Equation Model for Hazard Condition



Note. A dotted line indicates a non-significant path. For these paths, the associated numbers are the *p*-values. For significant paths, the numbers represent the standardized estimates, with the standard errors in parentheses. R^2 for intentions = .484. Adjusted R^2 for intentions = .474. **p* < .05. ***p* < .01. ****p* < .001.

For both models, the belief constructs were significantly associated with their respective direct constructs. Not all direct TPB constructs were significantly associated with intentions, and the significance of paths varied between the two groups. In the disaster condition, experiential attitudes, injunctive norms, and self-efficacy were positively asso-

ciated with intentions, while controllability was negatively associated. Overall, the model explained 42.6% of the variance in intentions, in line with typical findings for this theory (e.g., Armitage & Conner, 2001; Vinnell et al., 2021).

In contrast to the model for the disaster condition, in the hazards condition both attitude factors and self-efficacy were positively associated with intentions to prepare for natural hazards whereas controllability and both norms factors were not significantly associated with intentions. Further, the model for the hazard condition explained 48.4% of the variance, more than the disaster model. There were, therefore, meaningful differences between the two models. These differences suggest that, while participants did not appear to differ on the hazard/disaster constructs in terms of mean scores, the way in which these constructs were associated with intentions did differ. Given that intentions are held to be a key predictor of behaviour (Armitage & Conner, 2001), the larger portion of the variance in intentions explained by the hazard model is a particularly important finding. Implications of this finding, and the differences in paths, are discussed later.

Predicting Behaviour

The behaviour variable was dichotomous, as participants either requested or declined to receive an earthquake-planning guide to increase their household preparedness. Logistic regression was therefore used to test the association between intentions and behaviour. In the natural disaster condition, this test was non-significant ($p = .181$), suggesting that those with stronger intentions to prepare for a natural disaster were no more likely to request the earthquake-planning guide than those with weaker intentions. In contrast, the odds ratio for the natural hazard condition was significant, $\text{Exp}(B) = 1.24$, $p < .05$, suggesting that those with stronger intentions to prepare for natural hazards were more likely to request the planning guide. The lack of significant chi-square cross tabulation comparing the ratio of those who did and did not request the guide between groups suggests that this difference in significance of odds ratio is not due to a different pattern of responding to the behavioural item, but rather reflects a difference in the association between information-seeking behaviour and intentions depending on the framing of the risk (i.e., hazard or disaster).

To clarify this difference, we conducted independent samples t -tests for each condition, using responses on the behavioural item as the grouping variable. In the disaster condition, the mean intention scores did not significantly differ between those who did and did not request the guide ($p = .240$). In contrast, in the hazard condition, the mean intention scores were higher in the subset of participants who did request the guide ($M = 5.35$, $SD = 1.23$) compared to those who did not, $M = 4.92$, $SD = 1.54$; $t(190.75) = 2.42$, $p < .05$, $d = 0.35$. This finding further supports the inference that intentions are significantly associated with behaviour in the natural hazard condition, but not the natural disaster condition. This finding suggests that efforts to increase intentions would be

more likely to be effective if those efforts addressed natural hazard preparation rather than if they addressed natural disaster preparation.

Discussion

This study tested for differences between the effects of two often-used terms in this field: natural disaster and natural hazard. While past research has demonstrated the importance of carefully considering wording when testing risk-related judgments and behavioural intentions (e.g., Flusberg et al., 2017; McClure et al., 2001, 2007), little research has shown a meaningful impact on behaviour of a minor change in wording. Particularly with the current global efforts to shift the research field away from using the term natural disaster (e.g., Blanchard, 2018), empirical evidence that the associations between cognition, intentions, and behaviour differ depending on the event frame meaningfully contributes to the practical field as well as the academic domain.

The findings of the present study are preliminary but offer important lessons for communication strategies as well as an impetus for further research. Interestingly, we found only one difference when we compared the mean scale scores between the two groups, suggesting that people hold similarly strong attitudes, perceptions of norms, and perceptions of behavioural control for both natural hazards and natural disasters. However, we found significant and meaningful differences in how those factors were associated with intentions to prepare, suggesting that even though absolute strength of the factors may not differ, how those factors contribute to people forming intentions to prepare does differ. This finding has important implications for communication efforts to increase intentions to prepare. Further, although intentions and behaviour individually did not differ when participants were asked about natural hazards or natural disasters, there was a significant positive association between intentions and behaviour among those asked about natural hazards (but not about natural disasters). This finding suggests that efforts to increase intentions to prepare for natural disasters are less likely to lead to a commensurate increase in actual behaviour than efforts to increase intentions to prepare for natural hazards. This has clear practical implications for how risks and potential impacts of natural hazard events are communicated.

Comparison of Structural Equation Models

While the framing manipulation did not meaningfully impact the strength of beliefs or cognitions, this study also examined whether the relationships *between* these constructs would differ depending on whether participants were asked about natural disasters or natural hazards. Although, overall, both hazards and disaster framing models explained intentions at approximately the expected level for a TPB study (e.g., Armitage & Conner, 2001), the natural hazard model explained more of the variance in intentions than the

natural disaster model (48.4% versus 42.6%, respectively, although this difference could not be tested for significance). This difference suggests that the formation of intentions to prepare at the household level differs depending on whether those intentions are to prepare for natural hazards or natural disasters.

Further evidence in support of this difference is demonstrated when comparing the associations in the structural equation models between the two conditions. In the disaster frame, instrumental attitudes and descriptive norms were not associated with intentions, and controllability was significantly *negatively* associated. In comparison, in the hazard frame, instrumental attitudes were significantly associated with intentions, and controllability was not. As with the disaster model, there was no association between descriptive norms and intentions; however, there was also no association between *injunctive* norms and intentions. Half of the paths between the constructs and intentions, therefore, differed between the two framing conditions. Crucially, the finding that instrumental attitudes related positively to intentions only in the natural hazard condition suggests that the term hazard implies elements of risk which can be prevented or mitigated. This finding is consistent with our conjecture that the term disaster more strongly implies inevitable, widespread damage—engendering increased fatalism—than the term hazard.

Further evidence for natural hazards being more suitable phrasing than natural disasters is the different association with the proxy behaviour measure, information seeking. Preparation intentions in the natural disaster frame were not associated with requesting the earthquake planning guide, but preparation intentions in the natural hazard frame *were* associated, such that those with stronger intentions were more likely to request the guide. The current study provides preliminary but crucial empirical evidence for the ongoing discussion among international researchers and disaster agencies about moving away from using the term natural disaster, suggesting that natural hazard intentions and behaviour may be easier to predict and change.

Risk Perception and Biases

Research has examined the role of cognitive biases in preparedness such as fatalism, the (incorrect) belief that processes such as earthquakes are too destructive to be able to prepare for, which have been shown as barriers to preparation action (Baytiyeh & Naja, 2016). However, these biases are difficult to shift (McClure et al., 2015), particularly when using non-intensive interventions such as public education campaigns (Montibeller & von Winterfeldt, 2015). Some evidence, such as that found by McClure et al. (2001, 2007), suggests that by informed and deliberate word choice, communications can avoid triggering these biases. By attributing damage to human causes, rather than the earthquake itself, McClure and colleagues found lower levels of fatalism. Our study supports these findings; natural disasters suggest a terrible event which has already occurred, and therefore logically could trigger beliefs that they are unpreventable. Natural hazards,

in contrast, refers to processes which could *potentially* lead to a disaster should other factors align.

It is possible that using the adjective *natural* in regard to hazards would still lead people to attribute any potential negative impacts to uncontrollable aspects of the environment, which could also lead to a fatalism bias and reduced intentions to act. The significant association between natural hazards and behaviour found here suggests that any fatalistic connotations of the word *natural* are not sufficient to entirely inhibit behaviour as appears to be the case when the word is paired with disaster. However, it is possible that stronger effects may be found using a different term which still implies a process that can be addressed but which also make explicit human causes of negative outcomes. This is an important area for further research.

Study Strengths

The main strength of this study is the experimental component applied to a key framing question in this domain. While research has demonstrated the importance of carefully selecting wording when testing risk-related perceptions and behavioural intentions (e.g., Flusberg et al., 2017; McClure et al., 2001, 2007), little research has shown such a meaningful impact of a very specific wording change. This finding therefore has clear practical implications for how risks associated with natural triggers are communicated, particularly when the focus is on encouraging preparation behaviour.

This research also has important implications for TPB studies more broadly. It is possible that some of the inconsistency in the TPB literature is due to differences in wording of behaviours across studies. While the TPB has been applied to many behaviours in many domains, and requires adaptation for each new behaviour, the findings here support the development of a single, cohesive measure for each of these behaviours which can be used consistently by different researchers (Vinnell et al., 2021). For example, a number of studies use the TPB to predict healthy eating behaviours, but these behaviours have been expressed in a multitude of different ways. This difference in wording could then lead to differences in findings for the “same” behaviour. As far as we are aware, this possibility has not been well explored, and this study represents one of the first, if not the first, to empirically demonstrate the importance of wording of the target behaviour.

Limitations and Future Directions

The lack of a true behaviour measure of preparation will need to be addressed in order to test the predictive capability of intentions over time. Discrepancies between intentions and behaviour are well documented within social psychological research (e.g., Armitage & Conner, 2001), although intentions are typically held to be one of the best predictors of future behaviour (e.g., Ajzen & Madden, 1986). Longitudinal research is needed to test whether the difference in association between the two framing terms found here

replicates in a causal model and whether the framing effect extends to other types of preparedness actions.

Further, this study used an online convenience sampling method. There are benefits to this method, such as the high speed and lower cost of recruitment (Teo, 2013); however, this method tends to produce samples that are less representative of general populations than those obtained with other methods such as intercept sampling, including a gender bias (Vinnell, 2016). While demographic differences in risk perception and behaviour tend to be inconsistent (Becker et al., 2015), future research could endeavour to test these framing effects using more representative samples, and ideally to replicate these effects in other populations both nationally and internationally to provide additional support for the relevance of these findings globally.

It is important to remember that these findings fall into the context of preparation actions; that is, those taken before an event occurs. Message framing in other contexts, such as media reporting of actual events, could also be explored. It is important to speak about past natural hazard events that exceeded local capacities in a way that reflects this extensive impact; currently, the term disaster is used for this purpose but this term does not necessarily imply the same meaning for the general public as the meaning that is inferred by researchers (Furedi, 2007). Further research could explore public interpretation of the term disaster used in the post-event context, to ensure that media reports and government initiatives, for example, lead to intended associations and understanding. Such research could also explore differences between other common terms, such as emergency (often used by government agencies), in relation to preparedness.

Conclusion

Given the widespread interchanging of the hazard/disaster terms in practice and the increasing push to move away from the term natural disasters (the preferred term in media reports and Google searches, for example), empirical evidence for differences between how these terms are understood has important implications. Despite the extensive exploration of framing effects in relation to myriad behaviours, such as those around climate change, little work has been done to examine such effects in relation to natural hazards. This study presents a useful finding suggesting that the term natural hazard is likely to be more effective in public communication than the term natural disaster, providing rare empirical evidence on an ongoing debate within the field that will hopefully lead to further work to explore other potential effects of word choices. Locally and globally, negative impacts of natural hazards are increasing; it is therefore imperative that we ensure our efforts to encourage preparation are as effective as possible.

Funding: This research was funded by the National Science Challenge: Resilience to Nature's Challenges and supported by a Victoria University of Wellington PhD grant. The funders played no role in the study design, data collection and analysis, decision to publish, or preparation of the article.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

Author Contributions: *Lauren J. Vinnell*—Idea, conceptualization | Design planning | Data analysis | Writing | Feedback, revisions. *Taciano L. Milfont*—Idea, conceptualization | Design planning | Data analysis | Feedback, revisions | Supervision, mentoring. *John McClure*—Idea, conceptualization | Design planning | Feedback, revisions | Supervision, mentoring.

Ethics Statement: Ethical approval for this study was granted by the School of Psychology Human Ethics Committee under the delegated authority of the Victoria University of Wellington Human Ethics Committee (approved: 23rd July 2018; reference number: 0000026244).

Related Versions: This paper is based on a study from Lauren Vinnell's doctoral thesis (see <https://researcharchive.vuw.ac.nz/handle/10063/9157>).

Data Availability: The data cannot be made publicly available due to ethics requirements. However, the data can be provided upon reasonable request to the corresponding author.

References

- Ajzen, I. (n.d.). *Constructing a Theory of Planned Behavior questionnaire* [PDF file]. <https://people.umass.edu/aizen/pdf/tpb.measurement.pdf>
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology*, 32(4), 665–683. <https://doi.org/10.1111/j.1559-1816.2002.tb00236.x>
- Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, 22(5), 453–474. [https://doi.org/10.1016/0022-1031\(86\)90045-4](https://doi.org/10.1016/0022-1031(86)90045-4)
- Armitage, C. J., & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40(4), 471–499. <https://doi.org/10.1348/014466601164939>
- Armitage, C. J., Reid, J. C., & Spencer, C. P. (2013). Changes in cognition and behaviour: A causal analysis of single-occupancy car use in a rural community. *Transportmetrica A: Transport Science*, 9(1), 1–10. <https://doi.org/10.1080/18128602.2010.509706>

- Baytiyeh, H., & Naja, M. (2016). The effects of fatalism and denial on earthquake preparedness levels. *Disaster Prevention and Management*, 25(2), 154–167.
<https://doi.org/10.1108/DPM-07-2015-0168>
- Becker, J. S., Paton, D., & Johnston, D. M. (2015). *Communication of risk: A community resilience perspective* [GNS Science Report 2015/66].
- Benjamin, D., Por, H., & Budescu, D. (2017). Climate change versus global warming: Who is susceptible to the framing of climate change? *Environment and Behavior*, 49(7), 745–770.
<https://doi.org/10.1177/0013916516664382>
- Blanchard, K. (2018, November 16). #NoNaturalDisasters – Changing the discourse of disaster reporting. PreventionWeb. www.preventionweb.net/experts/oped/view/61996
- Breitsohl, H. (2019). Beyond ANOVA: An introduction to Structural Equation Models for experimental designs. *Organizational Research Methods*, 22(3), 649–677.
<https://doi.org/10.1177/1094428118754988>
- Brown, C., McDonald, G., Uma, S. R., Smith, N., Sadashiva, V., Buxton, R., Grace, E., Seville, E., & Daly, M. (2019). From physical disruption to community impact: Modelling a Wellington Fault earthquake. *Australasian Journal of Disaster and Trauma Studies*, 23(2), 65–76.
- Brun, W. (1992). Cognitive components in risk perception: Natural versus manmade risks. *Journal of Behavioral Decision Making*, 5(2), 117–132. <https://doi.org/10.1002/bdm.3960050204>
- Chmutina, K., & von Meding, J. (2019). A dilemma of language: “Natural disasters” in academic literature. *International Journal of Disaster Risk Science*, 10, 283–292.
<https://doi.org/10.1007/s13753-019-00232-2>
- 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. <https://doi.org/10.1037/0022-3514.58.6.1015>
- Darker, C. D., French, D. P., Longdon, S., Morris, K., & Eves, F. F. (2007). Are beliefs elicited biased by question order? A Theory of Planned Behaviour belief elicitation study about walking in the UK general population. *British Journal of Health Psychology*, 12(1), 93–110.
<https://doi.org/10.1348/135910706X100458>
- Ejeta, L. T., Ardalan, A., & Paton, D. (2015). Application of behavioral theories to disaster and emergency health preparedness: A systematic review. *PLOS Currents Disasters*.
<https://doi.org/10.1371/currents.dis.31a8995ced321301466db400f1357829>.
- Elliott, M. A., & Armitage, C. J. (2009). Promoting drivers’ compliance with speed limits: Testing an intervention based on the theory of planned behaviour. *British Journal of Psychology*, 100(1), 111–132. <https://doi.org/10.1348/000712608X318626>
- Flusberg, S. J., Matlock, T., & Thibodeau, P. H. (2017). Metaphors for the war (or race) against climate change. *Environmental Communication*, 11(6), 769–783.
<https://doi.org/10.1080/17524032.2017.1289111>
- Francis, J., Johnston, M., Eccles, M., Walker, A., Grimshaw, J. M., Foy, R., Kaner, E. F. S., Smith, L., & Bonetti, D. (2004). *Constructing questionnaires based on the theory of planned behaviour: A*

- manual for health services researchers*. Centre for Health Services Research.
<http://openaccess.city.ac.uk/id/eprint/1735>
- Furedi, F. (2007). The changing meaning of disaster. *Area*, 39(4), 482–489.
<https://doi.org/10.1111/j.1475-4762.2007.00764.x>
- George, D. (2017, March 24). *Major earthquake could split Wellington region into 'seven islands'*. Stuff.
<https://www.stuff.co.nz/national/nz-earthquake/90790889/major-earthquake-could-split-wellington-region-into-seven-islands>
- Gregorich, S. E. (2007). Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework. *Medical Care*, 44(1), 78–94. <https://doi.org/10.1097/01.mlr.0000245454.12228.8f>
- 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.
<https://doi.org/10.1016/j.jenvp.2015.08.003>
- Johnston, D., Becker, J., McClure, J., Paton, D., McBride, S., Wright, K., Leonard, G., & Hughes, M. (2013). Community understanding of, and preparedness for, earthquake and tsunami risk in Wellington, New Zealand. In H. Joffe, T. Rossetto & J. Adams (Eds.), *Cities at risk: Living with perils in the 21st century* (pp. 131–148). Springer. https://doi.org/10.1007/978-94-007-6184-1_8
- Kahlor, L. A., Olson, H. C., Markman, A. B., & Wang, W. (2020). Avoiding trouble: Exploring environmental risk information avoidance intentions. *Environment and Behavior*, 52(2), 187–218. <https://doi.org/10.1177/0013916518799149>
- Kelman, I. (2018). Lost for words amongst disaster risk science vocabulary? *International Journal of Disaster Risk Science*, 9, 281–291. <https://doi.org/10.1007/s13753-018-0188-3>
- McClure, J., Allen, M. W., & Walkey, F. (2001). Countering fatalism: Causal information in news reports affects judgments about earthquake damage. *Basic and Applied Social Psychology*, 23(2), 109–121. https://doi.org/10.1207/S15324834BASP2302_3
- McClure, J., Ferrick, M., Henrich, L., & Johnston, D. (2019). Risk judgments and social norms: Do they relate to preparedness after the Kaikōura earthquakes? *Australasian Journal of Disaster and Trauma Studies*, 23(2), 41–51.
- McClure, J., Johnston, D., Henrich, L., Milfont, T., & Becker, J. (2015). When a hazard occurs where it is not expected: Risk judgments about different regions after the Christchurch earthquakes. *Natural Hazards*, 75, 635–652. <https://doi.org/10.1007/s11069-014-1338-6>
- McClure, J., Sutton, R. M., & Sibley, C. G. (2007). Listening to reporters or engineers? How instance-based messages about building design affect earthquake fatalism. *Journal of Applied Social Psychology*, 37(9), 1956–1973. <https://doi.org/10.1111/j.1559-1816.2007.00245.x>
- McClure, J., White, J., & Sibley, C. G. (2009). Framing effects on preparation intentions: Distinguishing actions and outcomes. *Disaster Prevention and Management*, 18(2), 187–199. <https://doi.org/10.1108/09653560910953252>

- McClure, J., Wills, C., Johnston, D., & Recker, C. (2011). How the 2010 Canterbury (Darfield) earthquake affected earthquake risk perception: Comparing citizens inside and outside the earthquake region. *Australasian Journal of Disaster and Trauma Studies*, 2011(1), 3–10.
- Montibeller, G., & von Winterfeldt, D. (2015). Cognitive and motivational biases in decision and risk analysis: Biases in decision and risk analysis. *Risk Analysis*, 35(7), 1230–1251. <https://doi.org/10.1111/risa.12360>
- Mulilis, J., Duval, T. S., & Lippa, R. (1990). The effects of a large destructive local earthquake on earthquake preparedness as assessed by an Earthquake Preparedness Scale. *Natural Hazards*, 3, 357–371. <https://doi.org/10.1007/BF00124393>
- Najafi, M., Ardalan, A., Akbarisari, A., Noorbala, A. A., & Elmi, H. (2017). The theory of planned behaviour and disaster preparedness. *PLoS Currents Disasters*. <https://currents.plos.org/disasters/article/the-theory-of-planned-behavior-and-disaster-preparedness/>
- O’Keefe, P., Westgate, K., & Wisner, B. (1976). Taking the naturalness out of natural disasters. *Nature*, 260, 566–567. <https://doi.org/10.1038/260566a0>
- Paton, D., & Buergelt, P. (2019). Risk, transformation and adaptation: Ideas for reframing approaches to disaster risk reduction. *International Journal of Environmental Research and Public Health*, 16(14), 2594–2612. <https://doi.org/10.3390/ijerph16142594>
- Quarantelli, E. L. (1980). *The study of disaster movies: Research findings, problems and implications*. University of Delaware Disaster Research Center. <http://udspace.udel.edu/handle/19716/447>
- Ras, M. (2017, May 18). *Natural disasters don’t exist but natural hazards do*. <https://www.preventionweb.net/news/view/53253>
- Rochford, E. B., Jr., & Blocker, T. J. (1991). Coping with “natural” hazards as stressors: The predictors of activism in a flood disaster. *Environment and Behavior*, 23(2), 171–194. <https://doi.org/10.1177/0013916591232003>
- Schröder, N. (2010). Framing disaster: Images of nature, media, and representational strategies in Hollywood disaster movies. In L. Volkmann, N. Grimm, I. Detmers, & K. Thomson (Eds.), *Local natures, global responsibilities* (pp. 289–306). Brill | Rodopi.
- Smith, N. (2015, May 10). *More targeted approach to earthquake-prone buildings*. <http://www.beehive.govt.nz/release/more-targeted-approach-earthquake-prone-buildings>
- Teo, T. (2013). Online and paper-based survey data: Are they equivalent? *British Journal of Educational Technology*, 44(6), 196–198. <https://doi.org/10.1111/bjet.12074>
- Terpstra, T., & Lindell, M. K. (2013). Citizens’ perceptions of flood hazard adjustments: An application of the Protective Action Decision Model. *Environment and Behavior*, 45(8), 993–1018. <https://doi.org/10.1177/0013916512452427>
- Tippett, M. K. (2018). Extreme weather and climate. *Climate and Atmospheric Science*, 1, Article 45. <https://doi.org/10.1038/s41612-018-0057-1>
- Toka Tū Ake, E. Q. C. (2019). *Resilience strategy for natural hazard risk reduction 2019-2029*. Earthquake Commission.

<https://www.eqc.govt.nz/assets/Publications-Resources/Resilience-and-Research-Publications-/EQC-Resilience-Strategy-2019-2029.pdf>

UNISDR. (2009). *UNISDR terminology on disaster risk reduction*. UNISDR.

Vinnell, L. J. (2016). *Examining the effects of message framing and social norms on judgments of earthquake legislation* [Master's thesis, Victoria University of Wellington]. Victoria University of Wellington Research Archive. <http://researcharchive.vuw.ac.nz/xmlui/handle/10063/5471>

Vinnell, L. J., McClure, J., & Milfont, T. L. (2017). Do framing messages increase support for earthquake legislation? *Disaster Prevention and Management*, 26(1), 28–40. <https://doi.org/10.1108/DPM-06-2016-0127>

Vinnell, L. J., Milfont, T. L., & McClure, J. (2019a). Do social norms affect support for earthquake strengthening legislation? Comparing the effects of descriptive and injunctive norms. *Environment and Behavior*, 51(4), 376–400. <https://doi.org/10.1177/0013916517752435>

Vinnell, L. J., Milfont, T. L., & McClure, J. (2019b). The impact of the Kaikōura earthquake on risk-related behaviour, perceptions, and social norm messages. *Australasian Journal of Disaster and Trauma Studies*, 23(2), 53–64.

Vinnell, L. J., Milfont, T. L., & McClure, J. (2021). Why do people prepare for natural hazards? Developing and testing a Theory of Planned Behaviour approach. *Current Research in Ecological and Social Psychology*, 2, Article 100011. <https://doi.org/10.1016/j.cresp.2021.100011>

Vinnell, L. J., Orchiston, C., Becker, J., & Johnston, D. (2019). Pathways to earthquake resilience: Learning from past events. *Australasian Journal of Disaster and Trauma Studies*, 23(2), 35–40.

Wallemacq, P., & House, R. (2018). *Economic losses, poverty & disasters: 1998-2017*. United Nations Office for Disaster Risk Reduction.

Wellington Region Emergency Management Office. (n.d.). *Earthquake planning guide* [PDF file]. <https://wremo.nz/assets/Publications/Earthquake-Planning-Guide.pdf>

White, K. M., Smith, J. R., Terry, D. J., Greenslade, J. H., & McKimmie, B. M. (2009). Social influence in the Theory of Planned Behaviour: The role of descriptive, injunctive, and in-group norms. *British Journal of Social Psychology*, 48(1), 135–158. <https://doi.org/10.1348/014466608X295207>

Appendix

Figure A1

Results of Google Ngram Viewer Search for Terms “Natural Disaster” and “Natural Hazard”

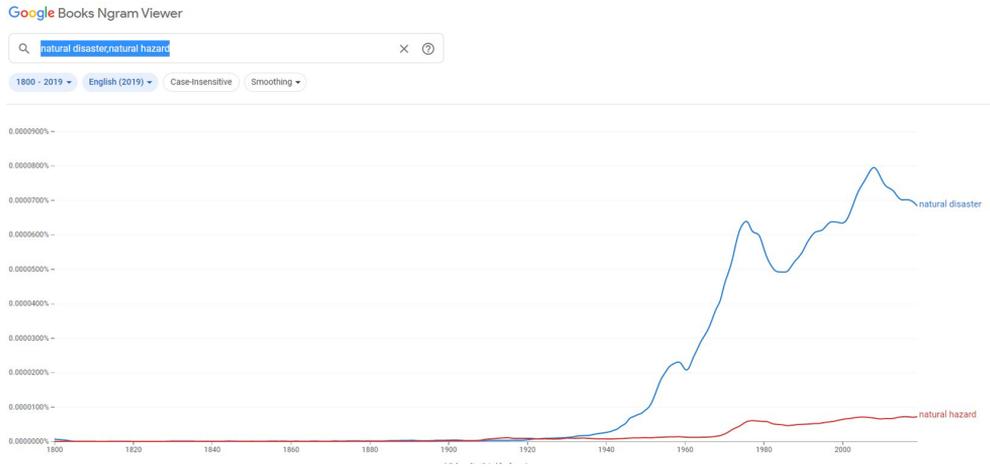
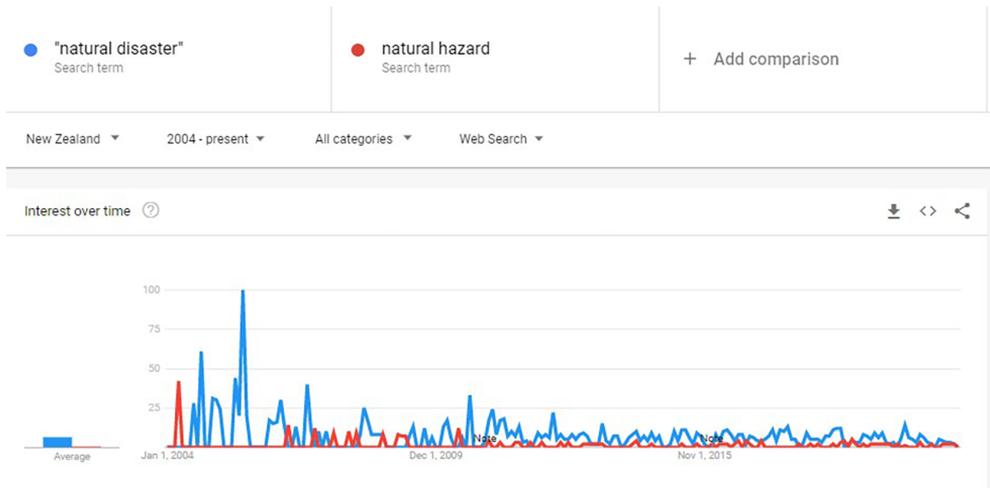


Figure A2

Results of Google Trends Search for Terms “Natural Disaster” and “Natural Hazard”





Social Psychological Bulletin (SPB) is an official journal of the Polish Social Psychological Society (PSPS).



leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.