NO PLACE LIKE HOME: THE ROLE OF PLACE ATTACHMENT IN INCREASING INDIVIDUAL PREPAREDNESS FOR NATURAL HAZARD EVENTS

BY

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Abstract

New Zealand is exposed to many natural hazards and yet, despite its heightened risk, national rates of individual preparedness remain low. Previous research has shown that place attachment is positively associated with disaster preparedness. My work builds on this research and explores (i) the relationship between place attachment and preparedness intentions and behaviours and (ii) the potential for a place attachment intervention to change preparedness and behaviours.

In the first two studies (Chapter 2), I examined 1) participants' levels of place attachment at different spatial scales, 2) participants' preparedness (intentions and behaviours), and 3) place attachment as a mediator of previously identified demographic predictors of preparedness. Findings show that place attachment is associated with both preparedness intentions and behaviour when measured simultaneously. When controlling for socio-demographic predictors, participants who reported stronger house and neighbourhood attachment also reported stronger intentions to prepare (Study 1). In Study 2, house attachment was associated with mitigation preparedness behaviour, whereas neighbourhood attachment was associated with community preparedness behaviour. House and neighbourhood attachment mediated the relationship between homeownership, length of residence, and preparedness. These findings suggest that place attachment varies by spatial scale which matters for different types of disaster preparedness.

The second set of studies (Chapter 3) consisted of a pilot study with undergraduate students (Study 3) and a two-wave randomised control trial with a community sample (Study 4) to examine whether the use of a place visualisation intervention would strengthen people's intentions to prepare (at Time 1) and encourage people to implement preparedness behaviours (at Time 2, two weeks later). I developed and implemented a guided place-based visualisation task, which asked participants to visualise a place they feel attached to (their house or in their neighbourhoods) and compared the effectiveness with visualisation of a neutral place. I expected that visualising one's house or neighbourhood (i.e. a place people feel attached to) would result in stronger intentions to prepare and higher uptake of preparedness behaviours at a two-week follow-up when compared to people who visualised a neutral place. I did not find any meaningful effect of place visualisation on preparedness intentions or behaviours.

In Study 5 (Chapter 4), I used qualitative methods to gain a deeper understanding of the quantitative findings. I thematically analysed qualitative data gathered as part of a

previous survey (Study 1) to understand people's relationships to places in more depth and to identify what people think is important about their attachment to places at different spatial scales. I identified six key themes (i.e. social, physical, residential, functional, sentimental, psychological) that were important for place attachment across four different spatial scales.

Finally, across two chapters, I further explored my place visualisation intervention and why it may not have been as effective as expected. To this end, I first provided a mixed-methods analysis of how participants engaged with the intervention task (e.g. time spent on the task and number of words written) (Study 6, Chapter 5). Then, I used insights from behaviour change theories (Chapter 6) to discuss the findings from Studies 1-6 as they relate to the advancement of place attachment theory, application to disaster preparedness behaviour-change, and implications for intervention design and implementation. In the final chapter (Chapter 7), I discussed the key findings and implications across the entire thesis and how these can be used to inform theory, practice, and future research directions.

Acknowledgements

This thesis is the product of countless hours of work by so many: the volunteers who pilot-tested my studies, the participants who contributed their time; and the colleagues who have improved my research along the way. And, most importantly, my supervisors who provided me with endless guidance and enthusiasm (even when we were all living on different continents). Dr Wokje Abrahamse, thank you for your constant support and your sound advice and insights at every step of this journey. Professor Ronald Fischer, thank you for your unfailing encouragement, for always pointing me in the right direction, and for enriching my research with your experience and knowledge. I have learnt so much from each of you and I will always be grateful for the effort you have put into teaching me. Thank you also to Professor Lori Peek who provided me with the experience of a lifetime at the Natural Hazards Centre; your leadership and kindness has inspired me endlessly.

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To my family, thank you for being there for every step of my student journey, from speech competitions in primary school, prizegiving ceremonies in high school, through to university graduations. You have always been there to encourage me. Mum and Dad, thank for your sacrifices that allowed me to be a first-generation university student. I will never forget that all of my achievements would not be possible without your decisions (and would not be anywhere near as enjoyable without your good humour and cheer). Thank you for always believing in me, gently guiding me, unconditionally loving me, and supporting me in more ways than you will ever know. I hope to keep making you proud.

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Statement of Authorship

I have submitted two manuscripts for journal publication using research from this thesis. Chapter 2 (Study 1 and 2) was submitted to 'Environment and Behavior' and is currently under review, after a first round of major revisions and a second round of minor revisions. Chapter 3 (Study 3 and 4) was submitted to the 'Journal of Environmental Psychology' and is currently under review after a first round of major revisions and a second round of minor revisions. As such, these two chapters were prepared as stand-alone research manuscripts. In this thesis, a revised version of each manuscript is presented with minor stylistic changes and with added context to add coherence to the overall thesis. I am the primary author on each of these manuscripts. With the help of my supervisors, I conceptualised the research, designed the surveys, collected the data, analysed and interpreted the data, and prepared the manuscripts.

Chapter 1: General Introduction

Just after midnight on Monday 14th November 2016, a magnitude 7.8 earthquake struck the North Canterbury area of New Zealand causing surface rupture, tsunami, coastal uplift, and landslides. Shaking was felt nationwide with damage recorded across much of the upper South Island and the capital city, Wellington (Hamling et al., 2017). While the loss of life was fortunately low (two deaths), the Kaikōura earthquake served as a reminder of New Zealand's ongoing natural hazard risk. Despite this, changes in household preparedness were short-lived. For example, a rise in preparedness from 2016 to 2017 (an increase of 7% of New Zealanders reported being prepared at home) in the wake of the Kaikōura earthquake had returned to baseline within two years (see *Figure 1.1*, Ministry of Civil Defence and Emergency Management, 2019). Moreover, baselines were inadequately low: only one in four people were prepared prior to the earthquake occurring. By comparison, nine in ten New Zealanders reported having a good understanding of the types of natural hazard events that could occur in New Zealand and the chances of them occurring prior to the earthquake occurring. There is a clear disconnect between the number of New Zealanders who are aware of the natural hazard risk they are exposed to and the number of New Zealanders who choose to act on this risk. This discrepancy between awareness and action reflects the many factors that contribute to preparedness decisions.

This thesis focuses on the larger Wellington region as a case study within New Zealand. According to a governmental review of the national hardscape, New Zealand's geography makes it particularly susceptible to multiple natural hazards including earthquakes, but also tsunami, flooding, volcanic activity, landslides, and storms (Ministry of Civil Defence and Emergency Management, 2007). The damage of these varied and continued natural hazard events is significant for a small nation (in terms of landmass and population). The 2016 Kaikōura earthquake, for example, lead to NZD$700 million worth of insured losses from private properties (with an additional NZD$1.5 billion insured losses from commercial properties: Insurance Council of New Zealand, 2020). This total was equivalent to roughly one percent of the Gross Domestic Product (GDP), whereas the total cost of insurance claims from the earlier Canterbury earthquake sequence of 2010-2011 was estimated at more than NZD$30 billion (equivalent to 15-20% of the GDP with 80,000 housing units damaged: Mumo & Watt, 2016; Noy, 2015). Gravely, 185 individuals lost their lives in the 2011 Canterbury earthquake. The Wellington region, more specifically, is situated

in one of the most active seismic regions in New Zealand with hazard modelling indicating that earthquake events across any of three prominent faults or subduction zone would generate significant damage to the city (Cousins et al., 2008). The Wellington region is also at risk for other natural hazard events including floods, tsunami, landslides, bushfires, and windstorms (Johnston et al., 2013; Khan, Crozier, & Kennedy, 2012). As evidenced by the earthquake losses recorded in New Zealand in the last decade alone, if disaster preparedness is not increased in the Wellington region, and across Aotearoa New Zealand, the consequences may be devastating.
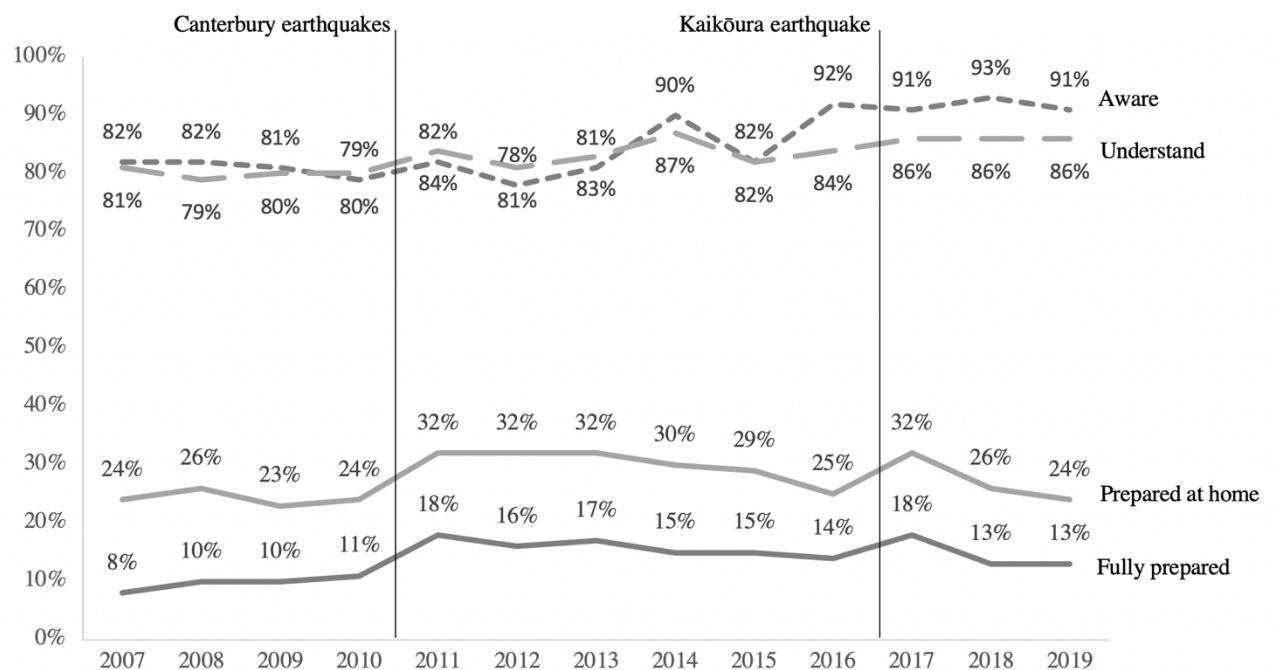
Figure 1.1. Rates of preparedness and natural hazard awareness/understanding in New Zealand from 2007-2019 (data collected by Colmar Brunton; Ministry of Civil Defence and Emergency Management, 2019)

That is the challenge addressed in this thesis: how can we better understand and increase preparedness to minimise risk for the many New Zealanders who remain unprepared? The issue with solving this challenge lies primarily in the complexity of the natural hazard events. While many natural hazards can be predicted, the timeframe between prediction and impact is often small (e.g. with extreme weather events). These small windows of opportunity to warn the public often leave little time for people to adequately prepare for the effects. This means that it is crucial that people make preparedness efforts

prior to any hazard event occurring (Paton, 2019). As previously stated, one major natural hazard risk in New Zealand comes from earthquakes. Earthquakes are not easily predicted, are infrequent, and cannot be prevented. This uncertainty can give rise to feelings of anxiety or even fatalism among those who are at risk (e.g. thinking 'nothing I do can make a difference'; Johnston et al., 2013). The individual decision to acknowledge natural hazards and act upon their risk is therefore complex and this complexity is backed by years of research investigating the varied predictors of preparedness (e.g. Dooley, Catalano, Mishra, & Serxner, 1992; Johnston et al., 2013; Kohn et al., 2012; Tierney, Lindell, & Perry, 2001).

In this thesis, I will examine the role of place attachment (defined as people's bonds with their meaningful places) as a promising predictor of preparedness behaviour (Scannell & Gifford, 2010a). While the relationship between place attachment and preparedness has been examined most extensively in the last decade (reflecting a surge in place attachment research since the turn of the 21st Century; *Figure 1.2*), it sits within a vast literature of psychological preparedness research. I will outline this literature briefly (for a recent comprehensive review, see Paton, 2019).

'Risk perception' is one of the earliest and most extensively examined predictors of preparedness, with decades of psychological research concerned with how people perceive the various risks they are faced with (Joffe, 2003; McClure, Ferrick, Henrich, & Johnston, 2019; Slovic, 1987; Twigg, 2013; Wachinger, Renn, Begg, & Kuhlicke, 2013). Acknowledgement of risk is indeed a precursor to actively reducing hazard risk in many cases (Johnston et al., 2013). However, as stated by Hilhorst and Bankoff (2013) when discussing the intersection between vulnerability, people, and disasters: "Perception, of course, is not knowledge, nor does knowledge necessarily translate into action" (p.4). People often make risk judgements in uncertain circumstances that are based on cognitive biases, such as the herding bias (i.e. making decisions based on observations of what other people are doing) or the optimism bias (i.e. underestimating personal risk and overestimating risk to other people: Johnston et al., 2013; Meyer & Kunreuther, 2017). Various other factors, such as natural hazard experience, values, and cultural and social dynamics also determine people's perceptions of risk (Eiser et al., 2012). As such, people's risk perceptions are regularly subject to inaccuracy, leading to a mismatch between perceived hazard susceptibility and actual hazard susceptibility (Khan et al., 2012). Even when perceived risk is high, a number of other factors contribute to people's decisions to prepare. Practical obstacles (e.g. picking up and installing a water tank) and/or financial restraints (e.g. cost of

water tanks) may be prohibitive for people to prepare adequately. Alternatively, people may simply not view preparedness as a priority (McClure, Spittal, Fischer & Charleson, 2015). Further, socio-political conditions can preclude the most disadvantaged or vulnerable groups from accessing vital resources to prepare (Blake, Marlowe, & Johnston, 2017). And, in situations where people are aware of the risk and how to prepare and are able to prepare, there is still a distinction between attitudes towards hazard likelihood and attitudes towards the necessity and effectiveness of preparing (Eiser et al., 2012).

Each of these conditions outlines the various reasons for low rates of disaster preparedness in New Zealand, even when perceived risk is high. Decades of research have come to these same conclusions: that people underprepare due to many psychological, socio-political, and contextual factors. Moving forward, it is crucial that novel approaches are taken to address this challenge and to help increase people's levels of preparedness for natural hazards. In this thesis, I use a psychological lens to explore one promising approach, based on previous studies. My approach will explore people's attachments to their important places as a predictor of disaster preparedness intentions and behaviour. But first, I will explore the broader natural hazard context, before outlining the current state of preparedness intervention research.

Natural Hazard Context

In 2019, the estimated global cost of disaster damage exceeded USD$200 billion (NZD$300 billion). This data from 2019 marked the end of the costliest decade for global disaster losses on record, totalled at nearly USD$3 trillion (NZD$5 trillion; Podlaha, Bowen, & Lörinc, 2019). The economic scale of these disaster losses is due, in part, to the increasing frequency of natural hazard events globally due to anthropogenic climate change as well as population growth and increasing urbanisation (Bouwer, 2011; Hoeppe, 2016). Reflecting the growing need for disaster risk reduction, New Zealand committed to the international Sendai Framework in 2015 (United Nations International Strategy for Disaster Risk Reduction; UNISDR, 2015). The framework offers a blueprint for reducing risk and loss from disasters globally through four prioritised areas. One of these priorities is "enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction" (UNISDR, 2015, p.21). Drawing on the terminology used by the UNISDR, I will define and explain three key terms for this thesis: preparedness, natural hazard, and

disaster. I will then explain how my thesis fits into these definitions and the Sendai Framework.

Preparedness is defined by the UNISDR as "The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters" (2016, p.21). In line with this definition, there are many ways in which people must prepare for natural hazards in order to reduce the impacts of disaster. Action is required that incorporates consideration of the social and physical environments, and action is needed at different levels of society. At the governmental level, for instance, policymakers need to enact policy that considers risk reduction, human welfare, and environmental protection. Response and recovery organisations at the frontline need to build community response plans and empower individuals to act to protect themselves, their families, and their neighbours. Individuals must increase their preparedness, and that of their family, their neighbours, and their community. And, above all, at each of these levels, groups should be working together and converging towards the common goal of reduced damage and disruption from natural hazard events.

Secondly, the UNISDR defines hazards as "a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation" (2016, p.18). Natural hazards are hazards that predominantly originate from natural processes or phenomena (as opposed to anthropogenic or socio-natural causes). The 'natural hazards' umbrella encompasses a long list of natural processes and phenomena including geological or geophysical hazards (e.g. earthquakes, tsunami, volcanic activity, and ground movement associated with these such as landslides), and hydrometeorological hazards (e.g. tropical cyclones, floods, drought, heatwaves, and coastal storm surges) (UNISDR, 2016).

Finally, natural hazards are events that *may* cause negative impacts whereas disasters are defined as "a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts" (UNISDR, 2016, p.13). The human dimension of natural hazard risk is therefore at the root of whether disasters eventuate. While hazards may have natural causes, disasters from natural hazards are only viewed as such when they severely disrupt or damage a community or society. They are grounded in the ability of humans to

successfully adapt to and prepare for such events. Additionally, disasters create disproportionate consequences on socially vulnerable populations, whether this vulnerability is financial, geographic, demographic, or otherwise. Human decisions, power structures, and historical inequalities continually perpetuate people's ability to prepare for natural hazard events and the likelihood that certain groups will experience serious disruption from these events (Kelman, Gaillard, Lewis, & Mercer, 2016; Thomas, Phillips, Lovekamp, & Fothergill, 2013). There is, therefore, no such event as a 'natural' disaster (Chmutina & von Meding, 2019; Gould, Garcia, & Remes, 2016; Kelman, 2020).

This thesis was motivated by New Zealand's commitment to the international Sendai Framework and a desire to increase knowledge about the way that individuals prepare for natural hazard events so that this knowledge could be applied to increase preparedness and reduce damage in New Zealand and globally. In line with the UNISDR definition, comprehensive preparedness comes from systemic change (e.g. at the governmental level), alongside individual and community-level changes, and that each of these levels should collaborate in their efforts towards disaster risk reduction. My thesis is grounded in psychological theory and methods and is therefore focused predominantly on preparedness actions at the individual level for natural hazard events. I do, however, acknowledge that individuals are embedded within their community and that community plays a key role in individual decision-making. The relationship between individuals and their communities will be discussed throughout this thesis. Further, it is important to note here that "preparedness for natural hazard events" is more accurate phrasing when compared with "disaster preparedness" given that natural hazard events need not become disastrous if adequate preparedness actions are taken. However, in this thesis, I will use both "disaster preparedness" and "preparedness for natural hazard events" to be consistent with the terminology used in the Sendai Framework (i.e. "disaster preparedness") and, therefore, global scientific efforts in this area of research. However, and importantly, I avoid using the term 'natural disaster' altogether because of mounting agreement in the scientific community that disasters eventuate due to human rather than natural causes.

Preparedness Interventions: What Works?

Decades of research have been devoted to understanding the various predictors of disaster preparedness. However, the successful translation of these learnings into a visible behavioural shift is unclear. Absolute levels of preparedness in at-risk communities around

the world remain low when considering the many recommended actions that can be taken at the individual level (Becker, Paton, Johnston, & Ronan, 2014; Kelly & Ronan, 2018; Perez-Fuentes & Joffe, 2015). While a great number of strategies are used to increase disaster preparedness in campaigns around the world, few of them are documented in detail, evaluated in-depth, or tested to determine their impact on behaviour (Bradley, McFarland, & Clarke, 2014; Joffe, Perez-Fuentes, Potts & Rossetto, 2016). In *Table 1.1*, I present a summary of the available preparedness intervention studies that reported on preparedness behaviour as an outcome variable. These are categorised into three broad categories: simple information provision, home checks, and community face-to-face workshops.

Table 1.1. Effectiveness of three types of preparedness intervention on preparedness behaviours

Intervention	Overview	Effectiveness	Cost	References
Simple information provision	Provision of educational material on preparedness delivered through mailers, social media posts, or advertisements	Mostly negative; information provision can increase preparedness in small-scale interventions, but widespread information campaigns are not effective	Low	Ballantyne et al., 2000; Eisenman et al., 2009; Glik et al., 2014; Paton, 2003; Perez-Fuentes & Joffe, 2015
Home checks	Visiting people's homes to observe their preparedness behaviours alongside self-reports of preparedness	Positive; in-home observational checks of preparedness actions can increase preparedness	Medium	Joffe et al., 2016
Community workshops	Hands-on preparedness education, face-to-face interaction, and/or community participation through	Positive; community workshops can increase disaster preparedness	High	Eisenman et al., 2014; Glik et al., 2014; MacDonald et al., 2017; Miller et

Disaster preparedness campaigns based on a model of simple information provision, have been common in New Zealand over past decades, reflecting a misguided assumption that information alone can change behaviour (Johnston et al., 2013; Paton, 2013). Simple information provision has shown some success when tested in smaller intervention groups (Eisenman et al., 2009; Glik, Eisenman, Zhou, Tseng, & Asch, 2014), however, evaluations of a widespread informational campaign in New Zealand showed no effect on preparedness behaviours (Ballantyne, Paton, Johnston, Kozuch, & Daly, 2000). In their study, Ballantyne and colleagues (2000) evaluated the effect of a preparedness information campaign run by government groups and administered widely through posters, leaflets, and fridge magnets. They found no change in preparedness behaviours and concluded that the information campaign did not influence risk reduction behaviours (despite being a key purpose of the campaign). While interventions such as these are low cost and easily scaled to a large population, the body of available evidence has led researchers to conclude that simple informational campaigns are not sufficient to change preparedness behaviours despite their widespread usage (Paton, 2003; Perez-Fuentes & Joffe, 2015).

Alternatively, strategies that administer educational face-to-face community workshops/meetings regularly report increases in self-reported preparedness across diverse populations (Eisenman et al., 2009; Eisenman et al., 2014; Glik et al., 2014; MacDonald, Johnson, Gillies & Johnston, 2017; Miller et al., 2014; Welton-Mitchell, James, Khanal, & James, 2018; Yasunari, Nozawa, Nishio, Yamamoto & Takami, 2011). The success of these interventions is likely attributable to their targeting of various preparedness predictors (e.g. self-efficacy, motivation, empowerment) rather than a sole focus on information provision (Joffe et al., 2016; Miller et al., 2014). While effective, community preparedness workshops are limited by their intensive approach. It is not possible to scale these interventions to reach a larger population (e.g. the Wellington region) without great cost. These financial restrictions leave government agencies and practitioners with little choice but to continue with (ineffective) mass information provision (e.g. informational preparedness leaflets) when there are no viable alternatives.

Preparedness Interventions: What Next?

The evidence base for preparedness interventions is scant and evaluation studies utilising experimental and/or longitudinal methodologies are scarce. Despite this, limited insights can be gleaned from those intervention studies that have been evaluated and subsequently published. While community workshops appear effective at increasing preparedness, they are also often expensive and resource heavy. There is a gap when it comes to research into low-cost, scalable, and non-intensive preparedness interventions. Such approaches can offer practitioners an evidence-based and effective alternative to simple information provision.

Additionally, the preparedness intervention literature is limited by a narrow definition of preparedness itself. The interventions outlined above largely focused on one type of preparedness only: survival preparedness (Ballantyne et al., 2000; Eisenman et al., 2009; Glik et al., 2014). Survival preparedness is defined as those actions taken to increase survival in the immediate aftermath of a natural hazard events such as storing food and water or having an emergency kit (Verrucci et al., 2016). Other interventions focused on other types of preparedness, including mitigation preparedness (defined as those actions taken to reduce risk of damage to structure, belongings, or self during a natural hazard event: McClure et al., 2015; Verrucci et al., 2016), but analysed preparedness as a whole rather than by its dimensions (Eisenman et al., 2014, Joffe et al., 2016; Welton-Mitchell et al., 2018). These one-dimensional approaches to measuring preparedness limit what can be concluded about an intervention's impact on different types of preparedness behaviours. As stated by McNeill and colleagues who examined different types of preparedness in their cross-sectional study: "It is important to understand how different factors might influence different types of preparedness, so as to enable the development of policies that target specific preparedness deficiencies in the most efficient manner" (McNeill, Dunlop, Heath, Skinner, & Morrison, 2013, p.1840). In the same way, it is important to understand how interventions influence different types of preparedness so that these interventions can be used efficiently and effectively to produce targeted behaviour change. Further, there has been a distinct lack of research into the predictors of community-based preparedness behaviours, defined as those actions taken at the individual level to increase community preparedness such as helping neighbours to prepare (Verrucci et al., 2016). Despite the importance of both mitigation and community preparedness behaviours for comprehensive and inclusive preparedness, they are less frequently undertaken compared with survival behaviours (McClure et al., 2015;

Verrucci et al., 2016). As such, there is a distinct need for future research to examine these different types of preparedness and how to increase them.

On these grounds, I propose that place attachment is an important avenue to explore for better understanding, and increasing, different types of disaster preparedness (i.e. survival, mitigation, and community preparedness). Humans are a territorial species who care deeply about the places we live and who we live with, with great implications for how we interact with our places (e.g. mitigation preparedness), and the people that make up these places (e.g. community preparedness). Our embeddedness or experience within our important places is tied up inextricably with how we think and act and, therefore, motivates cognition, emotion, and behaviour (Scannell & Gifford, 2010a). Supporting this, place attachment has been found to predict preparedness intentions and behaviours but, to date, researchers have only used correlational and qualitative methods (e.g. Anton & Lawrence, 2016; Mishra, Mazumdar, & Suar, 2010). Despite this, studies have found potential for place attachment to be used as a simple tool to change emotions, cognitions, and behaviour (Kumashiro & Sedikides, 2005; Mikulincer, Shaver, Gillath, & Nitzberg, 2005; Scannell & Gifford, 2017a). Building on these studies, I pose the following research question: Can we understand and harness place attachment as a tool to increase disaster preparedness?

Place Attachment as a Tool for Preparedness

Research on place attachment has proliferated over the last two decades. A keyword search for 'place attachment' in the ProQuest database returned 571 publications in 2019 alone compared to just 18 publications two decades earlier in 1999 (see *Figure 1.2*). This spike in scientific attention reflects an increased acknowledgement of the importance of people-place relationships for how we think, feel, and act. It can also be attributed to the changing role of place in contemporary society where "globalization, increased mobility, and encroaching environmental problems threaten the existence of, and our connections to, places important to us" (Scannell & Gifford, 2010a, p.1). This is particularly pertinent when we consider the growing risk posed to us globally by natural hazard events and the changing climate. The threat that natural hazards pose for our places, and the meaning associated with them, makes it particularly important to understand and study place attachment in the context of individual preparedness. On this, Carrus and colleagues (Carrus, Scopelliti, Fornara, Bonnes, & Bonaiuto, 2014) propose that there may be a place-protective function inherent to place attachment, such that individuals act in certain ways that are consistent with place

preservation. This is particularly relevant for disaster preparedness when considering that certain actions (such as strengthening house foundations) are performed in pursuit of protecting the house from damage. Supporting this, a recent meta-analysis identified place attachment as one of thirteen factors that motivate adaptive action for natural hazard risk, therefore signifying person-place bonds as theoretically and empirically relevant for place-protective action (van Valkengoed & Steg, 2019). Place attachment and preparedness are undoubtedly relevant for one another, and this is reflected in a body of correlational research (e.g. Anton & Lawrence, 2016; Mishra et al., 2010). However, questions remain regarding the mechanisms and practical utility of this association. Research in this space will benefit from further exploration into the role of person-place bonds for preparedness and into whether these bonds can be used to facilitate preparedness behaviour change.
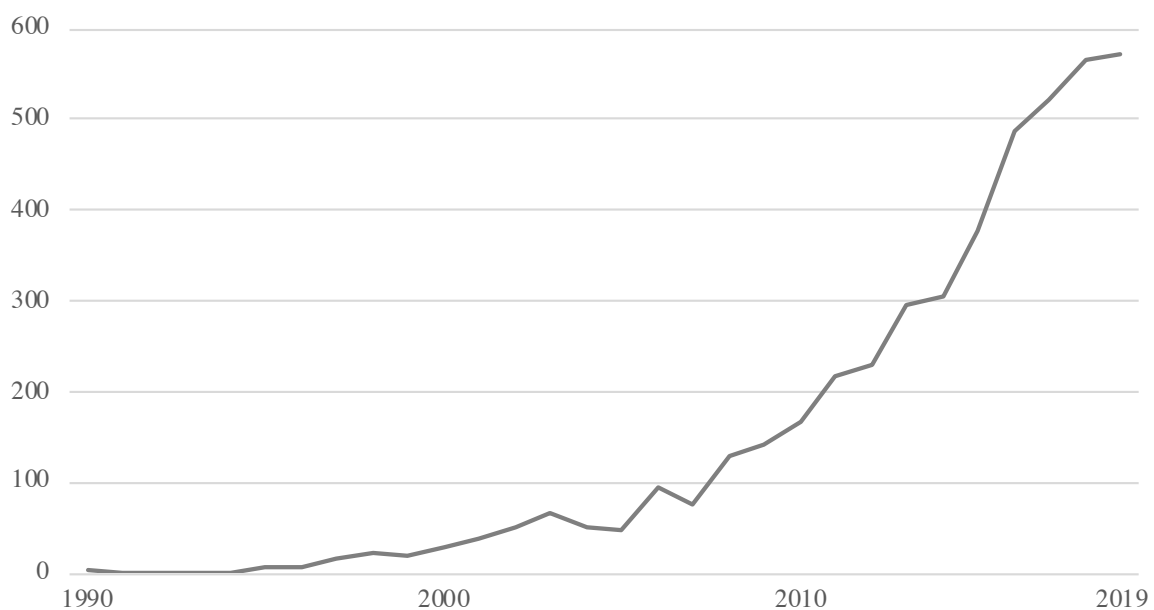
Figure 1.2. Number of publications containing keyword 'place attachment' from 1990-2019 (ProQuest, 2020)

Broadly speaking, 'place' can be defined as the combination of physical and human environments (Shamai, 1991), or the attribution of value to a neutral space as it becomes better known (Tuan, 1977). As outlined by Proshansky and colleagues (Proshansky, Fabian, & Kaminoff, 1983) in their seminal piece on place-identity, place is not merely 'experienced and recorded' by a person, but also varies in its ability to fulfil human needs and desires.

One's conception or experience of a place is also influenced by other people and what they think about that place and is "best thought of as a potpourri of memories, conceptions, interpretations, ideas, and related feelings about specific physical settings as well as types of settings" (Proshansky et al., 1983, p.60).

Place attachment itself is defined as the bonding that occurs between a person and any place that is meaningful to them (Scannell & Gifford, 2010a). It is important to note that a person's conception of, and connection to, their places can be classified in different ways by different authors depending on their disciplinary focus. It can also be classified differently based on the type and scale of the place in question, from rooms, homes, and neighbourhoods to landscapes, cities, and countries (Williams, 2014). Through this differentiation, various concepts and definitions have arisen over the past decades and many terms are still (at times, mistakenly) used interchangeably. Multiple reviews have been conducted on the topic of untangling people-place concepts, including place identity, place dependence, sense of place, and rootedness (e.g. Bott, Cantrill, & Myers, 2003; Easthope, 2004; Williams, 2014). Traditional measures of place attachment acknowledge place identity as an important component of attachment to place but also incorporate other dimensions to represent emotional or behavioural processes related to the person-place bond (see Jorgensen & Stedman, 2001). In the process of quantifying place attachment through psychometric scales, the concept is commonly viewed as multi-dimensional, with the dominant approach distinguishing between two key dimensions: place identity and place dependence (Williams, Patterson, & Roggenbuck, 1992; Williams & Vaske, 2003). Place identity is defined under this framework as a mixture of feelings and symbolic connections to a place that defines who we are, whereas place dependence is the functional or goal-directed connections to a place that facilitates intended usage of that place (Raymond, Brown, & Weber, 2010).

In their early defining book on place attachment, Altman and Low (1992) noted that place attachment was historically the domain of phenomenologist scholars who were concerned with the unique subjective experiences of people with their places. It was not until later in the twentieth century that the study of environment and behaviour came under psychological scrutiny, looking specifically into people's cognitions about their environments. While place attachment as a concept has traditionally been the focus of environmental psychologists, it is also the focus of sociologists, human geographers, planners, architects, and cultural anthropologists alike (to name only a few; Lewicka, 2011). Place attachment has also been elevated into the realm of applied science where it is being

used to inform urban and community design processes, social housing policymaking, natural resource management, pro-environmental behaviours, and response to natural hazard risk (Manzo & Devine-Wright, 2014). These rich and varied research streams mark a new and growing area of development within the place attachment literature and one that holds great promise.

When considering the implications for certain behaviours and attitude, research has highlighted the importance of considering place attachment at different spatial scales (e.g. neighbourhood vs country: Devine-Wright & Batel, 2017). Despite this, the majority of research into place attachment has focused on attachment at one level only (often neighbourhood: Lewicka, 2011). To overcome this, there has been a call to examine people's attachment to different types of places, at different spatial scales, by multiple researchers (Devine-Wright & Batel, 2017; Lewicka 2010). Research on this topic has been dominated by quantitative studies thus far. People report, on average, stronger levels of attachment to their houses or their cities than to their neighbourhoods (Casakin, Hernández, & Ruiz, 2015; Hidalgo & Hernández, 2001; Lewicka 2010). Further to this, research shows that large-scale attachment (national or regional) is either equal (Ardoin, 2014) or greater in strength to smaller-scale local attachments (e.g. neighbourhood) (Ardoin, 2014; Devine-Wright & Batel, 2017; Devine-Wright, Price, & Leviston, 2015; Hernández, Hidalgo, Salazar-Laplace, & Hess, 2007). A cross-national study on this topic compared the strength of multiple attachments (neighbourhood, town/city, province, country, and continent) and found that, for 22 of the 24 countries surveyed (including New Zealand), country attachment was stronger than neighbourhood attachment (Laczko, 2005). Despite this, regional and national attachments are still vastly under-researched in the literature (Ives et al., 2017). There is, therefore, significant rationale to consider the effects of large-scale place attachment through examining place attachment by spatial scale.

Across multiple disciplinary approaches, researchers have employed an array of methods to study place attachment: quantitative (e.g. psychometric scales within surveys), qualitative (e.g. interviews) and mixed methods (e.g. questionnaires, interviews, and discussion groups; Hernández, Hidalgo, & Ruiz, 2014). However, mixed methods research projects remain in the minority, and most research efforts in recent decades have been devoted to describing or explaining people's bonds with their places (Ives et al., 2017; Lewicka, 2011), rather than looking at how these understandings can be used to create positive change. This thesis marks the next step in the applied research agenda through an in-

depth examination of place attachment (at different spatial scales) as a predictor of different types of disaster preparedness. This examination will be conducted through a mixed methodological approach, including correlational surveys, experimental surveys, and thematic analyses.

Thesis Overview

The purpose of this thesis was to examine the relationship between place attachment and disaster preparedness in the Wellington region of New Zealand. To further this goal, I sought to explore the usage of place attachment as a tool to increase disaster preparedness through an intervention study. These goals were achieved in the following chapters and are summarised in a schematic overview in *Figure 1.3*.

The first aim of this thesis was to empirically establish the relationship between place attachment and people's engagement in disaster preparedness behaviours. Chapter 2 presents correlational data, and I examine how place attachment relates to disaster preparedness in the Wellington region of New Zealand. I collected data from two different community samples and this allowed me to explore the cross-sectional association between place attachment at four different spatial scales (house, neighbourhood, city, and country) on the one hand and three types of preparedness intentions and behaviours on the other hand (survival, mitigation, and community). In this chapter, I also examine the role of place attachment as a mediator of the relationship between preparedness behaviour and sociodemographic factors.

Building on the correlations between place attachment and preparedness behaviour observed in Chapter 2, I then designed and tested a place visualisation intervention with the goal to use place attachment to increase preparedness behaviour. Chapter 3 details the findings from a pilot-test of this intervention with an undergraduate student sample. This pilot test was conducted as a preliminary test of the intervention (with preparedness intentions as the dependent variable) and as a manipulation check of the intervention (measuring pre and post-intervention place attachment). The chapter then reports findings from a pre-registered randomised controlled intervention study with a community sample. Data was collected at two time-points to determine the effect of the place attachment visualisation intervention on self-reported preparedness intentions and behaviour.

In Chapter 4, I used thematic analysis to explore the qualitative data I had gathered on place attachment as part of the cross-sectional surveys. Participants were asked to freely list all of the ways in which they considered themselves attached at four different spatial scales

(house, neighbourhood, city, and country). I present key themes of place attachment at each of these four different spatial scales and discuss these to provide a more in-depth insight into people's bonds with places and the intervention findings presented in Chapter 3. These findings are also highly relevant for refinements of place attachment scales and attachment theories. Further explanations for intervention findings are presented in Chapter 5. In this chapter, I analysed qualitative data collected as part of the intervention studies to uncover individual differences in how the tasks were approached by participants (e.g. what they reported while visualising their chosen place). I also analysed quantitative data (word-count and time spent on the intervention tasks) to explore their potential influence on the intervention's effectiveness. These findings are useful in combination with the qualitative analysis of the key themes of attachment to examine whether visualisation tasks capture relevant key themes of place attachment and vice versa. In Chapter 6, I contextualise my intervention design alongside prominent behaviour change theories to make recommendations for the future of intervention research. Together, these chapters provide an overview of my research process from intervention rationale and design through to implementation and evaluation.

	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6
Research Objective	Testing cross-sectional associations between place attachment and preparedness	Testing cross-sectional associations between place attachment and preparedness	Pilot test and manipulation check of place visualisation intervention	Full test of place visualisation intervention	Analysing themes of place attachment across spatial scales	Exploring what people visualised during the intervention
Methodology	Quantitative (linear regression, mediation)	Quantitative (linear regression, mediation)	Quantitative (Analysis of Variance)	Quantitative (Analysis of Variance)	Qualitative (Thematic Analysis)	Quantitative and Qualitative
Data Source	Community survey	Cross-sectional data from Study 4	Experimental survey with students	Community intervention (Time 1 and Time 2)	Free-response data from Study 1	Intervention data from Study 4
Main Variables	Place attachment (small-scale and large-scale) and preparedness	Place attachment (house and neighbourhood) and preparedness	Intervention condition (IV) and preparedness intentions (DV)	Intervention condition (IV) and preparedness behaviour (DV)	Themes of place attachment	Keywords from visualisation, time spent on visualisation, and word count
Sample (N)	291	401	131	401 (T1) 177 (T2)	245	239

Figure 1.3. Schematic summary of empirical studies presented in this thesis

Chapter 2: Place Attachment and Disaster Preparedness: Examining the Role of Spatial Scale and Preparedness Type[1]

Abstract

Research shows that place attachment is associated with disaster preparedness. In two studies I examined 1) participants' place attachment at different spatial scales, 2) participants' preparedness (intentions and behaviours), and 3) place attachment as a mediator of previously identified demographic predictors of preparedness. My findings show that place attachment is associated with both preparedness intentions and behaviour. When controlling for socio-demographic predictors, participants who reported stronger house and neighbourhood attachment also reported stronger intentions to prepare (Study 1). In Study 2, house attachment was associated with mitigation preparedness behaviour, whereas neighbourhood attachment was associated with community preparedness behaviour. House and neighbourhood attachment mediated the relationship between homeownership, length of residence, and preparedness. These findings suggest that place attachment varies by spatial scale which matters for different types of disaster preparedness. House and neighbourhood attachment should be considered as relevant predictors of mitigation and community disaster preparedness.

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[1] The content in this chapter was submitted to 'Environment and Behavior' and is currently under review, after a first round of major revisions and a second round of minor revisions. Minor revisions and stylistic changes have been made to the manuscript to establish coherence with the rest of the thesis

Introduction

In this chapter, I seek to establish the cross-sectional relationship between place attachment and disaster preparedness in the Wellington region of New Zealand. This chapter marks the first research explicitly examining place attachment in relation to disaster preparedness in a New Zealand context. It will additionally explore how place attachment relates to spatial scale of place, type of preparedness, and other established demographic predictors of preparedness.

Globally, the number of disasters is increasing over time, both in terms of frequency and severity, with devastating impacts in terms of death, displacement, and damage (Hoeppe, 2016). Disaster scientists have shifted away from framing these events as 'natural' disasters because of the role that people play in exacerbating vulnerability at the individual, community, and societal level (O'Keefe, Westgate, & Wisner, 1976). One example of this vulnerability is the low adoption rates of preparedness actions in at-risk communities around the world (Kelly & Ronan, 2018). Given the failure of hazard information alone at increasing levels of disaster preparedness (Ballantyne, Paton, Johnston, Kozuch, & Daly, 2000; Paton & Johnston, 2001), researchers need greater insight into the determinants of disaster preparedness and 'what works' when it comes to increasing preparedness (see Mileti & Peek, 2002). To determine 'what works', a recent meta-analysis (van Valkengoed & Steg, 2019) identified 13 key factors that motivate adaptive behaviours to natural hazard events (primarily hurricanes and flooding). Of these, place attachment was identified as both theoretically and empirically important for disaster preparedness. Despite this, the relative effect of the relationship between place attachment and adaptive behaviour was weak compared to other identified factors (e.g. social norms, self and outcome efficacy, and risk perception). I argue that this effect may be suppressed by a narrow operationalization of both place attachment and disaster preparedness in previous research. This chapter analyses people's place attachments at different spatial scales, and the type of preparedness being studied, when these associations are considered.

Defining Place Attachment

Place attachment is broadly defined as the bond between individuals and their meaningful places (Scannell & Gifford, 2010a) and usually encompasses an emotional tie to these places (Altman and Low, 1992). Originally measured through proxies (e.g. length of residence; Riger & Lavrakas, 1981), research into place attachment has developed over the

last decades to recognise the limitations of these measures (i.e. that they do not capture the complex affective, cognition, and behavioural aspects of attachment). Some researchers — based on studies conducted within a wider array of theoretical positions — propose two distinct but related dimensions of attachment: place identity and place dependence. Pioneering authors, such as Proshansky and colleagues (Proshansky, Fabian, & Kaminoff, 1983), initially examined place identity as an extension of the identity literature. Place identity is also used in the place attachment domain to reflect the "symbolic importance of place as a repository for emotions and relationships that give meaning and purpose to life" (Williams & Vaske, 2003, p.831). Place dependence, however, reflects functional ties to a place, or the ability of that place to provide amenities to undertake desired or necessary actions such as having nearby shops, holding resources needed to undertake work, or providing access to schools (Vaske & Kobrin, 2001). This two-dimensional structure of place attachment (place identity and place dependence) has been validated across samples and place types (Vaske, Beaman, & Sponarski, 2017; Williams & Vaske, 2003), and is regularly used to quantitatively measure place attachment (e.g. White, Virden, & van Riper, 2008).

Preparedness and Spatial Scales of Attachment

The first aim of this research is to understand the extent to which attachment at different spatial scales is associated with disaster preparedness. As identified by Lewicka (2011), studies on attachment have often focused on one type of place in isolation and neglected to compare attachment to other types and scales of places. Earlier place attachment research, for instance, examined attachment to one's neighbourhood (Riger & Lavrakas, 1981), while later studies were expanded to look at attachment to one's house (Anton & Lawrence, 2016), city (Scannell & Gifford, 2010b), country (Churchman & Mitrani, 1997), and natural resource areas (Williams & Vaske, 2003). Concerning the importance of attachment at the different scales, Hidalgo and Hernández (2001) found a U-shaped curvilinear relationship between place attachment and spatial scale. They found that attachment at the house and city level were stronger, but attachment at the neighbourhood level was generally weaker. Lewicka (2010) subsequently argued that environmental psychologists should pay more attention to smaller (i.e. house) and larger (i.e. city) scales of place attachment rather than solely focusing on neighbourhood attachment. In taking this approach, studies have found differences in environmental attitudes, beliefs, intentions, and behaviours according to the spatial scale of place attachment (e.g. larger-scale versus local-

scale sense of place: Ardoin, 2014; neighbourhood identity versus regional identity: Forsyth, van Vugt, Schlein, & Story, 2015; and local versus national versus global attachment: Devine-Wright & Batel, 2017). These findings suggest that understanding the geographic scale of a place (from house to neighbourhood to country) can help to capture variation in strength and people's experiences of place attachment.

The relationship between people's place attachment and their behaviour may also depend on the spatial scale of the place. Published reviews on place attachment have reported weak relationships with preparedness (e.g. van Valkengoed & Steg, 2019) and in other cases, the findings have been inconclusive (e.g. Bonaiuto, Alves, De Dominicis, & Petruccelli, 2016). As previous research has indicated, behaviours are more likely to be influenced by cognitions that match in specificity and spatial scale (Fishbein & Ajzen, 2010; Weigel, Vernon, & Tognacci, 1974). In line with this, disaster preparedness behaviour may be more likely to correlate with cognitions when the spatial dimension of attachment matches the spatial scale of the behaviours. I argue that comprehensive analyses of the relationship between place attachment and disaster preparedness, using the spatial scale of place and preparedness type as independent variables, may achieve greater clarity on the strength of the relationship. My study examines people's place attachment to four different types of place (house, neighbourhood, city, and country) in relation to their disaster preparedness.

In line with this emphasis on greater precision (i.e. no longer treating 'disaster preparedness' as one behavioural category), the second aim of my research is to understand the extent to which place attachment is associated with different types of preparedness (e.g. Spittal, McClure, Siegert, & Walkey, 2008). I differentiate between survival, mitigation and community behaviours. Survival behaviours, for instance, directly contribute to the safety and wellness of individuals once a natural hazard event has occurred (e.g. storing food and water). In contrast, mitigation behaviours are actions taken prior to the natural hazard event that seek to minimise or reduce the risk of damage to people, buildings, and infrastructure (e.g. fastening furniture to walls). Research has found that individuals were more likely to have completed survival behaviours than any other type of preparedness behaviour (McClure, Spittal, Fischer & Charleson, 2015). While mitigation behaviours are crucial to reducing damage to buildings and consequent injury and fatalities during natural hazard events, they have been under-emphasised in hazard preparedness education (Russell, Goltz & Bourque, 1995). Finally, community behaviours are a third type of behaviour concerned with enhancing the safety and wellbeing of others outside of one's household (e.g. identifying

vulnerable neighbours that need checking up on). This type of behaviour has traditionally received less attention (Helsloot & Ruitenberg, 2004). This may be because the role of community in disaster management came to the forefront in recent decades, allowing for a more inclusive view of preparedness to emerge in the 21st century (Maguire & Hagan, 2007).

My research therefore examines preparedness in three separate categories (mitigation, survival, and community) to determine how it is related to place attachment. In this research, I include self-reported preparedness intentions and self-reported preparedness behaviours as my two key dependent variables. I choose to test preparedness intentions alongside preparedness behaviours as intentions to prepare are associated with preparedness behaviour (see Najafi, Ardalan, Akbarisari, Noorbala, & Elmi, 2017). This will allow me to expand the conclusions I can draw about my data whilst looking at 'what works' in increasing preparedness.

Place Attachment in Mediation

Finally, the third aim of my research is to understand how place attachment and preparedness relate to relevant socio-demographic variables. Lewicka's (2011) review reports on two robust predictors of place attachment. Homeownership is frequently associated with place attachment (Anton & Lawrence, 2014; Brown, Perkins, & Brown, 2003; Ringel & Finkelstein, 1991) alongside length of residence (Bonaiuto, Aiello, Perugini, Bonnes, & Ercolani, 1999; Brown et al., 2003; Lewicka, 2010). Both variables are also associated with greater levels of preparedness (Anton & Lawrence, 2016; Russell et al., 1995; Spittal et al., 2008). Paton and colleagues (2008) theorised that place attachment may influence preparedness because "place attachment… increases people's emotional investment in their community, making it more likely that people will be motivated to act to enhance their safety within this environment" (Paton, Bürgelt, & Prior, p.44). To the extent that homeownership and length of residence may increase attachment to a place, which in turn may increase the motivation to prepare for a possible natural hazard event, one could expect that attachment cognitions mediate the effect of these demographic variables on preparedness. Hence, I test whether place attachment is a statistical mediator of the relationship between preparedness and both homeownership and length of residence. In doing so, I add to the wider understanding of what variables are associated with preparedness and the explanatory role of place attachment in these associations. Even though other socio-demographic variables are found to be linked with both place attachment and preparedness (e.g. education, income, and

age: Lewicka, 2011), I do not find any of these relationships to be empirically robust enough to justify mediation tests.

Summary and Research Questions

To conclude, place attachment is a key component in helping researchers to better understand decisions around disaster preparedness (Paton & Bürgelt, 2017; van Valkengoed & Steg, 2019; Xu, Peng, Liu, & Wang, 2018). People with higher levels of place attachment to their neighbourhoods and local areas, for instance, are more likely to prepare for possible floods (e.g. through survival, mitigation, and community involvement) (Bonaiuto, De Dominicis, Fornara, Ganucci Cancellieri & Mosco, 2011; Mishra, Mazumdar, & Suar, 2010). Place attachment to houses and local areas (both place identity and place dependence) is also positively associated with survival and mitigation preparedness for wildfires (Brenkert-Smith, 2006; Collins, 2008; Paton et al., 2008; Bihari & Ryan, 2012; Anton & Lawrence, 2016). Moreover, place attachment is associated with length of residence and homeownership and both, in turn, are associated with preparedness. These relationships and their likely temporal association provide a case for proposing and testing mediation and, therefore, the development of theoretical models that might broaden knowledge about place attachment as a predictor. Across two studies, I therefore explore two key research questions. I have chosen to use research questions here instead of hypothesis-testing due to a lack of prior research establishing how spatial scale might influence place attachment and preparedness links, as well as mediation patterns. As such, this research is exploratory in nature.

Research Question 1 (RQI): How does the relationship between place attachment and disaster preparedness (intentions and behaviour) differ according to the spatial scale of the place being considered, and the type of preparedness being considered?

Research Question 2 (RQ2): Does place attachment mediate the relationship between homeownership and preparedness (behaviours and intentions), and between length of residence and preparedness (behaviours and intentions)?

Study 1
Method

Participants and Procedure. The survey was distributed online via local social media networks (buy-sell-swap groups in the Wellington region of New Zealand) and participants were able to enter a prize draw for one of three $100 grocery vouchers as a token

of appreciation for their participation. Participants were informed that the survey was conducted to better understand people's disaster preparedness in the Wellington region. Inclusion criteria for survey participants were current residence in the Wellington region (including Upper Hutt, Lower Hutt, and Porirua) and age (18 years or older). Of those that started the online survey, seventy-four percent (74.1%) of those participants who were eligible, and consented, to be involved completed our survey, resulting in a final sample of 291 adults (see *Table 2.3* for demographic information). Comparing our sample demographics with those from the most recent Aotearoa/New Zealand Census (Statistics New Zealand, 2013), some aspects of the sample are broadly reflective of the Wellington region e.g., income (Census: $32,700 median), age (Census: 36.2 years median), and ethnic diversity (Census: 77% New Zealand European/Pākehā; 13% Māori; 8% Pasifika). Other aspects however reflect an over-representation of females (Census: 52% female) and educated individuals (Census: 28% Bachelors degree or higher). The School of Psychology Human Ethics Committee granted ethical approval for this survey under the delegated authority of the Victoria University of Wellington Human Ethics Committee (#0000025441).

Measures. To examine place attachment, participants completed six questions adapted from the measure used by Scannell and Gifford (2017a). These questions included four items related to place identity (e.g. "I really miss ___ when I'm away from it for too long" and "I feel that ___ is a part of me"), and two items related to place dependence (e.g. "___ is not a good place to do the things I most like to do", reverse-coded). These six questions were asked in relation to four different spatial levels of place: house, neighbourhood, city, and country (not counterbalanced). All questions were asked on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). For descriptive statistics, see *Table 2.1*.

Preparedness behaviours were assessed at the beginning of the survey using a self-report checklist. A total of 18 preparedness behaviours were assessed including seven survival behaviours, eight mitigation behaviours, and three community behaviours (refer to *Table 2.2* for a full list of items). These items were drawn from Paton and Johnston's (2008) adapted version of Spittal, Walkey, McClure, Siegert, and Ballantyne's (2006) Earthquake Readiness Scale. I added additional items, including all community behaviours, in accordance with up-to-date information from New Zealand's Ministry of Civil Defence and Emergency Management such as making an emergency kit and having disaster insurance coverage. Participants were asked to indicate whether they had undertaken each of the

specific behaviours with five response options to choose from: "Yes", "No", "Partly", "Unsure", and "Not applicable". 'Not applicable' responses were excluded from the analyses (see *Table 2.2* for sample size after these exclusions). For this study, participant responses for each item were only analysed if they were deemed 'applicable' by the participant. With those remaining responses, each individual behaviour was dichotomously coded for completion (1= "Yes"), or non-completion (0= "No", "Partly", "Unsure"). For those participants whom *all* behaviours within the subscale were 'applicable', individual preparedness behaviours were tallied together to create three frequency measures: survival preparedness behaviours (n=274), mitigation preparedness behaviours (n=249), community preparedness behaviours (n=274). See *Table 2.2* for descriptive information.

This survey also assessed self-reported participants' intentions to complete each of the possible 18 behaviours they had not completed already (therefore excluding those who had completed the behaviour, partly completed the behaviour, were unsure, or reported that it was not applicable). Intentions ratings were made on a 5-point Likert scale ranging from 1 (definitely not) to 5 (definitely yes). Three subscales were created for each participant to measure preparedness intentions by averaging intention scores across categories of preparedness behaviours: survival preparedness intentions (n=260); mitigation preparedness intentions (n=267); and community preparedness intentions (n=249; see *Table 2.2*).

Based on prior research (Russell et al., 1995; Spittal et al., 2008) on common predictors of preparedness, other information about participants (age, gender, education, income, homeownership, length of residence, and previous natural hazard experience) was collected to be used as control variables in my analysis (see *Table 2.3*).

Results

Data treatment. Principal Components Analysis (PCA) using oblimin rotation was conducted with all 24 place attachment items (identity and dependence items asked in relation to house, neighbourhood, city, and country). Five factors were extracted based on Kaiser's eigenvalue larger than 1 criterion. The first four of these components captured identity by place scale: house identity, neighbourhood identity, city identity, and country identity. A fifth component represented all dependence items related to house, neighbourhood, city, and country. It is noteworthy that place dependence items were negatively framed while place identity items were all worded positively. Negatively worded items may introduce a higher cognitive load when answering, which may have resulted in this

separate component with all items across spatial scales loading together. I decided to only use the four identity components and exclude the dependency component from a second Principal Component Analysis. Based on scree plot visualisation, and to minimise issues of multicollinearity (correlations between components ranging between .22 and .42), two components were extracted which in combination explained 55.15% of the variance, both with eigenvalues greater than one (Bartlett's Test of Sphericity: $\chi^2(120)=2594$, $p<.001$). The first component represented a combined house and neighbourhood attachment (hereafter referred to as small-scale attachment) made up of the identity items relating to participants' houses and neighbourhoods (8 items). The second component represented a combined city and country attachment (hereby referred to as large-scale attachment) made up of the identity items relevant to Wellington and New Zealand (8 items). See *Table 2.1* for the items, component loadings, and cross-loadings. Reliability scores were good for each of the two components: small-scale attachment ($\alpha=.87$), large-scale attachment ($\alpha=.88$). Further, as anticipated by the use of oblimin rotation, small-scale attachment was moderately positively correlated with large-scale attachment (.37). In order to avoid multicollinearity problems, I performed a series of linear regressions separately for each attachment predictor as well as a joint analysis with both predictors entered jointly. I also examined the multicollinearity of the independent variables in each model using the Variance Inflation Factor (VIF). I chose a conservative threshold to determine cases of multicollinearity (VIF greater than 4; O'Brien, 2007).

RQ1: Linear Regression. Multiple linear regressions were conducted to determine whether place attachment significantly correlates with disaster preparedness (behaviours and intentions), over and above known correlates. For each regression, Model 1 controlled for a range of socio-demographic characteristics commonly found to account for changes in preparedness (Russell et al., 1995; Spittal et al., 2008). These included age, gender, income, education, length of residence in one's house, homeownership, and previous natural hazard experience. The two attachment factors (small-scale attachment and large-scale attachment) were added independently in Model 2 and 3, and then together in Model 4, to establish the predictive capacity of place attachment on survival preparedness behaviours, mitigation preparedness behaviours, community preparedness behaviours, survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions. Results of these regressions can be found in *Table 2.4* and *Table 2.5*.

Both small-scale attachment and large-scale attachment were positively and significantly correlated with nearly all types of preparedness behaviours and intentions (correlations ranging from $r=.16$ to $r=.30$). The only exception to this was between large-scale attachment and community preparedness behaviours for which there was no significant correlation (see *Table 2.6*).

My first research question speculated that both the scale of attachment and type of preparedness matter. In line with this, I found that large-scale attachment was a significant predictor of survival preparedness behaviours ($R^2=.18$, R^2 change$=.02$, $p<.05$, $ß=.14$, $p<.05$) and mitigation preparedness behaviours ($R^2=.13$, R^2 change$=.04$, $p<.01$, $ß=.22$, $p<.01$), over and above known correlates when introduced as the only attachment variable in the regression. Similarly, small-scale attachment was a significant predictor of mitigation preparedness behaviours ($R^2=.14$, R^2 change$=.05$, $p<.01$, $ß=.24$, $p<.01$) and community preparedness behaviours ($R^2=.16$, R^2 change$=.02$, $p<.05$, $ß=.16$, $p<.05$), over and above known correlates. When introducing both attachment predictors simultaneously, neither of the place attachment predictors were statistically significant. Despite acceptable Variance Inflation Factors in the combined model (ranging from 1.03-1.72), these findings suggest the unique variance of each predictor controlling for the respective other attachment scale was not reliable.

Further, for preparedness intentions, both small-scale attachment and large-scale attachment were significant predictors of survival preparedness intentions (small-scale attachment: $R^2=.10$, R^2 change$=.05$, $p<.01$, $ß=.24$, $p<.01$; large-scale attachment: $R^2=.08$, R^2 change$=.03$, $p<.05$, $ß=.18$, $p<.05$), mitigation preparedness intentions (small-scale attachment: $R^2=.13$, R^2 change$=.08$, $p<.001$, $ß=.31$, $p<.001$; large-scale attachment: $R^2=.09$, R^2 change$=.04$, $p<.01$, $ß=.21$, $p<.01$), and community preparedness intentions (small-scale attachment: $R^2=.25$, R^2 change$=.09$, $p<.001$, $ß=.33$, $p<.001$; large-scale attachment: $R^2=.22$, R^2 change$=.06$, $p<.001$, $ß=.25$, $p<.001$), over and above known correlates, when each variable was introduced individually into the regression model. When both variables were introduced together, only small-scale attachment was a significant predictor of survival preparedness intentions ($R^2=.10$, R^2 change$=.05$, $p<.01$, $ß=.19$, $p<.05$), mitigation preparedness intentions ($R^2=.13$, R^2 change$=.85$, $p<.001$, $ß=.26$, $p<.01$), and community preparedness intentions ($R^2=.26$, R^2 change$=.10$, $p<.001$, $ß=.25$, $p<.01$). Variance Inflation Factors were acceptable across all models (ranging from 1.03-1.67).

RQ2: Mediation. I used the Lavaan package in R (Rosseel, 2012) to run a structural equation model testing the indirect effect between two predictor variables (homeownership and length of residence), two mediator variables (small-scale attachment and large-scale attachment), and six outcome variables (survival preparedness behaviours, mitigation preparedness behaviours, community preparedness behaviours, survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions). I computed bias-corrected bootstrapped confidence intervals with 5000 samples at the 95% confidence level to test for statistical significance.

I found three significant indirect effects between homeownership and small-scale attachment with survival preparedness behaviour (B=.13, SE=.01, β=.03, z=1.49, 95% CI [.369, -.007]), mitigation preparedness intentions (B=.10, SE=.05, β=.05, z=1.85, 95% CI [-.232, -.019]), and community preparedness intentions (B=.11, SE=.06, β=.06, z=1.85, 95% CI [-.258, -.019]). The direct effects were statistically significant in each of these models indicating that small-scale attachment partially mediated the relationship between homeownership and survival preparedness behaviour (B=.50, SE=.15, β=.12, z=1.37, 95% CI [1.208, .219]), mitigation preparedness intentions (B=-.10, SE=.17, β=-.05, z=-.55, 95% CI [.224, .450]), and community preparedness intentions (B=-.37, SE=.15, β=-.20, z=-2.56, 95% CI [.092, .666]). I found no other significant mediation effects among the other predictor, mediator, and outcome variables (see *Table 2.7* for full reporting).

Discussion

Regarding my first research question, I report a positive relationship between place attachment and self-reported disaster preparedness. Specifically, my findings suggest that attachments to smaller-scale places best predict preparedness intentions, whereas findings for self-reported preparedness behaviours were inconclusive. In response to my research question, small-scale and large-scale attachment do not equally predict preparedness behaviours and intentions. Both small-scale and large-scale attachment predicted all types of intentions when examined independently from one another, but small-scale attachment was the only significant predictor of survival, mitigation, and community intentions while controlling for large-scale attachment. This suggests that small-scale attachment is a stronger correlate of preparedness intentions and implies that there may be something unique about people's attachment to smaller-scale places (houses and neighbourhoods) when it comes to determining their intentions to prepare, more so than their attachment to larger-scale places

(cities and countries). These findings are in line with previous psychological research observing a trend where attitudes and behaviours correspond in their specificity (i.e. are applicable at the same spatial scale; Fishbein & Ajzen, 2010; Weigel et al., 1974). The preparedness behaviours provided in my survey all operate at the personal, household, and community level. It therefore follows that the attachment variables at these same spatial scales (i.e. house and neighbourhood) share stronger associations with preparedness than attachment variables at larger spatial scales (city and country). As such, Study 2 will focus on these smaller-scale place attachments by narrowing in on house and neighbourhood attachment and their differing relationships with preparedness.

Type of preparedness also matters, as per my first research question. Survival, mitigation, and community preparedness behaviours were associated with attachment in different ways, but only when small-scale and large-scale attachment were not included as predictors in the same model. Survival behaviours, but not community behaviours, were associated with large-scale attachment when tested independently from small-scale attachment. Further, community behaviours, but not survival behaviours, were associated with small-scale attachment when tested independently from large-scale attachment. These findings illustrate the importance of considering preparedness by type as well as attachment by spatial scale when examining the relationship between attachment and disaster preparedness.

Finally, mediation analyses conducted for my second research question found that small-scale attachment significantly mediated the relationship between homeownership and three different preparedness outcomes (survival preparedness behaviours, mitigation preparedness intentions, and community preparedness intentions). These findings add evidence to the relationship between small-scale place attachment (to house and neighbourhood) and all types of preparedness (survival, mitigation, and community). Importantly, this mediation was significant for homeownership, but not length of residence, as the predictor variable. This suggests that owning your home may increase your attachment to that house and neighbourhood, which therefore may increase your survival preparedness behaviours, and your intent to perform mitigation and community preparedness behaviours. Previous research has shown that homeowners prepare more for natural hazard events than renters (e.g. Spittal et al., 2008). The current study extends this knowledge by showing that the link between homeownership, but not length of residence, is at least partially explained by the strength of place attachment to one's house and neighbourhood. These findings

convey that, while homeownership cannot be easily targeted in an intervention to increase preparedness (because it cannot be easily altered), place attachment could instead be targeted as an alternative means to increase preparedness.

This study is limited by the brevity of some of the instruments used to measure complex phenomena. For instance, my place dependence measure consisted of only two items adopted directly from a larger pre-existing scale (Scannell & Gifford, 2017a). Both place dependence items were reverse coded, which might have resulted in an answering bias that encouraged participants to answer in a certain way independent of the content of the item. Given the unclear structure that resulted from my Principal Components Analysis, I excluded this dimension of place attachment from my analyses. Further, I used only three behavioural items to capture community preparedness, which is the preparedness type that has been most recently introduced to the literature. This may have contributed to the lower reliability of this measure. Study 2 will extend the findings of Study 1 by focusing in on house and neighbourhood attachment and testing relationships using an expanded preparedness scale and a more comprehensive place attachment scale.

Study 2

In my previous study, I found that small-scale attachment (house and neighbourhood) was significantly associated with preparedness intentions but had a non-significant relationship with preparedness behaviours when tested alongside large-scale attachment (city and country). Further, small-scale attachment significantly mediated the relationship between homeownership and all types of preparedness. From this, I determined that small-scale attacment shared a stronger relationship with various types of preparedness behaviours and intentions than large-scale attachment. It remains unknown, however, whether house or neighbourhood attachment drives the respective relationships between small-scale attachment and disaster preparedness. Additionally, I seek to investigate whether house and neighbourhood attachment are differentially associated with survival, mitigation, and community preparedness behaviours and intentions. I therefore expand and replicate the findings in Study 1 by narrowing in my analyses on house and neighbourhood attachment in Study 2. I also take a more comprehensive approach to measurement in this study by using an extended disaster preparedness scale and place attachment scale. I use the same analytic approach in Study 2 as with Study 1 and seek to answer the same research questions. As in Study 1, research questions are chosen here instead of hypothesis-testing due to a lack of

prior research establishing how spatial scale (e.g. house vs. neighbourhood) might influence place attachment and preparedness links, as well as mediation patterns. As such, this research is exploratory in nature. First, how does the relationship between place attachment and preparedness differ according to spatial scale and type of preparedness? Second, does place attachment mediate the relationship between homeownership, length of residence, and preparedness?

Method

Participants and Procedure. All procedural aspects of the second study match those in Study 1, although a larger sample was obtained with some variations in their demographic make-up (N=401; see *Table 2.3*). Further, some changes were made to the measurement of key variables in the design of this study.

Measures. To examine place attachment, participants completed 11 questions adapted from the measure used by Anton and Lawrence (2016). These questions included six items related to place identity (e.g. "I feel that my house is a part of me"), and five items related to place dependence (e.g. "Doing what I do in my house is more important to me than doing it anywhere else"). These 11 questions were asked in relation to two different spatial levels of place: house and neighbourhood. All questions were asked on a 5-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). For descriptive statistics, see *Table 2.8*.

Preparedness behaviours were measured using an expanded self-report checklist. A total of 23 preparedness behaviours were assessed including seven survival behaviours, eight mitigation behaviours, and eight community behaviours (refer to *Table 2.9* for full item list). Most of the original preparedness items from the first study were retained with some wording changed to reflect the most up-to-date advice e.g. "Purchase natural disaster insurance" was changed to "Ensure my home and contents are insured for the right amount in the event of a disaster". A total of five additional items were added to the community preparedness subscale such as attending a community meeting about preparation and having contact details for neighbours. Participant responses to these preparedness behaviours were coded into a dichotomous variable (1 = "Yes", 0 = "No"). Individual preparedness behaviours were then tallied together to create three frequency measures: survival preparedness behaviours (n=393), mitigation preparedness behaviours (n=384), and community preparedness behaviours (n=383). Refer to *Table 2.9* for full reporting.

This survey also assessed participants' self-reported intentions to complete each of the possible 23 behaviours they had not completed already. Intention ratings were made on a 5-point Likert scale ranging from 1 (definitely not) to 5 (definitely yes). Three measures were created for each participant by averaging intention scores across categories of preparedness behaviours: survival preparedness intentions (n=347); mitigation preparedness intentions (n=382); and community preparedness intentions (n=380). Refer to *Table 2.9* for descriptive information.

Results

Data treatment. As with Study 1, Principal Components Analysis (PCA) using oblimin rotation was conducted with all 22 place attachment items (identity and dependence items asked in relation to house and neighbourhood). Based on scree plot visualisation (sharp inflexion at two factors), Kaiser's eigenvalues over one, and theoretical reasoning, two components were extracted which in combination explained 67.79% of the variance (Bartlett's Test of Sphericity: $\chi^2(231)=8519.64, p<.001$). The first component was made up of all of the house attachment items, whereas the second component was made up of all of the neighbourhood attachment items. See *Table 2.8* for items, component loadings, and cross-loadings. Reliability scores were good for each of the two components: house attachment ($\alpha=.94$), neighbourhood attachment ($\alpha=.96$). As with Study 1, and as anticipated by the use of oblimin rotation, house attachment was positively correlated with neighbourhood attachment (.46). I therefore carefully examined the multicollinearity of the independent variables in each model using the Variance Inflation Factor (VIF). I chose a conservative threshold to determine cases of multicollinearity (VIF greater than 4; O'Brien, 2007).

RQ1: Linear Regression. Both house attachment and neighbourhood attachment were positively and significantly correlated with all types of preparedness behaviours and intentions (correlations ranging from $r=.18$ to $r=.30$, see *Table 2.12*). Full results of the regressions can be found in *Table 2.10* and *Table 2.11*.

Further, when controlling for socio-demographic variables, house attachment was a significant predictor of mitigation preparedness behaviours both when it was introduced individually in the regression model ($R^2=.24, R^2$ change=.02, $p<.01, \beta=.15, p<.01$), and when analysed simultaneously with neighbourhood attachment in the combined model ($R^2=.24, R^2$ change=.02, $p<.05, \beta=.14, p<.05$). Neighbourhood attachment was a significant predictor of community preparedness behaviours both when it was introduced individually ($R^2=.19, R^2$

change=.03, $p<.01$, β=.17, $p<.01$), and when analysed alongside house attachment in the combined model (R^2=.19, R^2 change=.03, $p<.01$, β=.17, $p<.01$). Neither house attachment nor neighbourhood attachment were significant predictors of survival preparedness behaviours when controlling for a range of other relevant socio-demographic predictors. Each of these models showed acceptable Variance Inflation Factors in the combined model (ranging from 1.02-1.96).

For preparedness intentions, both house attachment (β=.14, $p<.05$) and neighbourhood attachment (β=.18, $p<.01$) were significant predictors of mitigation preparedness intentions, over and above known correlates, both when introduced individually and when analysed simultaneously in the combined model (R^2=.15, R^2 change=.06, $p<.001$). Similarly, both house attachment (β=.13, $p<.05$) and neighbourhood attachment (β=.18, $p<.01$) were significant predictors of community preparedness intentions, over and above known correlates, both when introduced singularly and in the combined model (R^2=.15, R^2 change=.06, $p<.001$). For survival preparedness intentions, both house attachment (R^2=.12, R^2 change=.03, $p<.01$, β=.18, $p<.01$) and neighbourhood attachment (R^2=.13, R^2 change=.04, $p<.001$, β=.22, $p<.001$) were significant predictors over and above known correlates when analysed individually in the regression model. In the combined model, however, only neighbourhood attachment was a significant predictor (R^2=.14, R^2 change=.05, $p<.001$, β=.18, $p<.01$). Variance Inflation Factors were acceptable across all models (ranging from 1.02-1.93).

RQ2: Mediation. As with Study 1, I used the Lavaan package in R (Rosseel, 2012) to run a structural equation model testing the indirect effect between two predictor variables (homeownership and length of residence), two mediator variables (house attachment and neighbourhood attachment), and six outcome variables (survival preparedness behaviours, mitigation preparedness behaviours, community preparedness behaviours, survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions). I computed bootstrapped confidence intervals with 5000 samples at the 95% level to test for significance.

I found multiple significant indirect effects. House attachment mediated the relationship between homeownership and both mitigation preparedness behaviours (B=.09, SE=.05, β=.03, z=1.80, 95% CI [.017, .230]) and mitigation preparedness intentions (B=.06, SE=.03, β=.03, z=1.74, 95% CI [.008, .143]). House attachment also mediated the relationship between length of residence and both mitigation preparedness behaviours

(B=.03, SE=.02, β=.03, z=1.75, 95% CI [.004, .065]) and mitigation preparedness intentions (B=.02, SE=.01, β=.03, z=1.77, 95% CI [.003, .041]). Of the four models with house attachment as the mediator, three-quarters of them showed non-significant direct effects indicating a full mediation between length of residence and mitigation preparedness behaviours (B=-.08, SE=.07, β=-.08, z=-1.26, 95% CI [-.208, .047]), and mitigation preparedness intentions (B=.01, SE=.03, β=.02, z=.27, 95% CI [-.057, .074]), as well between homeownership, and mitigation preparedness intentions (B=-.05, SE=.11, β=-.03, z=-.48, 95% CI [-.265, .164]). House attachment partially mediated the relationship between homeownership and mitigation preparedness behaviours, because the direct effect remained significant (B=1.62, SE=.22, β=.45, z=7.53, 95% CI [1.168, 2.021]).

In addition, neighbourhood attachment significantly mediated the relationship between length of residence and four outcome variables: community preparedness behaviours (B=.04, SE=.02, β=.04, z=2.08, 95% CI [.011, .095]), survival preparedness intentions (B=.03, SE=.01, β=.05, z=2.33, 95% CI [.009, .061]), mitigation preparedness intentions (B=.02, SE=.01, β=.04, z=1.95, 95% CI [.015, .064]), and community preparedness intentions (B=.03, SE=.01, β=.06, z=2.78, 95% CI [.015, .064]). The direct effect between length of residence, and community preparedness behaviours remained significant indicating a partial mediation effect (B=.15, SE=.07, β=.14, z=2.14, 95% CI [.011, .291]). All other models showed non-significant direct effects indicating a full mediation between length of residence and survival preparedness intentions (B=-.01, SE=.04, β=-.02, z=-.32, 95% CI [-.094, .070]), mitigation preparedness intentions (B=.01, SE=.03, β=.02, z=.27, 95% CI [-.057, .074]), and community preparedness intentions (B=.03, SE=.03, β=.06, z=1.05, 95% CI [-.03, .098]). I found no other significant mediation effects among the other predictor, mediator, and outcome variables (see *Table 2.13* for full reporting).

Discussion

The findings of Study 2 broadly confirm those from Study 1, indicating a positive relationship between place attachment and self-reported disaster preparedness behaviours and intentions. In response to my first research question, house and neighbourhood attachment did not predict preparedness behaviour and intentions in the same way. I found that different types of preparedness are associated with different types of attachment. Both house and neighbourhood attachment were significantly related to both mitigation and community preparedness intentions, whereas neighbourhood attachment (but not house attachment) was

associated with survival preparedness intentions in the combined model. This suggests that, for preparedness intentions, the scale of place attachment does not matter as much as for preparedness behaviours (except for survival intentions). Lining up with the literature on the attitude-behaviour link, place attachment and preparedness behaviours were matched in terms of specificity. House attachment was significantly associated with mitigation preparedness behaviours which are undertaken at the household level (e.g. fastening furniture, or strengthening foundations). Further, neighbourhood attachment was significantly associated with community preparedness behaviours, the majority of which involve community engagement in one's neighbourhood (e.g. attending a community meeting or having contact details of neighbours). Researchers in this field should consider a segmented approach that measures and, importantly, matches both the target of attachment (house, neighbourhood, or otherwise) and the type of preparedness (i.e. survival, mitigation, and community) when analysing place attachment and disaster preparedness.

Finally, in response to my second research question, place attachment mediated the relationship between length of residence and preparedness behaviours, and homeownership and preparedness behaviours. More specifically, house attachment mediated the relationship between homeownership and mitigation preparedness behaviours and intentions and between length of residence and preparedness mitigation behaviours and intentions. This supports the notion that house attachment is associated with an investment of finances or time spent in a place. The relationships between homeownership, length of residence and preparedness are robust as per previous research. However, my study finds that, for mitigation preparedness, the relationship functions through an emotional attachment to one's house. Homeownership, and length of time spent in that home, appears to increase house attachment, which may then increase preparedness actions taken to mitigate risk within the house. I also found that neighbourhood attachment mediated the relationship between length of residence and community preparedness behaviours, survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions. The more time spent in one's neighbourhood, the greater their emotional attachment to that neighbourhood and, therefore, the greater their community-based preparedness behaviours (and their general intentions to prepare). It is likely that time spent in one's neighbourhood and a greater neighbourhood attachment also relate to greater social embeddedness and an increased desire to protect one's neighbours which may, in part, explain findings. Further, greater social embeddedness may create social pressure to prepare which would explain why

neighbourhood attachment (as a product of length of residence) might produce a generalised desire or intent to prepare more broadly. I note that, while there are some variations in the mediation findings from Study 1 to Study 2, these are attributable to my narrowed focus onto house and neighbourhood attachment as separate mediators (compared to Study 1 where they were combined into one variable). In taking this more focused approach in Study 2, as well as recruiting a larger sample, I was also able to identify a greater number of mediation effects, demonstrating the strength of place attachment as a statistical mediator. These mediation analyses provide a richer picture of the way in which place attachment is shaped by various related sociodemographic factors and how attachment, in turn, predicts different types of preparedness. The implications and applications of these findings are laid out in the general discussion.

General Discussion

My first research question focused on the relationship between place attachment and self-reported disaster preparedness behaviours and intentions. I examined whether this relationship varied according to both spatial scale of place and type of preparedness. My second research question focused on how place attachment functioned as a mediator between homeownership, length of residence, and preparedness. Supporting previous research, I found an overall positive association between disaster preparedness and place attachment for both self-reported behaviours and intentions. These findings suggest more broadly that having an emotional attachment for a place increases one's likelihood of preparing for a natural hazard event. However, my research adds specificity and nuance to this broad relationship by examining place attachment by spatial scale and examining disaster preparedness by the type of preparedness. I conclude that place attachment scale matters when it comes to associations with different types of preparedness. I also determine that place attachment is a significant mediator of the relationship between homeownership, length of residence and preparedness. Through this approach, these studies add knowledge to how the relationship between place attachment and disaster preparedness functions and why it may sometimes fail to replicate (see Bonaiuto et al., 2016). I will discuss three main takeaways from my research before expanding on the strengths and limitations of my findings.

First, attachment to smaller-scale places (house and neighbourhood) was more strongly associated with preparedness intentions than attachment to larger-scale places (city and country) in my first study. This addresses my first research question and is also supported

by previous research findings that attachment to home was associated with wildfire mitigation preparedness while attachment to local area was not; possibly suggestive of a linear relationship between place attachment and preparedness where behaviours are matched in terms of spatial scale (Anton & Lawrence, 2016). However, when I narrowed my focus onto house and neighbourhood as separate predictors in Study 2, I did not find any differential patterns between house and neighbourhood attachment in their associations with preparedness intentions. At smaller scales, therefore, a more generic attachment to both the house and the area that one lives in is associated with all types of preparedness intentions, over and above relevant sociodemographic characteristics. From a psychological perspective, the house in which a person is living is integrated into a larger network of community relationships within a neighbourhood, highlighting the social nature and importance of attachment. Given that preparedness intentions are considered direct antecedents of preparedness behaviour (Najafi et al., 2017), I take these findings to mean that, when it comes to fostering preparedness intentions, people's general attachments to both their houses and neighbourhoods could be targeted to increase general preparedness.

Secondly, at the behavioural level, house attachment was associated with mitigation preparedness behaviours, while neighbourhood attachment was associated with community preparedness behaviours in Study 2 (while controlling for all attachment dimensions and other relevant socio-demographic characteristics). Importantly, these findings relate to self-reported preparedness behaviour itself, independent of self-reported intentions to prepare. They also address my research question concerning whether place attachment is associated with preparedness only for certain place scales and only for certain types of preparedness. As per previous research that finds attitudes and behaviours matched on their specificity, it is not surprising that I would find these differences; especially when considering that the scale of the behaviour is correlated with the spatial scale of the place attachment being looked at. These findings are in line with those from prior research and may be attributed to a place-protective function; a desire to preserve and protect the places to which one is emotionally bonded to (see Devine-Wright, 2009). Community engagement might also play a role in this association, as proposed by Paton and colleagues (2008) who suggest that increased attachment increases accessibility to social resources that therefore assist with natural hazard risk management and response (Bihari & Ryan, 2012). In effect, my results suggest that making people aware of their attachment to their houses or neighbourhood may increase the likelihood that they perform mitigative and community preparedness behaviours respectively.

Future research should continue to look at preparedness types separately, rather than combined, to better understand the role that place attachment plays in predicting disaster preparedness. It is also important to note that survival behaviours are the behaviours most commonly undertaken (McClure et al., 2015) and yet place attachment appears to best predict community and mitigation behaviours (but not survival behaviours). Such a finding is promising in terms of expanding what we know about promoting these less common, but highly impactful, behaviours.

Lastly, in addressing my second research question, I found significant mediation effects between homeownership, length of residence, place attachment, and preparedness intentions and behaviours. In Study 1, small-scale attachment partially mediated the relationship between homeownership and various types of preparedness. In Study 2, however, I found expanded findings when I focused my analysis on house and neighbourhood attachment as separate mediators. House attachment, for instance, mediated the relationship between both homeownership and length of residence and mitigation preparedness as an outcome variable. The greater financial and time-based investment in a house, therefore, leads to greater house attachment, which leads to greater mitigative intentions and behaviours. This finding is important because it points to the role of emotional ties in explaining mitigation preparedness, rather than relying on a financially motivated explanation where homeowners perform mitigative behaviours on their homes solely as a way of protecting their investment. Place attachment also partially mediated the relationship between length of residence as it related to community-based preparedness behaviour, but only for neighbourhood (and not house) attachment. The greater the time spent in a house, the greater the attachment to that neighbourhood and, therefore, the more community-minded preparedness behaviours performed. People may want to protect the neighbourhood that they live in not only because they have lived there a long time, but also because this length of residence has facilitated emotional ties with that place. Neighbourhood attachment also mediated the relationship between length of residence and preparedness intentions (survival, mitigation, and community). This indicates a relationship between time spent in a place, and neighbourhood attachment, which creates a generalised desire to prepare. When it comes to actual preparedness behaviour, however, those that have lived in a place for a long time, and therefore increased their neighbourhood attachment, are then more likely to undertake community behaviours. The same relationship is not true for any other type of preparedness behaviour. This reinforces that preparedness behaviours, compared to intentions, are matched

in their level of specificity when examined alongside place attachment at different spatial scales. House attachment mediates the relationship between socio-demographic variables and preparedness for mitigation behaviours only, whereas neighbourhood attachment is a mediator for community preparedness behaviours only. These findings give strength to the role of place attachment in understanding disaster preparedness by explaining how attachment explains other well-established preparedness predictors.

There are some limitations to the conclusions that I draw. Firstly, the sample I surveyed may have limited my ability to generalise conclusions. Both study samples were predominantly women and relatively well-educated. Educated individuals and, to a certain extent, women are more likely to prepare for natural hazard events according to prior research (Russell et al., 1995) which may represent a self-selection bias in my sample. For example, those who were already more likely to prepare may have also been more likely to volunteer to participate in my survey. Regarding my gender-skewed sample, I note that there is a large body of literature examining the role of gender in disaster (for a recent review, see Enarson, Fothergill, & Peek, 2018). Findings on the role of gender in preparedness are not always consistent (e.g. Miceli, Sotgiu, & Settanni, 2008) and, indeed, in my studies I did not find a consistent effect of gender on preparedness behaviour or intentions. Nevertheless, researchers have recognised the gendered structures of households and communities that influence preparedness, response, and recovery from natural hazards and disasters (Enaron et al., 2018). In many cases it is women who take up caregiving and household duties and, as such, who the burden of preparing falls to. Therefore, while the gender-skew in my samples are reflective of survey research in general (in that women are more likely to participate in surveys; Korkeila et al., 2001), they may also reflect the gendered nature of preparing. As such, it is crucial that future research in this area recruits more representative samples (with greater male participation) to ensure that the findings reported here hold true across all genders.

Socio-demographic overrepresentations are especially important to note when considering the role that social vulnerability plays in exacerbating the disastrous consequences of natural hazard events. Those who are lower in socio-economic status and education, for example, are more likely to be affected negatively by natural hazard events and are also less likely to be able to prepare effectively (Fothergill & Peek, 2004). Results from my study cannot be generalised to these groups and I acknowledge that preparedness is more accessible and available to certain populations (i.e. many of those that I surveyed) than it may

be to others. Additionally, the cross-sectional nature of the data collected in this survey precludes me from concluding any causal relationships between variables. Future research should collect data at several time-points to test the proposed cause-effect relationship between attachment and preparedness. Longitudinal data collection may also help to minimise any self-report biases that occur from cross-sectional data collection through following up on intention judgements to confirm behavioural follow-through.

Additionally, while I controlled for multiple demographic and hazard-related variables in the analysis presented in this chapter, I did not control for previous intervention exposure or geographic location within the Wellington region. For several hazards (e.g. earthquakes and storms) the natural hazard risk is felt across the entire region. However, for other hazards, there are varying degrees of risk. For example, tsunami risk is relevant for many coastal suburbs whereas landslide risk is more relevant for those living in hilly suburbs (Khan et al., 2012). Future research should control for geographic location while conducting these analyses to ensure that future replications of these studies are not influenced by such variations in hazard risk. In addition, given the varying degrees of risk in different suburbs across Wellington, there have already been multiple targeted interventions run in certain suburbs. Residents of the southern coast of Wellington (e.g. Island Bay and Owhiro Bay), for example, have been targeted by previous government-funded interventions regarding their tsunami risk (Johnston et al., 2013). It is possible that this prior exposure to preparedness interventions would have influenced pre-existing preparedness rates and, as such, should be controlled for in future research.

A key strength of my study lies in how it examines place attachment across different place types in association with preparedness (previously only looked at in relation to home and local areas, e.g. Anton & Lawrence, 2016). Examining place attachment in this way allows for findings that enhance what we know about preparedness and how to increase it. For example, knowing that attachment to smaller-scale places (house and neighbourhood) is associated with mitigation and community preparedness behaviours provides a rationale for future research using house and neighbourhood attachment as predictor variables. In addition, this study tests preparedness across three categories (survival, mitigation, and community). I recommend that policy-makers and practitioners who are tasked with increasing preparedness consider two takeaways from this research: 1) that differentiation between survival, mitigation, and community preparedness is important, and 2) that place attachment plays a role in preparedness (especially when preparedness behaviours and place attachment are

matched in terms of spatial scale). I posit that interventions to increase preparedness may benefit from drawing from place attachment theory to design and test a place-based behaviour-change tool. Greater knowledge of how place attachment is associated with different types of preparedness provides greater confidence in the impact of any evidence-based intervention that may be trialled moving forward. One example of how this could be approached is through facilitating the active awareness of people's attachments to their houses and neighbourhoods as a means of increasing preparedness. More broadly, this research also gives added applied significance to the role of place attachment in explaining behaviour (i.e. through mediating the length of residence and homeownership to preparedness link). This will enhance place attachment theory by moving beyond conceptual understandings and into the realm of behaviour change.

In summary, this research has examined the relationship between place attachment and disaster preparedness. Importantly, I found that it was necessary to differentiate between spatial scale attachment (small-scale and large-scale), and the type of preparedness (survival, mitigation, community) when testing this relationship. Attachment to smaller place types (house and neighbourhood), for example, appears most important in association with self-reported preparedness intentions. Further, when small-scale attachment was teased out into separate predictors in Study 2, house and neighbourhood attachment were associated with self-reported mitigation and community-based preparedness behaviours. In short, my findings broadly support the relationship between place attachment and preparedness, especially when those attachments and behaviours are matched in terms of spatial scale. I conclude with the tenable argument that reminding people of their emotional bond to their houses and neighbourhoods might be an effective approach to increase general preparedness intentions and, more specifically, their place-protective and community-based preparedness behaviours.

Table 2.1. Study 1: Attachment item PCA factor loadings using oblimin rotation, 1 (Strongly disagree) – 7 (Strongly agree)

Items	N	Mean (SD)	Alpha	Factor 1	Factor 2
Small-scale attachment			.87		
I feel that my house is a part of me	288	4.10 (1.87)		-.04	**.76**
I feel that I can really be myself in my house	284	5.64 (1.38)		.01	**.59**
My house is my favourite place to be	284	4.99 (1.55)		-.09	**.73**
I really miss my house when I'm away from it for too long	286	4.48 (1.79)		-.10	**.78**
I feel that my neighbourhood is a part of me	273	3.98 (1.72)		.07	**.76**
I feel that I can really be myself in my neighbourhood	267	4.66 (1.50)		.19	**.58**
My neighbourhood is my favourite place to be	272	4.02 (1.60)		.02	**.81**
I really miss my neighbourhood when I'm away from it for too long	269	3.83 (1.74)		.15	**.68**
Large-scale attachment			.88		
I feel that Wellington is a part of me	268	5.53 (1.41)		**.73**	.17
I feel that I can really be myself in Wellington	264	5.67 (1.22)		**.74**	.07
Wellington is my favourite place to be	265	5.17 (1.49)		**.61**	.22
I really miss Wellington when I'm away from it for too long	265	5.43 (1.48)		**.72**	.11
I feel that New Zealand is a part of me	266	6.35 (1.10)		**.79**	-.12
I feel that I can really be myself in New Zealand	262	6.23 (1.04)		**.81**	-.12
New Zealand is my favourite place to be	264	5.82 (1.42)		**.73**	.01
I really miss New Zealand when I'm away from it for too long	265	5.98 (1.30)		**.71**	-.10
Eigenvalue				6.26	2.56
Percent variance				27.98	27.17
Cumulative variance				27.98	55.15

Note. PCA = Principal Component Analysis. Loadings above .50 are in boldface.

Table 2.2. Study 1: Descriptive information on disaster preparedness behaviours and intentions

Preparedness items	Behaviour (y/n)			Intentions (1-5)		
	N	% complete	Alpha	N	Mean (SD)	Alpha
Survival			.79			.93
1. Store water	289	55.71		84	3.46 (1.17)	
2. Store non-perishable food	287	52.96		79	3.41 (1.17)	
3. Make an emergency kit	290	46.55		82	3.65 (1.14)	
4. Make an emergency plan (e.g., knowing where to meet family)	288	34.72		110	3.66 (1.08)	
5. Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	289	36.68		128	3.37 (1.19)	
6. Purchase items to use if power is lost such as a torch, radio, or gas cooker	288	46.88		92	3.32 (1.14)	
7. Purchase water tank	284	9.51		239	2.38 (1.16)	
Mitigation			.68			.93
8. Cloud-store important documents and/or photos on an internet server	289	31.49		140	3.25 (1.03)	
9. Purchase natural disaster insurance	284	14.44		196	2.32 (1.04)	
10. Seek out information about the different natural hazard risks posed to my home	283	24.38		158	2.94 (1.12)	
11. Have the strength of my building checked (or ask landlord to do the same)	286	29.37		157	2.66 (1.14)	
12. Fasten tall furniture to the wall	277	20.22		176	2.97 (1.13)	
13. Secure moveable objects in my home (such as computers and TVs)	286	23.43		169	2.91 (1.06)	
14. Strengthen my house/its foundations (or ask landlord to do the same)	269	12.27		195	2.41 (1.19)	
15. Ensure that heavy objects are stored on the floor and at the bottom of cupboards	285	40.70		105	3.11 (1.13)	
Community			.52			.77
16. Identify people in my neighbourhood who need checking up on in a disaster	284	22.89		178	3.11 (1.13)	
17. Store enough emergency supplies to help others not in my household	286	15.73		200	2.88 (1.04)	
18. Volunteer my time to help my community in the event of a disaster e.g., Community Emergency Hubs	277	12.64		200	2.63 (.88)	

Table 2.3. Socio-demographic descriptive information

Variable	Study 1	Study 2
N	291	401
Age (average)	31.13 years	35-44 years
Women	80%	87%
NZ European/Pakeha	57%	74%
Māori	18%	6%
Pasifika	9%	2%
European	7%	8%
Asian	4%	2%
Other	5%	6%
Tertiary qualification	39%	68%
Income (average)	$30-39,999	$40-59,000
House residence (average)	4.14 years	3-5 years
Homeownership	20%	54%

Table 2.4. Study 1: Hierarchical regression of small-scale and large-scale attachment on preparedness behaviours

Variable	Survival behaviours				Mitigation behaviours				Community behaviours			
	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β
Model 1:	.16***	-			.09**	-			.14***	-		
Gender (Women)			-.94 (.44)	-.14*			-.34 (.40)	-.06			-.18 (.17)	-.07
Age			.03 (.01)	.14			.01 (.01)	.09			.01 (.01)	.10
Education			-.24 (.11)	-.15*			.09 (.10)	.07			-.06 (.04)	-.10
Income			.02 (.07)	.02			-.03 (.06)	-.04			.00 (.03)	.01
Homeownership			.71 (.39)	.13			.35 (.36)	.08			-.01 (.15)	-.01
Natural hazard experience			.39 (.11)	.23***			.39 (.10)	.27***			.14 (.04)	.20**
Length of residence			.00 (.00)	.06			.00 (.00)	.00			.00 (.00)	.23***
Model 2:		.01				.05**				.02*		
Small-scale attachment			.22 (.13)	.12			**.35 (.11)**	**.24****			**.11 (.05)**	**.16***
Model 3:		.02*				.04**				.01		
Large-scale attachment			**.31 (.14)**	**.14***			**.40 (.13)**	**.22****			.06 (.06)	.07
Model 4:		.02				.06**				.02		
Small-scale attachment			.25 (.16)	.11			.26 (.15)	.14			.11 (.06)	.16
Large-scale attachment			.12 (.14)	.07			.24 (.13)	.16			.00 (.07)	.00

Note. * = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001

Table 2.5. Study 1: Hierarchical regression of small-scale and large-scale attachment on preparedness intentions

	Survival intentions				Mitigation intentions				Community intentions			
Variable	R^2	$\triangle R^2$	B (SE)	β	R^2	$\triangle R^2$	B (SE)	β	R^2	$\triangle R^2$	B (SE)	β
Model 1:	.05	-			.05	-			.16***	-		
Gender (Women)			.47 (.23)	.14*			.21 (.21)	.07			.24 (.19)	.09
Age			.01 (.01)	.08			.01 (.01)	.11			.03 (.01)	.36***
Education			-.09 (.05)	-.12			-.07 (.05)	-.10			-.10 (.05)	-.16*
Income			.02 (.03)	.04			.01 (.03)	.03			-.02 (.03)	-.05
Homeownership			-.05 (.20)	-.02			.03 (.18)	.01			-.32 (.16)	-.15*
Natural hazard experience			.06 (.06)	.07			.06 (.05)	.09			.06 (.05)	.08
Length of residence			-.00 (.00)	-.01			.00 (.00)	.06			-.00 (.00)	-.02
Model 2:		.05**				.08***				.09***		
Small-scale attachment			**.20 (.06)**	**.24****			**.23 (.06)**	**.31*****			**.24 (.05)**	**.33*****
Model 3:		.03*				.04**				.06***		
Large-scale attachment			**.19 (.07)**	**.18***			**.20 (.06)**	**.21****			**.22 (.06)**	**.25*****
Model 4:		.05**				.08***				.10***		
Small-scale attachment			**.16 (.07)**	**.19***			**.20 (.06)**	**.26****			**.18 (.06)**	**.25****
Large-scale attachment			.10 (.08)	.10			.09 (.07)	.10			.12 (.07)	.14

*Note. * = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001*

Table 2.6. Study 1: Pearson's correlation matrix between place attachment, preparedness behaviour, and preparedness intentions

	1	2	3	4	5	6	7	8
1. Small-scale attachment	1							
2. Large-scale attachment	.44***	1						
3. Survival behaviours	.21***	.17**	1					
4. Mitigation behaviours	.23***	.21***	.40***	1				
5. Community behaviours	.26***	.11	.47***	.46***	1			
6. Survival intentions	.21***	.16*	-.06	.09	.08	1		
7. Mitigation intentions	.30***	.17**	.23***	.11	.30***	.53***	1	
8. Community intentions	.27***	.23***	.14*	.17*	.24***	.38***	.56***	1

*Note. * = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001*

Table 2.7. Study 1: Indirect effects using small-scale attachment and large-scale attachment as mediators

Variable			Indirect effect			
Predictor	Mediator	Outcome	*B (SE)*	*β*	*z*	95% CI
Length of residence	Small-scale attachment	Survival preparedness behaviours	.00 (.00)	.05	1.57	.000, .003
		Mitigation preparedness behaviours	.00 (.00)	.04	1.46	.000, .002
		Community preparedness behaviours	.00 (.00)	.04	1.20	.000, .001
		Survival preparedness intentions	.00 (.00)	.03	.93	.000, .001
		Mitigation preparedness intentions	.00 (.00)	.08	1.85	.000, .002
		Community preparedness intentions	.00 (.00)	.09	2.33	.000, .002
	Large-scale attachment	Survival preparedness behaviours	.00 (.00)	.00	.33	.000, .001
		Mitigation preparedness behaviours	.00 (.00)	.01	.86	.000, .001
		Community preparedness behaviours	.00 (.00)	-.01	-.84	.000, .000
		Survival preparedness intentions	.00 (.00)	.01	.86	.000, .001
		Mitigation preparedness intentions	.00 (.00)	-.00	-.05	.000, .000
		Community preparedness intentions	.00 (.00)	.01	.89	.000, .001
Homeownership	Small-scale attachment	Survival preparedness behaviours	**.13 (.09)**	**.03**	**1.49**	**-.369, -.007**
		Mitigation preparedness behaviours	.09 (.06)	.03	1.37	-.263, .000
		Community preparedness behaviours	.03 (.03)	.03	1.23	-.105, .004
		Survival preparedness intentions	.04 (.04)	.02	.88	-.155, .020
		Mitigation preparedness intentions	**.10 (.05)**	**.05**	**1.85**	**-.232, -.019**
		Community preparedness intentions	**.11 (.06)**	**.06**	**1.85**	**-.258, -.019**
	Large-scale attachment	Survival preparedness behaviours	.02 (.06)	.01	.37	-.202, .066
		Mitigation preparedness behaviours	.06 (.06)	.02	.98	-.247, .013
		Community preparedness behaviours	-.02 (.02)	-.01	-1.04	-.004, .066
		Survival preparedness intentions	.05 (.04)	.02	1.23	-.150, .004
		Mitigation preparedness intentions	-.00 (.03)	-.00	-.05	-.052, .076
		Community preparedness intentions	.04 (.03)	.02	1.17	-.136, .005

Table 2.8. Study 2: Attachment item PCA factor loadings using oblimin rotation, 1 (Strongly disagree) – 5 (Strongly agree) (continued on next page)

Items	N	Mean (SD)	Alpha	Factor 1	Factor 2
House attachment			.94		
I feel that my house is a part of me	393	3.66 (1.19)		-.01	**.77**
My house is very special to me	391	3.83 (1.13)		-.09	**.88**
I identify strongly with my house	392	3.54 (1.24)		-.03	**.89**
I am very attached to my house	391	3.68 (1.22)		-.08	**.90**
Living in my house says a lot about who I am	391	3.47 (1.20)		.05	**.78**
My house means a lot to me	390	3.83 (1.10)		-.11	**.88**
My house is the best place for what I like to do	391	3.76 (1.05)		.06	**.71**
No other place can compare to my house	389	2.83 (1.34)		.14	**.73**
I get more satisfaction out of living in my house than I would anywhere else	390	2.97 (1.28)		.23	**.67**
Doing what I do in my house is more important to me than doing it anywhere else	390	3.04 (1.22)		.17	**.67**
I would not substitute any other place for doing the types of things that I do in my house	391	2.91 (1.25)		.19	**.65**
Neighbourhood attachment			.96		
I feel my neighbourhood is a part of me	392	3.20 (1.19)		**.77**	.07
My neighbourhood is very special to me	391	3.31 (1.17)		**.85**	.00
I identify strongly with my neighbourhood	391	3.10 (1.19)		**.88**	-.01
I am very attached to my neighbourhood	392	3.25 (1.23)		**.90**	-.09
Living in my neighbourhood says a lot about who I am	391	3.05 (1.16)		**.80**	.02
My neighbourhood means a lot to me	391	3.29 (1.16)		**.88**	.00
My neighbourhood is the best place for what I like to do	391	3.10 (1.16)		**.84**	.00
No other place can compare to my neighbourhood	392	2.58 (1.18)		**.82**	.06
I get more satisfaction out of living in my neighbourhood than I would anywhere else	390	2.72 (1.20)		**.81**	-.00
Doing what I do in my neighbourhood is more important to me than doing it anywhere else	390	2.58 (1.12)		**.84**	.01

I would not substitute any other area for doing the types of things that I do in my neighbourhood	392	2.56 (1.15)	
		.81	.04
Eigenvalue		11.19	3.72
Percent variance		36.55	31.24
Cumulative variance		36.55	67.79

Note. PCA = Principal Component Analysis. Loadings above .50 are in boldface.

Table 2.9. Study 2: Descriptive information on disaster preparedness behaviours and intentions (continued on next page)

Preparedness items	Behaviours (y/n)			Intentions (1-5)		
	N	% complete	Alpha	N	Mean (SD)	Alpha
Survival			.81			.93
1. Store water	397	65.24		138	2.88 (1.17)	
2. Store non-perishable food	396	57.07		171	2.98 (1.13)	
3. Make an emergency kit	397	52.39		187	2.83 (1.13)	
4. Make an emergency plan (e.g., knowing where to meet family)	398	43.72		221	3.05 (1.20)	
5. Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	398	40.95		229	2.97 (1.19)	
6. Purchase items to use if power is lost such as a torch, radio, or gas cooker	398	62.56		147	2.89 (1.20)	
7. Purchase a water tank	396	30.05		276	1.78 (.97)	
Mitigation			.66			.95
8. Cloud-store important documents and/or photos on an internet server	397	35.77		251	2.78 (1.14)	
9. Ensure my home and contents are insured for the right amount in the event of a disaster	396	68.69		125	2.46 (1.19)	
10. Seek out information about the different natural hazard risks posed to my home	397	49.37		196	2.57 (1.09)	
11. Have the strength of my building checked (or ask landlord to do the same)	398	26.88		285	1.84 (1.04)	
12. Fasten tall furniture to the wall	393	32.57		267	2.34 (1.17)	
13. Secure movable objects in my home (such as computers and TVs)	397	20.40		313	2.40 (1.18)	
14. Strengthen my house/its foundations (or ask landlord to do the same)	392	20.15		313	1.67 (.92)	
15. Ensure that heavy objects are stored on the floor and at the bottom of cupboards	397	52.90		182	2.69 (1.17)	

	Behaviours (y/n)			Intentions (1-5)		
Preparedness items	N	% complete	Alpha	N	Mean (SD)	Alpha
Community			.74			.93
16. Identify people in my neighbourhood who need checking up on in the event of a disaster	395	26.58		285	2.23 (1.04)	
17. Store enough emergency supplies to help others not in my household	396	15.91		328	2.36 (1.11)	
18. Volunteer my time to help prepare my community	394	12.69		340	2.04 (.97)	
19. Participate in a lifesaving skills/emergency response course and feel confident in my ability to help others	398	34.42		253	2.07 (1.02)	
20. Talk to people I know about getting prepared	391	41.43		231	2.62 (1.13)	
21. Attend a community meeting where preparation is discussed	396	15.91		327	2.06 (1.04)	
22. Have contact details of my neighbours in case of emergency	392	38.27		244	2.24 (1.05)	
23. Identify my local Community Emergency Hub and understand how to use it to coordinate community response	399	41.60		226	2.61 (1.19)	

Table 2.10. Study 2: Hierarchical regression of house and neighbourhood attachment on preparedness behaviours

Variable	Survival behaviours				Mitigation behaviours				Community behaviours			
	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β
Model 1:	.32***	-			.22***	-			.16***	-		
Gender (Female)			-.08 (.33)	-.01			-.28 (.30)	-.05			.40 (.33)	.06
Age			.44 (.11)	.26***			.09 (.10)	.06			.28 (.11)	.18*
Education			.13 (.08)	.08			.10 (.08)	.07			.10 (.08)	.06
Income			.17 (.07)	.13*			.12 (.07)	.10			.04 (.07)	.03
Homeownership			.62 (.27)	.13*			1.51 (.25)	.38***			.15 (.27)	.04
Natural hazard experience			.21 (.14)	.07			.23 (.13)	.09			.26 (.14)	.10
Length of residence			.30 (.09)	.21***			-.01 (.08)	-.01			27 (.09)	.21**
Model 2:		.00				.02**				.01		
House attachment			.06 (.13)	.02			**.33 (.12)**	**.15****			.19 (.13)	.09
Model 3:		.00				.01				.03**		
Neighbourhood attachment			.04 (.12)	.02			.16 (.11)	.08			**.35 (.11)**	**.17****
Model 4:		.00				.02*				.03**		
House attachment			.05 (.15)	.02			**.31 (.13)**	**.14***			.01 (.14)	.00
Neighbourhood attachment			.02 (.13)	.01			.04 (.12)	.02			**.35 (.13)**	**.17****

*Note. * = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001*

Table 2.11. Study 2: Hierarchical regression of house and neighbourhood place attachment on preparedness intentions

	Survival intentions				Mitigation intentions				Community intentions			
Variable	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β	R^2	ΔR^2	B (SE)	β
Model 1:	.09***	-			.09***	-			.09***	-		
Gender (Female)			-.05 (.17)	-.02			-.01 (.15)	-.00			-.16 (.14)	-.06
Age			.08 (.06)	.10			.03 (.05)	.05			.15 (.05)	.24**
Education			-.17 (.04)	-.24***			-.13 (.04)	-.20***			-.09 (.04)	-.14*
Income			.01 (.04)	.01			-.03 (.03)	-.06			-.05 (.03)	-.09
Homeownership			.09 (.14)	.05			.08 (.12)	.05			-.20 (.12)	-.11
Natural hazard experience			.17 (.07)	.13*			.17 (.06)	.14**			.10 (.06)	.09
Length of residence			-.03 (.05)	-.05			.04 (.04)	.07			-.01 (.04)	-.01
Model 2:		.03**				.04***				.04***		
House attachment			**.19 (.07)**	**.18**			**.21 (.06)**	**.22***			**.20 (.06)**	**.22***
Model 3:		.04***				.05***				.05***		
Neighbourhood attachment			**.22 (.06)**	**.22***			**.22 *.05)**	**.24***			**.20 (.05)**	**.23***
Model 4:		.05***				.06***				.06***		
House attachment			.10 (.07)	.10			**.13 (.06)**	**.14***			**.12 (.06)**	**.13***
Neighbourhood attachment			**.18 (.07)**	**.18**			**.17 (.06)**	**.18**			**.15 (.06)**	**.18**

*Note. * = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001*

Table 2.12. Study 2: Pearson's correlation matrix between place attachment, preparedness behaviour, and preparedness intentions

	1	2	3	4	5	6	7	8
1. House attachment	1							
2. Neighbourhood attachment	.52***	1						
3. Survival behaviours	.23***	.19***	1					
4. Mitigation behaviours	.30***	.19***	.49***	1				
5. Community behaviours	.20***	.27***	.52***	.51***	1			
6. Survival intentions	.18***	.24***	.03	.12*	.12*	1		
7. Mitigation intentions	.24***	.24***	.12*	.15**	.19***	.66***	1	
8. Community intentions	.18***	.25***	.11*	.11*	.22***	.62***	.70***	1

*Note. * = significant at the level of $p < .05$. ** = significant at the level of $p < .01$. *** = significant at the level of $p <.001$*

Table 2.13. Study 2: Indirect effects using house attachment and neighbourhood attachment as mediators

Variable			Indirect effect			
Predictor	Mediator	Outcome	*B (SE)*	*β*	*z*	95% CI
Length of residence	House attachment	Survival preparedness behaviours	-.00 (.02)	-.00	-.24	-.046, .028
		Mitigation preparedness behaviours	**.03 (.02)**	**.03**	**1.75**	**.004, .065**
		Community preparedness behaviours	-.00 (.02)	-.00	-.08	-.036, .027
		Survival preparedness intentions	.01 (.01)	.01	.63	-.010, .027
		Mitigation preparedness intentions	**.02 (.01)**	**.03**	**1.77**	**.003, .041**
		Community preparedness intentions	.01 (.01)	.01	.56	-.011, .026
	Neighbourhood attachment	Survival preparedness behaviours	.01 (.02)	.01	.45	-.032, .052
		Mitigation preparedness behaviours	-.00 (.02)	-.00	-.04	-.036, .033
		Community preparedness behaviours	**.04 (.02)**	**.04**	**2.08**	**.011, .095**
		Survival preparedness intentions	**.03 (.01)**	**.05**	**2.33**	**.009, .061**
		Mitigation preparedness intentions	**.02 (.01)**	**.04**	**1.95**	**.004, .047**
		Community preparedness intentions	**.03 (.01)**	**.06**	**2.78**	**.015, .064**
Homeownership	House attachment	Survival preparedness behaviours	-.02 (.06)	-.00	-.24	-.146, .107
		Mitigation preparedness behaviours	**.09 (.05)**	**.03**	**1.80**	**.017, .230**
		Community preparedness behaviours	-.00 (.05)	-.00	-.08	-.115, .101
		Survival preparedness intentions	.02 (.03)	.01	.64	-.036, .091
		Mitigation preparedness intentions	**.06 (.03)**	**.03**	**1.74**	**.008, .143**
		Community preparedness intentions	.02 (.03)	.01	.55	-.038, .090
	Neighbourhood attachment	Survival preparedness behaviours	.00 (.02)	.00	-.01	-.038, .035
		Mitigation preparedness behaviours	.00 (.01)	.00	.00	-.028, .028
		Community preparedness behaviours	-.00 (.04)	.00	-.02	-.078, .068
		Survival preparedness intentions	-.00 (.02)	.00	-.02	-.048, .048
		Mitigation preparedness intentions	.00 (.02)	.00	-.02	-.038, .035
		Community preparedness intentions	-.00 (.03)	.00	-.02	-.056, .053

Chapter 3: Does Place Visualisation Increase Individual Preparedness for Natural Hazard Events?[2]

Abstract

Novel approaches are needed to increase preparedness behaviours in at-risk populations. Crucially, such approaches need to take into account the relationships that people have with place. I report a randomised controlled trial to test the effectiveness of an online place attachment visualisation task to increase preparedness behaviours. Findings from a pilot (Study 3) using pre and post-test measures showed mixed evidence for the influence of visualisation on place attachment. Using a pre-registered randomised controlled trial with a two-week follow-up in a community sample (Study 4), I expected that visualising one's house or neighbourhood would result in stronger intentions to prepare, and greater implementation of preparedness behaviours at a follow-up, when compared to visualising a neutral place. Findings showed no main effect of visualisation on survival, mitigation, or community preparedness behaviours. These studies broadly indicate that a place attachment visualisation task does not influence preparedness behaviours. I discuss the implications of these findings for the advancement of place attachment theory and behaviour-change techniques.

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[2] The content in this chapter was submitted to the 'Journal of Environmental Psychology' and is currently under review after a first round of major revisions and a second round of minor revisions. Minor revisions and stylistic changes have been made to the manuscript to establish coherence with the rest of the thesis. This research was also pre-registered on Open Science Framework before data collection began: https://osf.io/p3kyv

Introduction

Supporting prior research, studies in the previous chapter found that individuals with greater place attachment also report greater disaster preparedness (Anton & Lawrence, 2016; Mishra, Mazumdar, & Suar, 2010; van Valkengoed & Steg, 2019), with many studies theorising that place attachment leads to disaster preparedness (Mishra et al., 2010; Paton, Bürgelt, & Prior, 2008). Specifically, Study 1 and 2 found that house and neighbourhood attachment (i.e. small-scale attachment) were most important for predicting mitigation and community preparedness behaviour in the Wellington region of New Zealand. Using a pre-registered field experiment, this chapter will present the first test of a place attachment visualisation to increase preparedness intentions and behaviours. I initially test this experimental design in a pilot study with undergraduate students to examine whether visualising one's house or neighbourhood increases place attachment (Study 3), before fully testing the effectiveness in a two-wave field experiment with a community sample (Study 4).

Given the low levels of disaster preparedness in at-risk populations around the world, it is crucial to intervene so that damage and loss of life are minimised (Verrucci et al., 2016). Some community-based education programmes are shown to be a successful avenue for increasing preparedness, however, these are usually both resource and time-intensive (Johnston et al., 2013; Said, Ahmadun, Mahmud, & Abas, 2011). Most critical is the inclusion of evidence-based behaviour-change techniques in these interventions. I propose and test an intervention that would be cost-effective, simple, and scalable.

A number of studies demonstrated that attachment to local areas is correlated with disaster preparedness (Anton & Lawrence, 2016; Bonaiuto, De Dominicis, Fornara, Ganucci Cancellieri & Mosco, 2011; Mishra et al., 2010; Paton et al., 2008). Findings of cross-sectional and experimental studies suggest that attachment to one's house or community is more strongly associated with disaster preparation and pro-environmental behaviour than attachment to regional or national level place attachment (Forsyth, van Vugt, Schlein, & Story, 2015; Wallis, Fischer, & Abrahamse, 2020). Researchers have theorised that local place attachment causes greater embeddedness in a place and a higher awareness of threats to that place, therefore motivating people to engage in behaviour to protect that place and ensure its safety (Florek, 2010; Mishra et al., 2010; Paton et al., 2008).

Previous studies have demonstrated the potential for visualisation techniques to influence behavioural and psychological responses (e.g. information-seeking behaviour, compassion, and altruistic behaviour) (Kumashiro & Sedikides, 2005; Mikulincer et al.,

2005). Most relevant for my purposes, Scannell and Gifford (2017a) instructed participants to visualise a place to which they were emotionally attached and guided them through a series of sensory observations of the chosen place. The authors found that place attachment visualisation was associated with higher feelings of self-esteem, meaning, and belonging, compared with neutral place visualisation and concluded that place visualisation was a successful manipulation of place attachment. In a conceptual replication, Reese and colleagues (Reese, Oettler & Katz 2019) found that mentally visualising a place without its meaningful features (e.g. social connections or physical components) can reduce subsequent place attachment ratings. Furthermore, research examining how people visualise their local coastal places has found that the visual content of these visualisations is predominantly based on senses (e.g. sight, smell, and sound), and is positively associated with people's place attachment levels, as well as their concern for protecting that place (Newell & Canessa, 2018). These findings suggest that mentally visualising a certain place may increase people's conscious awareness of their attachments with that place, thereby increasing their self-reported place attachment post-visualisation. In doing so, a place visualisation task may consequently provoke attitudes, cognitions or behaviours that are congruent with the attachments that are evoked (e.g. preparedness behaviour). Therefore, sensory-based place visualisation may be an effective tool to manipulate place attachment and increase disaster preparedness. These studies, together with the reported correlations between place attachment and disaster preparedness behaviour, provide a promising opportunity to use a cost-effective and simple intervention to increase preparedness outcomes (preparedness intentions and preparedness behaviour).

My main research question investigates whether a place attachment visualisation can increase disaster preparedness behaviour. I decided to focus on place attachment because there is a paucity of experimental designs in the place attachment literature and limited research on the effect of place attachment on actual behaviour. More studies are needed that use actual behaviour measures in addition to intention measures. Even though intentions are related to behaviours (e.g. Ajzen, 1991; Paton, Bajek, Okada, & McIvor, 2010; Najafi, Ardalan, Akbarisari, Noorbala, & Elmi, 2017; Sheeran & Webb, 2016), people who form intentions do not always proceed to change their behaviour (Webb & Paschal, 2006). This disconnect between intention and behaviour may be due to self-regulatory failures or external barriers (Sheeran & Webb, 2016). To draw conclusions about the effectiveness of a behavioural intervention in general, changes in behaviour need to be evaluated alongside

intentions (McKenzie-Mohr, 2000). My aim is therefore to examine the extent to which an experimental manipulation of place attachment at Time 1 will influence preparedness intentions and self-reported preparedness behaviour two weeks later.

Study 3

This study is a pilot test and serves as a conceptual replication of the only known experimental manipulation of place attachment (Scannell & Gifford, 2017a). One of the problems of the original study was that the authors did not measure changes in attachment scores using a pre- and post-test design. Therefore, in my study, I measure place attachment at two time-points (before and after the experimental manipulation) as an added manipulation check. I predict that those in the place attachment visualisation condition will report greater place attachment (house and neighbourhood) in the post-test compared to the pre-test, and when compared with those in the neutral visualisation condition or the control condition.

Second, I conduct the first test of my overarching hypothesis that when people visualise a place they are attached to, they will report greater preparedness intentions (Najafi et al., 2017; Paton et al., 2010). Preparedness is measured in my study with three functional categories. Survival preparedness refers to actions taken to increase individual chances of survival in the direct aftermath of a natural hazard event, whereas mitigation preparedness refers to actions that minimise the risk of damage during such an event. Community preparedness refers to those preparedness actions that involve community engagement (Verrucci et al., 2016). I anticipate that when people visualise their house or neighbourhood, they will report increased preparedness intentions compared with people who visualise a neutral place or are not instructed to visualise any place.

Hypothesis 1 (H1). Participants who visualise their house or neighbourhood will report greater attachment to both their houses and their neighbourhoods compared with those participants who are instructed to visualise a neutral place, or no place at all.

Hypothesis 2 (H2). Participants who visualise their house or neighbourhood will report stronger survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions, compared with those participants who are instructed to visualise a neutral place, or no place at all.

Method

Participants. A power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) computed a required sample size of approximately 159 participants to detect an effect size of $r=.24$ for my second hypothesis. This effect size was informed by correlational findings from previous studies (e.g. Wallis et al., 2020). A total of 131 first-year psychology undergraduate students at Victoria University of Wellington, New Zealand participated in exchange for course credit. Due to resource constraints, and considerable difficulty recruiting participants, this sample was lower than initially planned. Given the purpose of the study, however, I deemed the sample size acceptable to proceed with statistical analysis because it was intended primarily as a pilot study to measure the suitability of the experimental design (Hypothesis 1). I chose this sample as a convenience sample given the relative accessibility of the student population for the purposes of a pilot test. This sampling choice was also guided by previous studies using student populations for disaster preparedness experiments/interventions (e.g. Kruvand & Bryant, 2015; Skurka, Quick, Reynolds-Tylus, Short, & Bryan, 2018). The limitations and strengths of this approach are discussed later in this chapter. This sample was 85% women, with an average age of 19 years (refer to *Table 3.1* for a summary of all demographic characteristics). The study was conducted online using Qualtrics (2020). Participants were not given any time restrictions to complete the survey, they were able to complete the survey at any time, and any location of their choosing on an internet-enabled device of their choosing. This study was granted ethical approval by the Victoria University of Wellington Human Ethics Committee (#0000026881).

Experiment. Building on Scannell and Gifford's experimental design (2017a), my study compared two experimental conditions: one group were asked to visualise a place to which they are attached, and another group were asked to visualise a neutral place. Overcoming the lack of a true control condition, I introduced a third group who were not instructed to visualise any place at all. This will help determine whether any changes in behaviour are due to the visualisation of a specific place (as expected), from visualising places more broadly, or from simply engaging in the study. Participants were randomly assigned to one of three conditions (place attachment visualisation, n=39; neutral visualisation, n=37; control, n=40). I found no significant between-group differences on key variables (preparedness levels, pre-test place attachment, natural hazard experience, and socio-demographic factors), indicating that randomisation was successful.

Attachment place visualisation. Participants were asked to indicate whether they felt a greater connection with their house or their neighbourhood. Participants were then asked to

visualise their chosen place (house or neighbourhood) in three distinct tasks. The first task involved visualising what they could see in their place, the second task involved visualising what they could smell, hear, and touch in their place, and the third task involved visualising the feelings and emotions associated with being in the place. Each of these three visualisation tasks (timed at one minute each), were interspersed with a writing task (also timed at one minute each) requiring participants to briefly note down what was visualised in the previous task. While conceptually similar to the visualisation task used in Scannell and Gifford's (2017a) study, my visualisation task was completed online without a research assistant present. Therefore, I had to impose other methods of ensuring that participants stayed on task (countdown timer) as well as interspersing writing prompts throughout the visualisation tasks. Most participants in the attachment visualisation condition chose to visualise their house rather than their neighbourhood (79%).

Neutral place visualisation. This visualisation task was identical to the attached place visualisation except for the place visualised by participants. Participants were instructed to pick a neutral or ordinary place that they visited frequently but felt no connection with.

Control. Participants in the control condition were instructed to provide written answers to six different prompts (filler tasks). These tasks were included to roughly match the amount of time spent on these tasks with the amount of time other participants spent on the visualisation tasks. Each of the writing tasks was also timed for one minute using a countdown timer. The writing prompts elicited broadly neutral information such as "Please spend the next minute describing your favourite meal in as much detail as you can. What is in it? What does it look like? What does it smell like?" While some elements of these writing tasks may have elicited visualisation strategies, the tasks did not prompt specific visualisation of places.

Measures. *Place attachment.* Place attachment was measured with an 11-item scale on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). This scale was used by Anton and Lawrence (2016; adapted from Brown & Raymond, 2007; Williams & Roggenbuck, 1989; Williams & Vaske, 2003). Six items specifically measured place identity (e.g. "I identify strongly with this place") and five items measured place dependence (e.g. "This place is the best place for what I like to do"). Refer to *Table 3.2* for a full list of items. All participants answered these questions in relation to both their houses ($\alpha=.93$) and their neighbourhoods ($\alpha=.96$). House and neighbourhood attachment were moderately and positively associated with one another (pre-test: $r=.49$, $p<.001$, 95% CI [.34, .62]; post-test:

$r=.61, p<.001$, 95% CI [.48, .71]). For those assigned to the neutral visualisation condition only, questions were also asked in relation to participants' neutral places of their choosing. All scales were administered twice in a pre-test/post-test design (before the experimental task and after the experimental task).

Preparedness. Twenty-three preparedness actions were presented and split into three sub-categories: seven survival behaviours (e.g. "Make an emergency kit"; $\alpha=.94$); eight mitigation behaviours (e.g. "Fasten tall furniture to the wall"; $\alpha=.94$); and eight community behaviours (e.g. "Talk to people I know about getting prepared"; $\alpha=.92$), adapted from the Earthquake Readiness Scale (Paton & Johnston, 2008; Spittal, Walkey, McClure, Siegert, & Ballantyne, 2006) and extended preparedness items developed by Wallis and colleagues (2020). Participants indicated their intentions to prepare for each of the 23 actions that they had not already completed (i.e. indicated that they had 'done this already'). These responses were recorded on a 5-point response scale (1 = definitely not to 5 = definitely yes). Overall intention (1-5) was averaged across each action of each preparedness type to calculate a single variable of intention for each participant for each preparedness type. This resulted in three continuous variables: survival preparedness intentions, mitigation preparedness intentions, and community preparedness intentions. *Table 3.3* provides an overview of the full list of items.

Attention check. Attention during the experimental task was measured with a single-item measure. After the experimental phase of the survey, I asked all participants "Answering honestly, how seriously do you think you took the writing tasks that you just completed?" Three response options were presented: "I took the tasks very seriously", "I gave them some thought", or "I did not take the tasks seriously".

Demographic variables. Using single-item measures, I collected information on age, gender, length of residence, homeownership, and ethnicity to determine the representativeness of my sample.

Results

Data treatment. Following data cleaning, my final sample consisted of 116 participants. From my original sample (N=131), one participant dropped out during the survey and was excluded as a result. A further ten participants spent less than two minutes total on their experimental task (a pre-determined cut-off) and thus, were deemed to have not thoroughly engaged with the tasks. Most remaining participants (97%) indicated that they had

given the experiment tasks at least some thought, and over one quarter indicated that they took the tasks very seriously (27%). Only a small minority indicated that they did not take the tasks seriously at all (3%). These participants (n=4) were excluded from subsequent analyses meaning that all remaining participants made some effort in complying with the experiment instructions.

Manipulation check. Consistent with the manipulation check used by Scannell and Gifford (2017a), participants in the place attachment visualisation condition were more attached to the place that they visualised using a post-test measure of place attachment (house or neighbourhood: *M*=3.37, *SD*=.77) than those in the neutral place visualisation condition (*M*=2.16, *SD*=.96), *t*(74)=-6.08, *p*<.001, *d*=-1.40, 95% CI [-1.60, -.81]). This suggests I successfully manipulated the target of the visualisation.

H1: Place Attachment. I conducted a repeated measures ANOVA to determine whether there was an interaction between point of measurement (pre- and post-test) and experimental condition on house and neighbourhood attachment. I found a significant main effect of point of measurement for house attachment (F(1,113)=6.66, *p*=.011, η_p^2=.06): independent of experimental conditions, there was an overall decrease in house attachment from pre-test (*M*=3.01, *SD*=.93) to post-test (*M*=2.91, *SD*=1.00, *t*(113)=2.58, *p*=.011, *d*=.24, 95% CI [.03, .19]), see *Figure 3.1*. Contrary to my hypothesis, I did not find a significant interaction between point of measurement and experimental condition (F(2,113)=2.52, *p*=.085, η_p^2=.04), or a main effect of experimental condition on house attachment (F(2,113)=2.71, *p*=.071, η_p^2=.05) despite small but noticeable effect sizes. No significant interaction (F(2,113)=1.75, *p*=.179, η_p^2=.03) or main effects were found for point of measurement (F(1,113)=2.65, *p*=.106, η_p^2=.02), or experimental condition (F(2,113)=.87, *p*=.423, η_p^2=.02) when examining neighbourhood attachment at pre-test (*M*=2.49, *SD*=.94) or post-test (*M*=2.43, *SD*=1.00), see *Figure 3.2*. House and neighbourhood attachment scores did not significantly increase from pre-test to post-test either for those who visualised their houses (house attachment, *t*(30)=-.29, *p*=.771, *d*=-.05, 95% CI [-.23, .17]; neighbourhood attachment, *t*(30)=-.09, *p*=.927, *d*=-.02, 95% CI [-.20, .19]) or those who visualised their neighbourhoods (house attachment, *t*(7)=.22, *p*=.836, *d*=.08, 95% CI [-.11, .14]; neighbourhood attachment, *t*(7)=-1.69, *p*=.135, *d*=-.60, 95% CI [-.35, .06]).

Given sizable partial eta-squared values, I conducted exploratory tests. I performed separate ANOVAs (for attachment at pre-test and post-test separately). I did not find between-group differences for house attachment at pre-test (F(2, 113)=1.76, *p*=.176, η_p^2=.03)

between place attachment visualisation (M=3.22, SD=.85), neutral place visualisation (M=2.98, SD=.98), or control (M=2.84, SD=.93). At post-test, while controlling for pre-test house attachment, I found no significant main effect of experimental condition on house attachment (F(2, 112)=2.81, p=.065, η_p^2=.05). Given the sizable partial eta-squared value, and as an exploratory test, I used planned contrasts for post-test house attachment while controlling for pre-test house attachment. A significant difference was found such that house attachment was higher for those in the place attachment condition compared with all other conditions (neutral and control; t(112)=2.32, p=.022, 95% CI [.03, .39]). Using post-hoc tests with Bonferroni correction, however, I found no significant differences: participants in the place attachment visualisation condition reported similar post-test house attachment (adjusted M=3.04, SE=.07) to those in the neutral condition (M=2.81, SE=.07, t(112)=-2.25, p=.079, d=-.24, 95% CI [-.48, .01]) and the control visualisation condition, while controlling for pre-test attachment (M=2.86, SE=.07, t(112)=-1.77, p=.236, d=.19, 95% CI [-.43, .06]). There was no significant difference between the neutral visualisation condition and the control condition on house attachment at post-test (t(112)=.50, p=1.00, d=.05, 95% CI [-.19, .10]).

No between-condition differences were found for neighbourhood attachment at either pre-test, F(2, 113)=.42, p=.656, η_p^2=.01 (attachment visualisation: M=2.60, SD=.99; neutral visualisation: M=2.44, SD=.83; control: M=2.42, SD=1.00) or post-test while controlling for pre-test, F(2, 112)=1.91, p=.152, η_p^2=.03 (attachment visualisation: M=2.53, SE=.07; neutral visualisation: M=2.36, SE=.07; control: M=2.39, SE=.07). As an exploratory test, I used planned contrasts for post-test neighbourhood attachment while controlling for pre-test neighbourhood attachment. No significant difference was found for neighbourhood attachment between those in the place attachment condition compared with all other conditions (neutral and control; t(112)=1.93, p=.056, 95% CI [-.00, .32]). Using post-hoc tests with Bonferroni correction, I also found no significant differences: participants in the place attachment visualisation condition reported similar post-test neighbourhood attachment to those in the neutral condition (t(112)=-1.83, p=.208, d=-.18, 95% CI [-.40, .05]) and the control visualisation condition while controlling for pre-test attachment (t(112)=-1.51, p=.405, d=-.14, 95% CI [-.36, .08]). There was no significant difference between the neutral visualisation condition and the control condition on house attachment at post-test (t(112)=.36, p=1.00, d=.03, 95% CI [-.19, .26]).

I also performed a series of three paired sample t-tests to examine within-group changes in house and neighbourhood attachment for each condition. For those in the attached

condition, there were no significant changes from pre-test to post-test for house attachment ($t(38)$=-.26, p=.794, d=-.04, 95% CI [-.18, .14]) or neighbourhood attachment ($t(38)$=-.48, p=.635, d=-.08, 95% CI [-.20, .12]). House attachment significantly decreased from pre-test (M=2.98, SD=.98) to post-test (M=2.78, SD=1.08) for those in the neutral visualisation condition ($t(36)$=3.32, p=.002, d=.55, 95% CI [.08, .32]). However, neighbourhood attachment did not significantly decrease for those in the neutral condition from pre-test to post-test, $t(36)$=1.93, p=.062, d=.32, 95% CI [-.01, .27]. For those in the control condition, there were no significant changes from pre-test to post-test for house attachment ($t(39)$=1.93, p=.061, d=.31, 95% CI [-.01, .29]) or neighbourhood attachment ($t(39)$=1.80, p=.079, d=.28, 95% CI [-.01, .20]).

H2: Intentions. Contrary to predictions, I found no main effect of visualisation condition on preparedness intentions: survival intentions ($F(2, 111)$=.27, p=.763, η_p^2=.00), mitigation intentions ($F(2, 112)$=.59, p=.558, η_p^2=.01), or community intentions ($F(2, 113)$=.00, p=1.00, η_p^2=.00). Given previous results on the correlations between place attachment and preparedness intentions (Wallis et al., 2020), I ran a linear regression model with four predictors: experimental condition (dummy-coded: attachment visualisation versus other experimental condition), pre-test attachment, post-test attachment, and the interaction between experimental condition and post-test attachment. Demographic variables were not included as covariates in these models due to a lack of variance in key variables (i.e. age, length of residence, homeownership). These regressions were run separately for each of the three types of preparedness intentions. I did not find any evidence that experimental condition acted as a predictor of preparedness intentions as an outcome variable (see *Table 3.4*). I did, however, replicate prior research with a significant and positive relationship between place attachment (survey measure) and preparedness intentions (Wallis et al., 2020). House attachment at pre-test was significantly associated with survival preparedness intentions (β=.45, p=.048, 95% CI [.00, .89]) and pre-test neighbourhood attachment was significantly associated with community preparedness intentions (β=.25, p=.016, 95% CI [.05, .46]) while controlling for experimental condition.

Discussion

This study presents findings from a pilot trial using an experimental manipulation of place attachment (place visualisation) to influence disaster preparedness intentions. My first hypothesis was concerned with the effect of the intervention at strengthening place

attachment. The visualisation exercise did not influence place attachment in the hypothesised direction when using omnibus statistical tests. However, using the same criteria as Scannell and Gifford's original study (2017a) as reported in my manipulation check, my intervention was a successful manipulation of place attachment. Further, contrary to my second hypothesis, I did not find any effect of place attachment visualisation on any of the preparedness intentions in my sample, although I did replicate a positive association between house and neighbourhood attachment and survival and community preparedness intentions when intentions were regressed on place attachment.

Regarding the effectiveness of the intervention at strengthening attachment (Hypothesis 1), I only found significant between-group differences in house attachment when pooling across conditions (e.g. place attachment visualisation vs. all other conditions), and not when running individual between-group post-hoc tests. Furthermore, hypothesised omnibus tests did not find any significant effects of the intervention on place attachment. Because the significant planned contrast result was an exploratory test and hypothesised tests did not find any significant effect, I cannot conclude that the place attachment intervention was effective at strengthening place attachment. Nevertheless, using the same (less rigorous) criteria as the authors of the original place attachment visualisation exercise (Scannell & Gifford, 2017a), I replicated a successful manipulation. As such, while the intervention did not strengthen place attachment for those that visualised their house or neighbourhood (using rigorous manipulation checks), I conclude tentative success of the intervention for manipulating place attachment.

Counter to my second hypothesis, place attachment visualisation did not influence disaster preparedness intentions. One limitation is a possible lack of power to detect a smaller effect size of the intervention given that my sample size was smaller than originally planned. Sensitivity analysis using G*Power (Faul et al., 2007) for a one-way ANOVA to test Hypothesis 2 at post-test suggested that my final sample size (after data treatment) was large enough to detect an effect size of $r=.28$, which is slightly larger than previous cross-sectional research on place attachment and preparedness ($r=.24$, Wallis et al., 2020), and especially compared with a recent meta-analysis which estimated a smaller effect size ($r=.13$; van Valkengoed & Steg, 2019). Correlational studies may over-estimate the size of the effect compared to experimental studies (Sheeran, Klein, & Rothman, 2017) and I indeed found effect sizes close to zero for preparedness intentions (main effect of intervention: $\eta_p^2=.00$ - .01). Therefore, while my sample size was likely not large enough to detect a smaller effect,

it may be that there was simply no meaningful effect of the intervention on preparedness intentions. In using a convenience sample, I studied a specific population (first-year university students) that was not representative of the wider population and may not have yet developed strong emotional links with their new environment since moving to university. None of my participants were homeowners and, importantly, most participants had lived in their houses for less than one year. Previous research asserts that these factors do not preclude participants from having formed bonds with their houses or neighbourhoods (e.g. Windsong, 2010) or from having engaged in preparedness behaviours (e.g. storing food and water, having an emergency plan, or securing moveable objects). I admit that a more representative sample would have been better suited for this pilot test. However, this population represents the future leaders of society as they are starting a new chapter in their lives and careers. Hence, establishing appropriate behaviour for dealing with risk as these students move to new environments would be important, justifying the use of these participants for trialling an important behaviour intervention. To expand on these findings, however, future research needs to test the second hypothesis using a larger and more demographically representative sample (i.e. age, home ownership, length of residence) to determine if this intervention might be useful for changing disaster preparedness behaviour.

This study has several strengths. Namely, to the best of my knowledge, this is the first study that has used place attachment as an independent variable in the field of behaviour change. I adapted the laboratory-based protocol to an online format which could be applied on a wider scale. This allows me to use the current experimental design to inform a community-based intervention using place attachment as a tool to increase actual preparedness behaviour. In addition to this, I used a segmented approach to measuring preparedness (i.e. examining survival, mitigation, and community preparedness as separate outcome variables). This approach can provide useful insights into the level of preparedness and the possible long-term resilience of at-risk populations. In my next study, I tested effectiveness in a pre-registered study with a community sample.

Study 4

Small-scale place attachment (i.e. attachment to one's house and neighbourhood) is associated with preparedness intentions (survival, mitigation, and community), whereas it is only associated with mitigation and community preparedness behaviour (Wallis et al., 2020). Importantly, survival-based preparedness is the most frequently performed type of behaviour,

whereas other types of preparedness are performed less often, despite being highly important for longer-term resilience of at-risk populations (McClure, Spittal, Fischer, & Charleson, 2015; Verrucci et al., 2016). This is even more concerning given the low levels of preparedness overall and the relative inefficacy of commonly used information campaigns (Ballantyne, Paton, Johnston, Kozuch, & Daly, 2000; Johnston et al., 2013). Novel interventions are needed to increase preparedness in community samples. I, therefore, applied the place visualisation intervention in a community sample to increase preparedness behaviour, in particular hoping to increase lesser-performed mitigation and community-based preparedness behaviours. In addition to preparedness intentions, I also evaluate intervention effectiveness using self-reported behavioural outcomes. My study employs a time delay of two weeks from administering the intervention (Time 1) to conducting a follow-up survey (Time 2) to examine self-reported behaviour change in a community sample. This offers greater confidence to extrapolate findings and possible effectiveness for the wider population.

A second innovation is that, while preparedness intentions and preparedness behaviours have been examined in previous studies, I also included preparedness goal completion as a novel outcome variable. Goal setting is a common behavioural intervention tool which is found to overcome barriers to behaviour change such as perceived skills, motivation, and action planning (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). I used an implementation intention approach to facilitate goal setting in participants, based on work by Gollwitzer (1999). All participants set a preparedness goal for a two-week timeframe (while also specifying the 'when', 'where', and 'how' of enacting the goal). The goal-setting protocol used in this study was informed by research on commitment making, planning, and implementation intentions (e.g. Abrahamse & Steg, 2013; Becker, Paton, & Johnston, 2015; Gollwitzer, 1999; Hagger & Luszczynska, 2014). The addition of goal completion as an outcome variable allowed me to examine the success of my intervention on self-reported behaviour as specified by the participant and to examine changes in overall preparedness (across a checklist of preparedness actions).

In Study 3, I found evidence that place attachment visualisation is an effective manipulation of place attachment. Therefore, in Study 4, I test the effectiveness of this place attachment visualisation intervention in changing preparedness intentions and behaviours in a general community sample. I used a randomised control trial which was pre-registered on the Open Science Framework (https://osf.io/p3kyv/) to test the effectiveness of place attachment visualisation against neutral place visualisation (and a control group). I tested the

effectiveness of the place attachment manipulation on three dependent variables: preparedness intentions, preparedness goal completion, and preparedness behaviour change. I make the following predictions: [3]

Hypothesis 1 (H1). I hypothesise that I will find a main effect for the place attachment visualisation intervention such that those participants who visualise a place to which they are attached will report stronger overall survival, mitigation, and community preparedness intentions to prepare at Time 1 (immediately after the visualisation task), compared with those participants who visualise a neutral place, or no place at all.

Hypothesis 2 (H2). I hypothesise that I will find an interaction between place attachment visualisation intervention and preparedness type: participants who visualise a place to which they are attached will report greater completion of mitigative or community-based goals at Time 2 (i.e. more 'yes' responses when asked whether the goal was completed) compared to survival-based preparedness goals and compared with those participants who visualise a neutral place, or no place at all.

Hypothesis 3 (H3). I hypothesise that I will find an interaction between place attachment visualisation intervention, time, and preparedness type: participants who visualise a place to which they are attached will report greater mitigation and community-based preparedness behaviour, but not survival-based preparedness, at Time 2, when compared with Time 1, and when compared with those participants who visualise a neutral place, or no place at all.

Method

Participants. Assuming a small-medium effect size ($\eta^2 = .04$), and power of .80, I determined that a sample size of approximately 300 participants was required for the interaction test needed to test Hypothesis 2 according to power analysis (G*Power: Faul et al., 2007). Assuming a conservative attrition rate of 60% between Time 1 and Time 2

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[3] Some hypotheses have been altered from the original hypotheses set out in the pre-registration document uploaded to OSF due to peer-reviewed advice on analysis and interpretation of previous datasets. Across all hypotheses, I have removed analysis of 'overall preparedness' due to a revised decision to analyse by preparedness type only (survival vs. mitigation vs. community). This resulted in the removal of Hypotheses 1a, 2a, and 3a. Further, due to re-interpretation of findings from previous datasets I changed the nature of Hypothesis 1b to predict an increase in preparedness intentions across all preparedness types.

(Hochheimer et al., 2016), and the likelihood of incomplete responses, I aimed to recruit liberally for a sample of at least 900 participants at Time 1 to achieve a sample of 300 participants at Time 2. To minimise the occurrence of any events that may have altered preparedness findings (e.g. earthquake, volcanic activity, etc.), my study was set to run for four weeks only. I pre-registered that I would cease data collection even if the target sample sizes were not achieved. During the period of my data collection, no strong or severe earthquakes occurred in New Zealand (Geonet, 2020) and no other noteworthy events occurred in New Zealand that may have affected the study findings.

Throughout my four-week data collection period, I recruited a total sample of 557 eligible participants from the Wellington region of New Zealand at Time 1 who consented to take part in the survey. For the demographic characteristics of this sample, see *Table 3.1*. Of these participants, 182 participants took part in the follow-up survey at Time 2 (32.68% retention rate). I found no significant differences between those who dropped out and those who remained on key variables (place attachment, preparedness intentions and behaviour, number of goals set, natural hazard experience, and socio-demographic factors), indicating that drop-out was not selective.

Procedure. The link to the survey was posted on different online channels (local community groups on Facebook) with up to two booster posts on each channel as a means of recruitment during this time. Participants were provided with a Qualtrics (2020) link and could complete the survey on their own internet-enabled device, in their own time, at a location of their choosing. At the end of the survey, email addresses were obtained from those who volunteered to be contacted for a follow-up survey two weeks later. This time-frame of two weeks was chosen based on the amount of time it takes to successfully undertake many preparedness actions (e.g. storing food and water), as well as to minimise the occurrence of any confounding events in the area, or in global current events (e.g. earthquakes or other hazards) that may have influenced preparedness levels. While certain preparedness behaviours (e.g. strengthening one's house) are difficult to complete in two weeks, participants were instructed to set a goal that *could* be achieved in this time (e.g. contacting someone to assess the strength of your house). The goal-setting component of the intervention was therefore intended to capture changes in preparedness that were realistic to the time-frame participants were given. The two week follow-up was also chosen to increase the likelihood of participation at Time 2, and was modelled on other studies in the field that have also used similar follow-ups (e.g. Pardini & Katzev, 1983; Skurka et al., 2018). An

invitation was sent via email two weeks after each participant completed the Time 1 survey and two subsequent reminders were sent once a week after the initial invitation if the participant had not already responded. The Time 2 survey closed to all participants five weeks after the last recorded participant completed their responding for my Time 1 survey. This allowed for all Time 1 participants who wished to be involved in the Time 2 survey to receive all three email invites reminding them to participate. This study was granted ethical approval by the Victoria University of Wellington Human Ethics Committee (#0000026881).

Experiment. The experimental design used in this study is nearly identical to that used in Study 3 (T1: place attachment visualisation: n=113; neutral place visualisation: n=126; control group: n=162; T2: place attachment visualisation: n=53; neutral place visualisation: n=64; control group: n=60). However, in this study, I did not include a filler task for the control (no place visualisation) condition. Participants in the control group completed all other measures in this study but were not instructed to take part in any visualisation or writing tasks. The neutral filler tasks were not included because no notable between-group differences were found between the neutral place visualisation condition and control condition in Study 3. This suggests that the experimental design was not sensitive to the differences between the control tasks and the neutral place visualisation task. Each of the intervention conditions (place attachment, neutral, and control) were pre-tested with a group of volunteers. During this pre-testing phase, each individual provided detailed and thorough feedback on any aspects of the experiment that they did not understand and offered suggestions for improvements. Their feedback was subsequently incorporated to refine and improve the visualisation exercises. Due to survey length constraints in a population sample, I did not include a pre and post-test measure of place attachment in this study.

I found no significant between-group differences on key variables (preparedness behaviour prior to participation, natural hazard experience, and socio-demographic factors), indicating that randomisation was mostly successful. Despite this, there were significant between-group differences for house attachment at Time 1 (completed shortly after the intervention, $F(2, 390)=6.46$, $p=.002$, $\eta_p^2=.03$): participants in the neutral place visualisation condition reported greater house attachment ($M=3.66$, $SD=.92$) than participants in the place attachment condition ($M=3.32$, $SD=.93$, $p=.016$, $t(390)=2.77$, $p=.018$, $d=.37$, 95% CI [.05, .63]) and participants in the control condition ($M=3.28$, $SD=.98$, $p=.002$, $t(390)=-3.38$, $p=.002$, $d=-.40$, 95% CI [-.65, -.12]). Because pre-visualisation house attachment was not measured due to time constraints in an online environment with community samples, I could

not determine if these differences were an intervention effect, or due to an issue with randomisation.

Measures. The measures used for preparedness behaviour, preparedness intentions, place attachment, and natural hazard experience were identical to Study 3. I also gathered demographic information on the following variables using a series of multi-choice questions: age, gender, length of residence, education, individual income, and homeownership status.

Goal completion. At Time 1, all participants were asked to set a preparedness goal to complete from a list of preparedness behaviours they had initially indicated they had some intention to perform. Participants did not have to set a goal if they did not want to, and they could also set more than one goal. Participants who did not report any intention to complete any preparedness behaviours over the next two weeks were not asked to set a goal. Participants who chose to set a goal were then asked to indicate when and where they would complete their selected action in a free-response text box. In a second free-response text box, they were asked to include one step that they could take to ensure that they remembered to complete the action. These steps have been used in other goal-setting studies (Ajzen, Czasch, & Flood, 2009; Gollwitzer & Brandstätter, 1997).

At Time 2, participants were asked whether they remembered the goal they set for themselves two weeks earlier. Those that did remember were asked if they had completed their preparedness goal (response options: No=0, Partly=1, Yes=2). Responses were treated as ordinal where higher scores represent greater goal completion. Goals were categorised based on the content of the goal (survival, mitigation, or community-based). This resulted in three ordinal goal completion variables for each three preparedness types (survival, mitigation, community). Not all participants set goals and some participants set more than one goal. For participants who set more than one goal, the highest score was taken for analysis within each subscale (mitigation, survival, community).

Results

Data treatment. Of the 557 participants who consented and were eligible to partake in the survey, 28 were excluded because they spent less than two minutes on the visualisation task in total. An additional 128 respondents completed fewer than 75% of the total survey indicating insufficient engagement. These exclusion criteria were set in my pre-registered data plan and were intended to filter out participants who failed to adequately engage with the

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survey. A final sample of 401 participants was retained for analysis (Time 1). For Time 2, the final sample consisted of 177 participants.

Manipulation check. Participants in the place attachment condition reported stronger attachment to the place they visualised, after the visualisation task ($M=3.47$, $SD=.87$) compared with participants in the neutral place visualisation condition ($M=2.24$, $SD=.91$, $t(236)=-10.61$, $p<.001$, $d=-1.38$, 95% CI [-1.46, -1.00]). This suggests I successfully manipulated the target of the visualisation.

H1: Intentions. I ran a series of non-parametric one-way ANOVAs because the data did not meet the normality assumptions. Contrary to my prediction, I found no significant between-group differences for survival preparedness intentions ($X^2(2)=.81$, $p=.667$, $\varepsilon^2=.00$), mitigation preparedness intentions ($X^2(2)=2.88$, $p=.237$, $\varepsilon^2=.01$), or community preparedness intentions ($X^2(2)=.45$, $p=.798$, $\varepsilon^2=.00$). This indicates that there was no significant effect of the place visualisation on intentions. See *Table 3.3* for descriptive statistics on preparedness intentions and *Table 3.6* for between-group statistics. I also tested the interaction between dummy coded condition (place attachment visualisation vs. other condition) and place attachment and did not find any evidence that the intervention was any more or less successful in changing preparedness intentions based on participants' strength of place attachment, see *Table 3.7*.

H2: Goals. I hypothesised that I would find an interaction effect between intervention condition and preparedness type such that participants who visualised a place to which they felt attached would report greater completion of mitigation and community preparedness goals at Time 2 (compared with survival preparedness goals, and compared with those participants who visualised a neutral place, or no place at all). However, at Time 2, only 53% of participants (n=93) reported that they remembered the goals that they had set for themselves two weeks prior. This resulted in low sample sizes when trying to analyse goal completion by type of preparedness goal (survival, mitigation, or community) as well as by condition (sample sizes ranging from n=11 to n=22 per outcome and cell). While I could not test my original hypothesis, in an additional analysis I found no between-group differences on participants' ability to remember the preparedness goal they had set for themselves (n=177: $X^2(2)=1.68$, $p=.432$, $\varepsilon^2=.01$), or the number of goals set at Time 1 (n=333: $X^2(2)=.46$, $p=.793$, $\varepsilon^2=.00$). Further, when I tested whether participants had completed any preparedness goal irrespective of preparedness type, I found no between-group differences (n=87: $X^2(2)=.77$, $p=.681$, $\varepsilon^2=.01$).

H3: Behaviour. I predicted that I would find an interaction between place attachment visualisation, time, and preparedness type such that participants who visualised a place to which they are attached would report greater mitigation and community preparedness behaviour, but not survival preparedness behaviour, at Time 2, when compared to Time 1, and when compared with those participants who visualised a neutral place, or no place at all. To test this hypothesis, I ran a repeated-measures ANOVA with two within-participants factors (time: Time 1 and Time 2; and preparedness type: survival, mitigation, and community) and one between-participants factor (condition: place attachment visualisation; neutral place visualisation; and control). I used ANOVA because results were largely identical when using non-parametric methods. Contrary to predictions, I did not find a significant interaction between preparedness type, time, and condition ($F(4, 288)=.33$, $p=.860$, $\eta_p^2=.00$). See *Table 3.5* for descriptive statistics on preparedness behaviours and *Table 3.6* for between-group statistics.

I used exploratory ANOVA tests to examine if there were any between-group differences when each type of preparedness was analysed separately at separate timepoints and while controlling for Time 1 behaviours. I did not find any significant between-group differences at Time 2 for mitigation preparedness behaviour ($F(2, 154)=1.67$, $p=.191$, $\eta_p^2=.02$; place attachment visualisation: adjusted $M=3.14$, $SE=.17$; neutral place visualisation: $M=2.79$, $SE=.15$; control condition: $M=3.16$, $SE=.17$) or community preparedness behaviour ($F(2, 149)=1.26$, $p=.286$, $\eta_p^2=.02$); place attachment visualisation: adjusted $M=2.37$, $SE=.17$; neutral place visualisation: $M=2.02$, $SE=.14$; control condition: $M=2.16$, $SE=.15$).

I did, however, find a significant between-group difference at Time 2 for survival preparedness behaviour while controlling for Time 1 behaviours ($F(2, 158)=3.96$, $p=.021$, $\eta_p^2=.05$). To examine the nature of these overall differences, I ran post-hoc tests using Bonferroni correction on survival preparedness behaviour at Time 2 and found a significant difference between those in the place attachment visualisation condition (adjusted $M=3.84$, $SE=.16$) compared to those in the neutral place visualisation condition ($M=3.33$, $SE=.14$, $t(158)=-2.47$, $p=.044$, $d=-.23$), 95% CI [-1.01, -.02], but no significant difference between those in the neutral place visualisation condition compared to the control condition ($M=3.80$, $SE=.14$, $t(158)=2.35$, $p=.060$, $d=.21$, 95% CI [-.00, .94]). There were no significant differences between those in the place attachment visualisation group and those in the control group ($t(158)=-.22$, $p=1.00$, $d=-.02$, 95% CI [-.55, .21]). Therefore, both the place attachment

and no visualisation condition showed higher survival preparedness behaviour at Time 2 (controlling for Time 1) compared to the neutral visualisation task.

As expected, I found no between-group differences at Time 1 for survival preparedness behaviour ($F(2, 390)=1.41$, $p=.245$, $\eta_p^2=.01$), mitigation preparedness behaviour ($F(2, 381)=.31$, $p=.733$, $\eta_p^2=.00$), or community preparedness behaviour ($F(2, 380)=.51$, $p=.599$, $\eta_p^2=.00$), suggesting that these effects are not due to random baseline differences. Using paired samples t-tests to examine changes over time within conditions, I found no significant changes from Time 1 to Time 2 for any condition in relation to any type of preparedness behaviour, [4] see *Figure 3.3*, *Figure 3.4*, and *Figure 3.5*.

I also tested the interaction between dummy coded condition (place attachment visualisation vs. other condition) and place attachment on preparedness behaviour and did not find any evidence that the intervention was any more or less successful at changing preparedness behaviour based on participants' strength of place attachment, see *Table 3.8*.

Discussion

Previous research has reported significant relationships between place attachment and disaster preparedness. Using a novel place visualisation task, I reported a randomised controlled trial with a two-week follow-up and found no overall between-condition

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[4] Mean survival preparedness behaviours were not significantly different from Time 1 to Time 2 for those in the place attachment condition (T1: $M=4.06$, $SD=2.18$; T2: $M=4.19$, $SD=2.20$, $t(46)=-.83$, $p=.411$, $d=-.12$, 95% CI [-.44, .18]), neutral visualisation condition (T1: $M=3.13$, $SD=2.41$; T2: $M=2.88$, $SD=2.31$, $t(59)=1.65$, $p=.104$, $d=.21$, 95% CI [-.05, .55]), or those in the control condition (T1: $M=3.87$, $SD=2.24$; T2: $M=3.98$, $SD=2.12$, $t(54)=-.75$, $p=.458$, $d=-.10$, 95% CI [-.40, .18]). Mean community preparedness behaviours were not significantly different from Time 1 to Time 2 for those in the place attachment condition (T1: $M=2.37$, $SD=1.89$; T2: $M=2.56$, $SD=2.07$, $t(42)=-.98$, $p=.331$, $d=-.15$, 95% CI [-.57, .20]), neutral visualisation condition (T1: $M=1.97$, $SD=1.96$; T2: $M=1.86$, $SD=1.96$, $t(57)=.79$, $p=.436$, $d=.10$, 95% CI [-.16, .37]), or for those in the control condition (T1: $M=2.19$, $SD=1.96$; T2: $M=2.19$, $SD=1.92$, $t(51)=.00$, $p=1.00$, $d=.00$, 95% CI [-.32, .32]). Mean mitigation preparedness behaviours did not significantly differ from Time 1 to Time 2 for those in the place attachment condition (T1: $M=3.36$, $SD=2.02$; T2: $M=3.30$, $SD=2.01$, $t(46)=.37$, $p=.710$, $d=.05$, 95% CI [-.28, .41]), neutral visualisation condition (T1: $M=2.67$, $SD=1.75$; T2: $M=2.43$, $SD=1.76$, $t(59)=1.46$, $p=.150$, $d=.19$, 95% CI [-.09, .55]), or in the control condition (T1: $M=3.51$, $SD=2.02$; T2: $M=3.43$, $SD=1.80$, $t(50)=.40$, $p=.690$, $d=.06$, 95% CI [-.31, .47]).

differences for preparedness intentions or preparedness behaviour of any type (survival, mitigation, or community). Additional exploratory analyses suggested some between-group differences for survival preparedness such that those who completed the place attachment visualisation reported greater survival preparedness at Time 2 (controlling for Time 1), compared to those who completed the neutral place visualisation (but not compared to those in the control group). Despite this, effect sizes across this study were overall very small, indicating limited practical utility. Findings relating to each of my hypotheses will be discussed in turn below, followed by a discussion of the strengths and limitations of the study.

Place attachment visualisation was not associated with increases in preparedness intentions to undertake survival, mitigation, or community preparedness. These intention ratings were completed immediately after undertaking the place visualisation task and showed effect sizes close to zero, suggesting that visualising one's house or neighbourhood did not increase people's intentions to prepare for a natural hazard event any more than visualising a neutral place or visualising no place at all. These results replicate those findings of intentions found in Study 3 which reinforce that place visualisation, as manipulated in my intervention design, does not increase preparedness intentions. As intentions are a necessary precursor to preparedness behaviour, these findings imply that my intervention design may not be appropriate to increase preparedness intentions and behaviour. However, given that intentions do not perfectly predict behaviour (Sheeran & Webb, 2016), it is important to also examine the intervention effect on preparedness behaviour itself.

While I could not test the second hypothesis directly because of low participant numbers, additional analyses indicated that there was no effect of place attachment visualisation on the number of preparedness goals, remembering the goals after a two-week delay, or overall preparedness goal completion. These tests were not hypothesised or pre-registered, so I am cautious to interpret these in any depth. Nearly half of all participants had forgotten what goal they had set two weeks prior, which undermined my ability to test for behavioural effects of the place attachment visualisation. Therefore, while goal setting has been used as a tool to successfully to change behaviour before, I conclude that my design may not have facilitated participants' recollection of these goals. This is curious given that implementation intentions were used deliberately as an evidence-based way of increasing goal follow-through (Gollwitzer & Brandstätter, 1997), therefore calling into question their efficacy for preparedness behaviour change. It also raises further questions about the utility

of goal-setting interventions without reminders in field settings. Future research could offer additional means of reinforcing these goals by harnessing the power of social influence (e.g. setting the goals in person with a research assistant present) or by sending out an email reminder.

This study was limited by its sample size which was lower than planned based on power analyses. However, effect sizes were small, indicating that there was no practically meaningful effect of the intervention on preparedness outcomes. Furthermore, findings from this study relied on self-reported measures of preparedness behaviour. Based on the social desirability bias found regularly in survey research (Krumpal, 2013), I cannot be sure that participants were completely truthful in their reporting of preparedness behaviour. However, I report a pre-registered study and made predictions towards the analyses performed here using justifications from previous research. As a result, I can be confident that my findings are in line with the current best-practice approach towards transparency in research. Furthermore, the design of this study used experimental methods with a community sample over two time-points, all of which allowed me to test important questions related to the behavioural outcomes of the intervention design. Most importantly, my design allowed me to explore the causal relationship between place attachment and disaster preparedness. This is a research question that has not been explored in research before and, therefore, represents a new frontier in place attachment and behaviour change research.

A further limitation is the gender skew in my sample. As discussed in Chapter 2, there is a large body of literature examining the role of gender in disaster preparedness, response, and recovery (Enarson et al., 2018). While the relationship between gender and preparedness is not always consistent, gender does play an important role in disaster risk reduction more broadly, with women often taking up household tasks where the burden of preparing falls to them (Enarson et al., 2018). As such, the gender skew in this intervention study is not ideal when it comes to its potential to influence preparedness in the general population. If I were to have found significant effects of this intervention on preparedness rates, an immediate step would be to replicate these effects with a sample that is gender-representative (i.e. equal numbers of men and women) to ensure that gender is not influencing intervention effectiveness. While my intervention was not successful in changing preparedness behaviours, future research that aims to build on this intervention should be mindful of the role of gender in preparedness and consider sampling methods that are more likely to achieve an equal gender split.

To summarise, I present findings in this study that broadly indicate a lack of effectiveness of place attachment visualisation (visualising one's house or neighbourhood) on preparedness intentions or behaviours, relative to neutral place visualisation, or visualising no place at all (control). Given that effect sizes were close to zero, I conclude that the visualisation task produced no practically meaningful changes in preparedness. This may reflect limitations in the strength of my manipulation or a non-causal relationship between place attachment and preparedness. Implications and applications of these conclusions are discussed below.

General Discussion

I ran two studies to test whether place attachment could be used as a tool to increase disaster preparedness in an at-risk population. Across these studies, I found no effect of place attachment visualisation on preparedness intentions, although the intervention was a successful manipulation of place attachment (using the same criteria as Scannell and Gifford: 2017a). Importantly, when I examined behaviour change over a two-week delay in Study 4, I found no effect of place attachment visualisation on participants' preparedness behaviour for any type of preparedness (when compared with those who visualised a neutral place). I discuss these findings in relation to two possible explanations: controllability of an online experiment, and non-causal associations.

Effect sizes across most tests indicated a small or negligible effect of place visualisation on preparedness intentions and behaviours. My intervention may have failed to influence disaster preparedness because I did not have complete control over how participants engaged with the place attachment visualisation through its online delivery. This may have affected the strength of the place attachment manipulation, compared with the study by Scannell and Gifford (2017a), who ran their experiment in-person with a research assistant present. An online intervention has the advantage that is can be easily scalable and cost-effective. However, because the intervention was conducted online, I also had limited ability to oversee the visualisation process. In designing the place visualisation intervention, I carefully considered issues such as the clarity and the placement of the instructions. I also considered how long participants could reasonably be asked to engage in the visualisation and how to enforce this through rigorous pre-testing with volunteers. However, despite these design decisions, participants may still not have engaged as thoroughly with the task as would be needed to produce a meaningful effect on behaviour.

Despite these limitations, the findings across these studies do suggest that visualisation can be a promising tool for manipulating place attachment (given manipulation checks and exploratory tests). This is worthwhile for two reasons. Firstly, it provides the foundation for future research on how place attachment might be used as an intervention for behaviour change. Secondly, it underscores the importance of evaluating the effectiveness of an intervention using behavioural measures (and rigorous manipulation checks). There are commonly held assumptions about 'what works' in terms of behaviour change. But insights about 'what does not work' are equally valuable and can help policymakers and intervention planners save time and resources. I present the current findings with the hope that they may prompt future research into how place attachment *can* be used successfully as an intervention. Future interventions that aim to increase preparedness for natural hazard events can be informed by knowledge of what does (and does not) work.

Finally, and importantly, it is also possible that place attachment and disaster preparedness are not causally related, despite suggestions of a causal link (Florek, 2011; Mishra et al., 2010; Paton et al., 2008). In van Valkengoed and Steg's (2019) meta-analysis of factors motivating behaviour change, they noted that experimental and longitudinal studies are needed to explore the causality of cross-sectional relationships. Indeed, the extent to which a variable predicts behaviour in correlational studies does not equate to how much change in behaviour will result from manipulating that variable (Sheeran et al., 2017). Instead, it may be that the two variables covary together, but are linked through a much larger network of variables. In theories such as Paton's (2019) preparedness theory, preparedness for natural hazards occurs through a multitude of contributing factors that exist on several levels (i.e. personal, family, community, and society). Therefore, while the association between place attachment and preparedness is replicated in all of my studies, it might be reductive to presume that the manipulation of place attachment alone is sufficient to increase preparedness behaviour without also considering the myriad other contributing variables that cause a person to prepare. Alternatively, and while this is contrary to theoretical reasoning, it is also possible that preparedness causes place attachment and not vice versa. Without experimental or longitudinal methods that establish an effect, I cannot be certain of the causality or indeed the directionality of the association.

To summarise, across two studies I did not find an effect of place attachment visualisation on subsequent disaster preparedness, which is conceptually important given the previously reported cross-sectional patterns. I offer multiple explanations for these findings

including the strength of my intervention, implementation of my intervention, and the causality of the relationship. I provide the first experimental study of place attachment on disaster preparedness. Given the low levels of disaster preparedness in at-risk populations and the low efficacy of standard intervention tasks, novel ways of increasing preparedness are needed. Reporting a pre-registered randomised controlled trial with a two-week follow-up, I evaluated the effectiveness of a place attachment intervention in a community sample to add to the knowledge on 'what works' when it comes to disaster preparedness. I hope these findings will contribute to place attachment theory as it pertains to behaviour change, as well as inform future intervention design using place attachment.
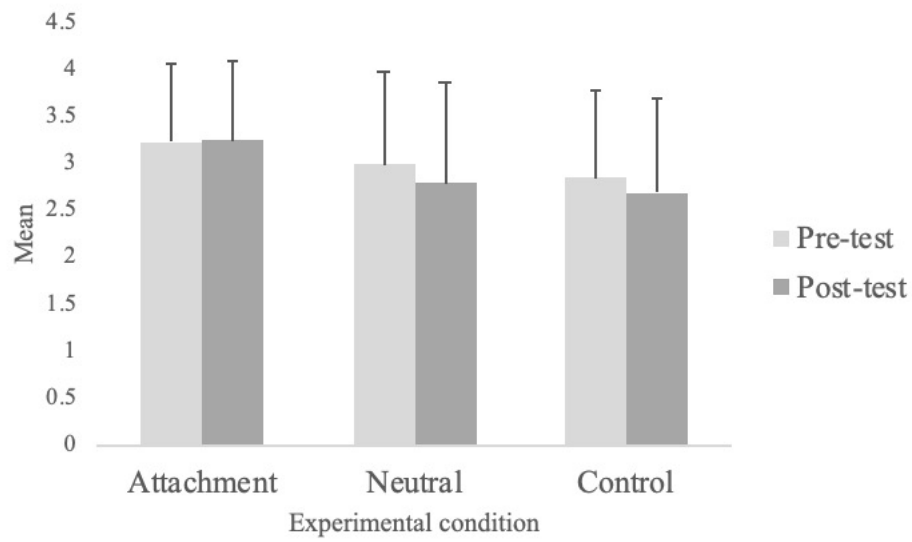
Figure 3.1. Study 3: Mean and standard deviation for house attachment by condition
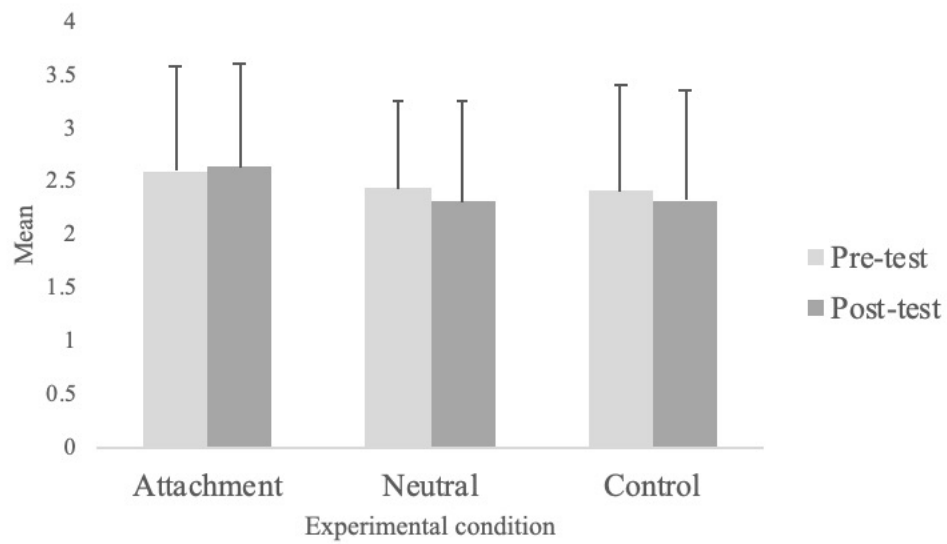
Figure 3.2. Study 3: Mean and standard deviation for neighbourhood attachment by condition
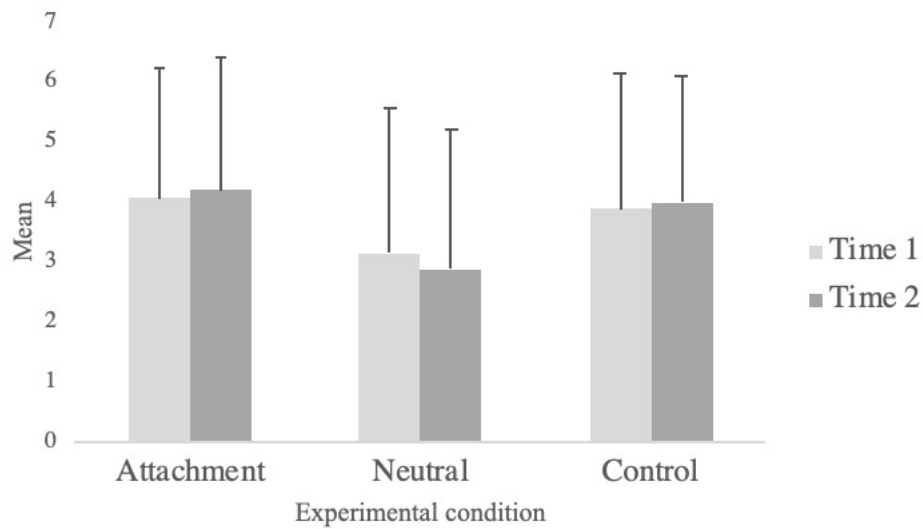
Figure 3.3. Study 4: Mean and standard deviation of survival preparedness behaviour by intervention condition (paired samples)
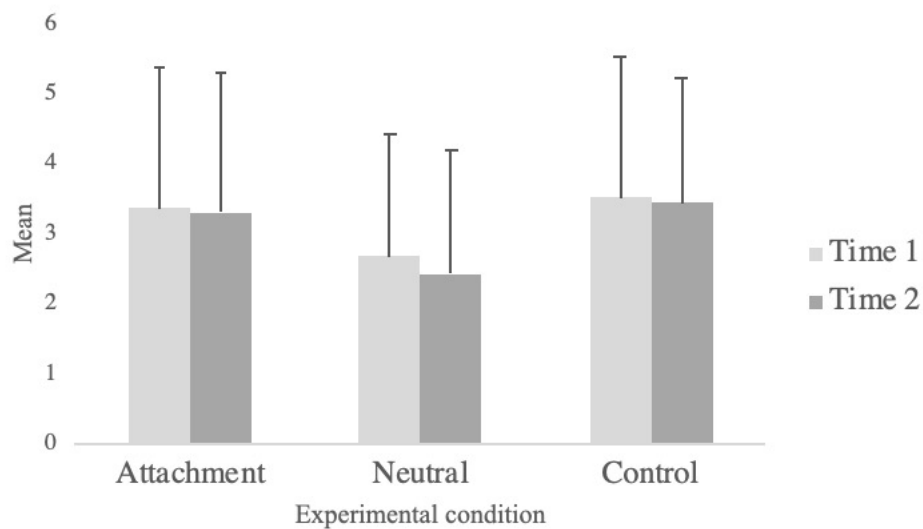
Figure 3.4. Study 4: Mean and standard deviation of mitigation preparedness behaviour by intervention condition (paired samples)
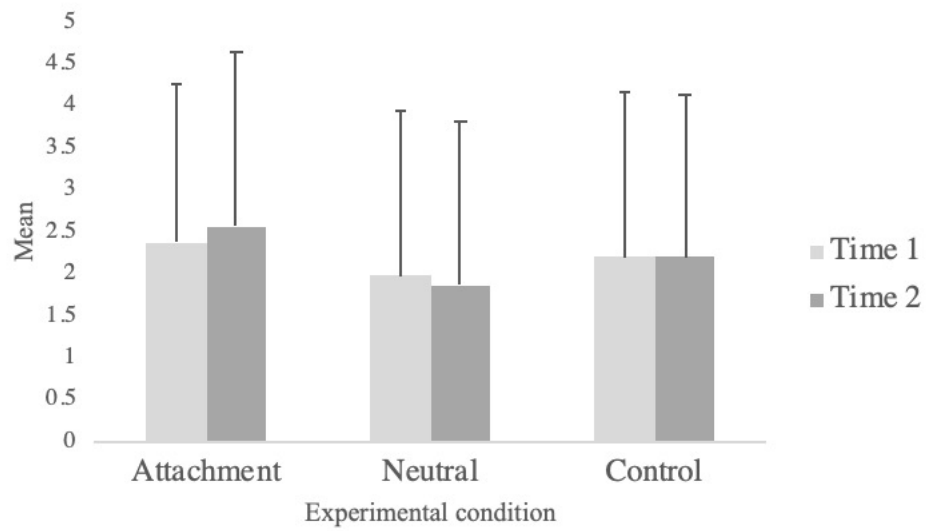
Figure 3.5. Study 4: Mean and standard deviation of community preparedness behaviour by intervention condition (paired samples)

Table 3.1. Socio-demographic descriptive information

Variable	Study 3	Study 4	
		Time 1	Time 2
N	116	401	177
Age (average)	19 years	35-44 years	35–44 years
Female	85%	87%	87%
NZ European/Pakeha	71%	74%	73%
Māori	4%	6%	6%
Pasifika	1%	2%	2%
European	6%	8%	12%
Asian	10%	3%	2%
Other	8%	7%	5%
University qualification	-	68%	73%
Income (average)	-	$40–59,000	$40–59,000
House residence (average)	< 1 year	3-5 years	3–5 years
Homeownership	0%	54%	57%

Table 3.2. Study 3: Attachment item descriptives, 1 (Strongly disagree) – 5 (Strongly agree)

		Pre-test		Post-test	
	N	Mean (SD)	Alpha	Mean (SD)	Alpha
House attachment	116	3.01 (.93)	.93	2.91 (1.00)	.96
I feel that my house is a part of me	116	3.27 (1.16)		3.03 (1.23)	
My house is very special to me	116	3.50 (1.22)		3.31 (1.23)	
I identify strongly with my house	116	3.11 (1.27)		2.96 (1.29)	
I am very attached to my house	116	3.16 (1.25)		3.12 (1.31)	
Living in my house says a lot about who I am	116	2.86 (1.10)		2.97 (1.20)	
My house means a lot to me	116	3.30 (1.19)		3.22 (1.23)	
My house is the best place for what I like to do	116	3.40 (1.12)		3.06 (1.14)	
No other place can compare to my house	116	2.56 (1.23)		2.48 (1.15)	
I get more satisfaction out of living in my house than I would anywhere else	116	2.78 (1.24)		2.55 (1.18)	
Doing what I do in my house is more important to me than doing it anywhere else	116	2.69 (1.19)		2.68 (1.13)	
I would not substitute any other place for doing the types of things that I do in my house	116	2.50 (1.17)		2.58 (1.13)	
Neighbourhood attachment	116	2.49 (.94)	.96	2.43 (1.00)	.96
I feel my neighbourhood is a part of me	116	2.64 (1.16)		2.53 (1.25)	
My neighbourhood is very special to me	116	2.61 (1.12)		2.59 (1.25)	
I identify strongly with my neighbourhood	116	2.54 (1.10)		2.34 (1.19)	
I am very attached to my neighbourhood	116	2.59 (1.14)		2.55 (1.20)	
Living in my neighbourhood says a lot about who I am	116	2.55 (1.14)		2.39 (1.15)	
My neighbourhood means a lot to me	116	2.53 (1.18)		2.62 (1.23)	
My neighbourhood is the best place for what I like to do	116	2.79 (1.21)		2.58 (1.17)	
No other place can compare to my neighbourhood	116	2.16 (1.07)		2.26 (1.10)	
I get more satisfaction out of living in my neighbourhood than I would anywhere else	116	2.42 (1.09)		2.30 (1.07)	
Doing what I do in my neighbourhood is more important to me than doing it anywhere else	116	2.28 (1.05)		2.23 (1.03)	
I would not substitute any other area for doing the types of things that I do in my neighbourhood	116	2.23 (1.08)		2.29 (1.07)	

Table 3.3. Study 3 and 4: Descriptive information on preparedness intentions (1-5) (continued on next page)

Preparedness items	Study 3 N	Study 3 Mean (SD)	Study 3 Alpha	Study 4 N	Study 4 Mean (SD)	Study 4 Alpha
Survival	114	3.34 (.84)	.94	347	2.72 (1.02)	.93
1. Store water	62	3.39 (1.08)		138	2.88 (1.17)	
2. Store non-perishable food	71	3.61 (1.01)		171	2.98 (1.13)	
3. Make an emergency kit	58	3.66 (1.04)		187	2.83 (1.13)	
4. Make an emergency plan (e.g., knowing where to meet family)	88	3.81 (1.03)		221	3.05 (1.20)	
5. Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	97	3.31 (1.03)		229	2.97 (1.19)	
6. Purchase items to use if power is lost such as a torch, radio, or gas cooker	64	3.45 (1.10)		147	2.89 (1.20)	
7. Purchase a water tank	105	2.32 (1.04)		276	1.78 (.97)	
Mitigation	115	3.00 (.88)	.94	382	2.32 (.91)	.95
8. Cloud-store important documents and/or photos on an internet server	66	3.26 (1.03)		251	2.78 (1.14)	
9. Ensure my home and contents are insured for the right amount in the event of a disaster	64	3.31 (1.10)		125	2.46 (1.19)	
10. Seek out information about the different natural hazard risks posed to my home	86	3.06 (1.09)		196	2.57 (1.09)	
11. Have the strength of my building checked (or ask landlord to do the same)	79	2.71 (1.11)		285	1.84 (1.04)	
12. Fasten tall furniture to the wall	87	2.62 (1.17)		267	2.34 (1.17)	
13. Secure movable objects in my home (such as computers and TVs)	102	2.94 (1.18)		313	2.40 (1.18)	
14. Strengthen my house/its foundations (or ask landlord to do the same)	90	2.53 (1.05)		313	1.67 (.92)	
15. Ensure that heavy objects are stored on the floor and at the bottom of cupboards	76	2.97 (1.01)		182	2.69 (1.17)	
Community	116	2.73 (.76)	.92	380	2.32 (.90)	.93
16. Identify people in my neighbourhood who need checking up on in the event of a disaster	104	2.86 (1.00)		285	2.23 (1.04)	
17. Store enough emergency supplies to help others not in my household	109	2.94 (1.16)		328	2.36 (1.11)	
18. Volunteer my time to help prepare my community	114	2.61 (.94)		340	2.04 (.97)	
19. Participate in a lifesaving skills/emergency response course and feel confident in my ability to help others	89	2.98 (1.02)		253	2.07 (1.02)	
20. Talk to people I know about getting prepared	102	2.96 (.96)		231	2.62 (1.13)	

| | | Study 3 | | | Study 4 | |
Preparedness items	N	Mean (SD)	Alpha	N	Mean (SD)	Alpha
21. Attend a community meeting where preparation is discussed	116	2.27 (.93)		327	2.06 (1.04)	
22. Have contact details of my neighbours in case of emergency	84	2.81 (1.02)		244	2.24 (1.05)	
23. Identify my local Community Emergency Hub and understand how to use it to coordinate community response	111	2.56 (1.04)		226	2.61 (1.19)	

Table 3.4. Study 3: Standardised regression coefficients for predictors of preparedness intentions

	Survival intentions (*β*)				Mitigation intentions (*β*)				Community intentions (*β*)			
Variable	1	2	3	4	1	2	3	4	1	2	3	4
Dummy (place attachment condition vs. other)	-.07	-.11	-.09	-.01	-.08	-.12	-.12	-.43	.00	-.03	-.05	-.01
Pre-test house attachment	-	.20	**.45***	**.45***	-	.18	.23	.24	-	.06	.05	.06
Pre-test neighbourhood attachment	-	.16	.07	.07	-	.17	.01	.02	-	**.25***	.05	.06
Post-test house attachment	-	-	-.31	-.28	-	-	-.06	-.49	-	-	.00	-.03
Post-test neighbourhood attachment	-	-	.16	.20	-	-	.19	.36	-	-	.22	.30
Dummy*Post-test house attachment	-	-	-	-.07	-	-	-	.69	-	-	-	.04
Dummy*Post-test neighbourhood attachment	-	-	-	-.06	-	-	-	-.25	-	-	-	-.11
Model Fit: R^2	.00	**.10****	.11	.11	.01	**.10****	.10	.11	.00	**.08****	.09	.09

Note. *R^2 significance levels indicating p-value for ΔR^2*

* = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001

Table 3.5. Study 4: Descriptive information on preparedness behaviours (Time 1 and Time 2)

Preparedness items	Time 1 Behaviours (y/n)			Time 2 Behaviours (y/n)		
	N	% complete	Alpha	N	% complete	Alpha
Survival			.81			.80
1. Store water	397	65.24		165	66.06	
2. Store non-perishable food	396	57.07		166	63.25	
3. Make an emergency kit	397	52.39		166	54.22	
4. Make an emergency plan (e.g., knowing where to meet family)	398	43.72		166	39.76	
5. Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	398	40.95		166	43.37	
6. Purchase items to use if power is lost such as a torch, radio, or gas cooker	398	62.56		166	62.05	
7. Purchase a water tank	396	30.05		165	32.73	
Mitigation			.66			.61
8. Cloud-store important documents and/or photos on an internet server	397	35.77		166	33.13	
9. Ensure my home and contents are insured for the right amount in the event of a disaster	396	68.69		166	68.67	
10. Seek out information about the different natural hazard risks posed to my home	397	49.37		165	55.76	
11. Have the strength of my building checked (or ask landlord to do the same)	398	26.88		166	24.10	
12. Fasten tall furniture to the wall	393	32.57		165	23.03	
13. Secure movable objects in my home (such as computers and TVs)	397	20.40		166	21.69	
14. Strengthen my house/its foundations (or ask landlord to do the same)	392	20.15		166	18.67	
15. Ensure that heavy objects are stored on the floor and at the bottom of cupboards	397	52.90		165	53.94	
Community			.74			.71
16. Identify people in my neighbourhood who need checking up on in the event of a disaster	395	26.58		166	27.11	
17. Store enough emergency supplies to help others not in my household	396	15.91		166	15.06	
18. Volunteer my time to help prepare my community	394	12.69		163	10.43	

	Time 1 Behaviours (y/n)			Time 2 Behaviours (y/n)		
Preparedness items	N	% complete	Alpha	N	% complete	Alpha
19. Participate in a lifesaving skills/emergency response course and feel confident in my ability to help others	398	34.42		165	35.15	
20. Talk to people I know about getting prepared	391	41.43		166	31.33	
21. Attend a community meeting where preparation is discussed	396	15.91		164	11.59	
22. Have contact details of my neighbours in case of emergency	392	38.27		166	37.95	
23. Identify my local Community Emergency Hub and understand how to use it to coordinate community response	399	41.60		166	48.80	

Table 3.6. Study 4: Descriptive information by condition for outcome variables (continued on next page)

		Minimum	Maximum	N	Mean	SD
Survival preparedness intentions	Control	1	5	139	2.79	1.06
	Neutral	1	5	112	2.65	.98
	Attachment	1	5	96	2.70	1.00
Mitigation preparedness intentions	Control	1	5	151	2.40	.95
	Neutral	1	5	123	2.21	.87
	Attachment	1	5	108	2.34	.90
Community preparedness intentions	Control	1	5	147	2.39	.96
	Neutral	1	5	125	2.25	.89
	Attachment	1	5	108	2.29	.81
T1: Survival preparedness behaviour	Control	0	7	156	3.57	2.22
	Neutral	0	7	125	3.24	2.41
	Attachment	0	7	112	3.73	2.36
T1: Mitigation preparedness behaviour	Control	0	8	149	3.16	2.07
	Neutral	0	8	123	2.98	1.96
	Attachment	0	8	112	3.13	1.97
T1: Community preparedness behaviour	Control	0	8	154	2.36	2.23
	Neutral	0	8	122	2.26	2.05
	Attachment	0	8	107	2.09	1.85
T2: Survival preparedness behaviour	Control	0	7	56	4.00	2.11
	Neutral	0	7	61	2.84	2.32
	Attachment	0	7	47	4.19	2.20
T2: Mitigation preparedness behaviour	Control	0	8	55	3.35	1.78
	Neutral	0	8	62	2.47	1.76
	Attachment	0	8	47	3.30	2.01

		Minimum	Maximum	N	Mean	SD
T2: Community preparedness behaviour	Control	0	8	53	2.15	1.93
	Neutral	0	8	62	1.79	1.92
	Attachment	0	8	47	2.62	2.02

Table 3.7. Study 4: Standardised regression coefficients for predictors of preparedness intentions

Variable	Survival intentions (β)			Mitigation intentions (β)			Community intentions (β)		
	1	2	3	1	2	3	1	2	3
Dummy (place attachment condition vs. other)	-.03	.01	-.63	.02	.05	-.21	-.04	-.02	.50
Time 1 house attachment	-	.08	-.03	-	**.16****	.08	-	.06	.21
Time 1 neighbourhood attachment	-	**.20*****	.06	-	**.17****	.15	-	**.22*****	.26
Dummy*Time 1 house attachment	-	-	.17	-	-	.12	-	-	-.23
Dummy*Time 1 neighbourhood attachment	-	-	.21	-	-	.03	-	-	-.07
Model Fit: R^2	.00	**.06*****	.07	.00	**.08*****	.08	.00	**.07*****	.07

Note. R^2 *significance levels indicating p-value for ΔR^2*

* = significant at the level of $p < .05$. ** = significant at the level of $p < .01$. *** = significant at the level of $p < .001$

Table 3.8. Study 4: Standardised regression coefficients for predictors of preparedness behaviour at follow-up (Time 2)

Variable	Survival behaviour (β)			Mitigation behaviour (β)			Community behaviour (β)		
	1	2	3	1	2	3	1	2	3
Dummy (place attachment condition vs. other)	**.35***	**.34***	-.45	.22	.22	-1.21	.34	.33	-.18
Time 1 house attachment	-	.07	.09	-	.16	-.22	-	.09	-.01
Time 1 neighbourhood attachment	-	.15	-.20	-	.05	-.07	-	.17	.09
Dummy*Time 1 house attachment	-	-	-.03	-	-	.62	-	-	.17
Dummy*Time 1 neighbourhood attachment	-	-	.54	-	-	.22	-	-	.13
Model Fit: R^2	.03	**.06***	.08	.01	.05	.07	.02	**.08***	.08

Note. R^2 *significance levels indicating p-value for* ΔR^2

* = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001

Chapter 4: Attached to What? Exploring Patterns of Place Attachment by Spatial Scale

Introduction

Place attachment is correlated with disaster preparedness (Study 1 and 2), however, a place attachment visualisation intervention did not increase disaster preparedness intentions or behaviours (Study 3 and 4). These findings were not in line with hypothesised effects and, therefore, a closer examination of how people think about place attachment is warranted. A qualitative approach allows me to give greater context to the findings presented in Studies 1-4 through better understanding how people think about their attachments and, therefore, postulate on how they relate to preparedness. In this chapter, I will analyse qualitative free-response data collected during the first quantitative study (Study 1). In addition to the quantitative scales, I also asked participants to list the different ways in which they were attached to their house, neighbourhood, city, and country which allows me to explore how people's place attachment differs across spatial scales. In doing so, I seek to understand how place attachment at different spatial scales might aid or buffer preparedness behaviour. Using thematic analysis, I will also identify broad patterns in the relationships people have with their places and use these insights to contextualise my findings from Chapter 2 and 3.

Rationale for Qualitative Research

Psychologists have traditionally been primarily concerned with quantifying people's subjective experience. This has been achieved by measuring rich cognitive structures with quantitative data that can be summarised and reduced to simpler models. However, quantitative scales can only go so far in representing people's subjective thoughts, experiences and salient concerns. In line with this, prominent scholars in the field of place attachment have called for more qualitative research (Hernández, Hidalgo, & Ruiz, 2014). As stated by Lewicka (2011) in their review of place attachment research, studies have largely focused on quantifying the significance of place attachment rather than understanding the meaning of places ('how much' rather than 'what'). According to the author, "the meaning of place is an intermediate link between the place's physical properties and strength of emotional bonds with it (place attachment). In order to understand attachment to a specific place, one must first identify its meaning" (Lewicka, 2011, p.221). Qualitative research offers access to this 'meaning', which can then help researchers to better understand the strength of emotional bonds (as measured in Studies 1-4). Understanding the meaning of place

attachment will shed light on the elements of place attachment that are most important to people and this can inform the design of future research (e.g. place visualisation interventions).

Place Attachment Framework

Before I examine the meaning of place attachment in my sample, it is necessary to ground this study in the existing literature. I will begin by describing Scannell and Gifford's (2010a) framework for place attachment, which organises the many definitions of place attachment across the literature into a single overarching framework (see *Figure 4.1*). Throughout the chapter, this framework will serve to contextualise findings in terms of the wider place attachment literature and theory. Central to the framework is its emphasis on three main dimensions of place attachment: person, process, and place (PPP).

The first of these dimensions, person, reflects the extent to which an attachment is held personally or collectively (e.g. cultural or religious-based meaning). At the personal level, this relates to personally held experiences, realisations, or milestones that are unique to the individual. At the collective level, attachment may be shared among group members due to shared cultural meaning (e.g. religious veneration: Mazumdar & Mazumdar, 2004). While individual attachments to houses are likely held personally (i.e. cannot be extrapolated to all others), even personal meanings are still shaped by sociocultural meanings of home/house and many characteristics of a city or country may also be experienced by a larger group. From this, some patterns of meanings at the city or country level of attachment might represent a collective, rather than personal, attachment.

The second dimension, process, reflects the manifestation of attachment through affect, cognition, and behaviour. Place attachment is grounded in various emotions (e.g. love and affection: Manzo, 2005; grief upon separation: Fried, 1963; and pride: Brown, Perkins, & Brown, 2004). Place attachment also includes variations in cognition (e.g. memories: Stedman, Beckley, Wallace, & Ambard, 2004; and place as a part of one's extended self-concept: Droseltis & Vignoles, 2010) as well as behaviour (e.g. proximity-seeking by staying close or returning to that place: Riemer, 2000).

Lastly, the third dimension, place, reflects aspects of the place itself that may vary (e.g. spatial scale of place and social and physical aspects). The importance of spatial scale of place for understanding place attachment will be discussed in greater depth below. However, it is also important to note that much research has focused on comparing social elements of a

place with natural or physical elements of a place (e.g. Hidalgo & Hernández, 2001). In addition, place attachment can have different relationships with behavioural outcomes depending on whether that attachment is to natural or social elements. For example, natural, but not social, place attachment consistently predicted pro-environmental behaviour in one study (Scannell & Gifford, 2010b). Other studies, however, have found greater utility in considering how physical and social characteristics complement one another. For example, rather than comparing physical and social factors, Stedman and colleagues (2004) found that they are closely linked (e.g. a mountain trail that is hiked regularly as part of a hiking group) and should not be viewed separately.

While not included as a key defining dimension, the PPP framework also acknowledges the many psychological functions of place attachment, primarily in the form of survival, security, goal support, continuity, and belongingness. The authors also highlight the need for more research on this topic, noting that "further research is needed to fully understand the functions of place attachment and the particular needs that it fulfils… For instance… do bonds at varying spatial levels serve different purposes?" (Scannell & Gifford, 2010a, p.6). The research presented in this chapter tries to answer that very question, while also examining how place attachment differs by spatial scale according to the person, place, and process (PPP) dimensions of place attachment.
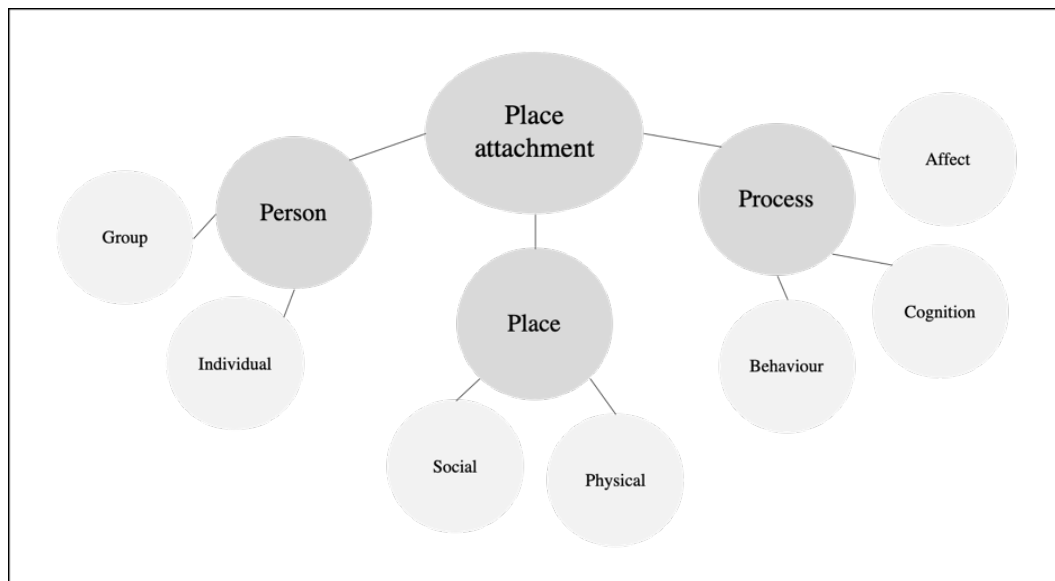
Figure 4.1. Person-Process-Place (PPP) framework of place attachment (Scannell & Gifford, 2010a)

Qualitative Literature Review

The following qualitative studies of place attachment will be examined alongside Scannell and Gifford's (2010a) framework to determine what is already known about place attachment. While research on place attachment in the New Zealand context is limited, several studies have been conducted exploring place meaning in specific areas. Here I will first focus on New Zealand specific research in greater detail because these reflect the themes of place most salient from the New Zealand perspective (the focus of my sample). I will then provide a brief review of selected international qualitative studies to establish the broader trends in place attachment research. For a more extensive review of qualitative research in the international area see Gustafson (2014).

Residents from Waiheke Island in New Zealand were asked to provide keywords or phrases to summarise the characteristics of the island. The authors found that 'beautiful', 'peaceful', 'paradise', 'friendly' and 'beaches' were most frequently cited, indicating the importance of both physical (e.g. beaches) and social (e.g. friendly) characteristics of place (Ryan & Aicken, 2010). Further, in thematic analysis of data collected as part of a new development in Ocean Beach, Hawke's Bay, New Zealand, the beach was often linked with cognitive processes (childhood memories), as well as physical (natural beauty), and social characteristics (e.g. links with family and genealogy) (Collins & Kearns, 2010). The conception of physical beauty is also central to other studies of place attachment in New Zealand, including attachment to the Ngunguru sandspit in Northland (Collins & Kearns, 2013). A qualitative analysis of house attachment for older adults living in their own houses in Auckland, New Zealand, found that participants expressed positive feelings about various aspects of their house (Wiles et al., 2009). These included affective processes (e.g. pride in their house) and cognitive processes (e.g. house holding memories) which are consistent with Scannell and Gifford's (2010a) process dimension of place attachment. They also reported attachment to physical characteristics of the place (e.g. size, location, views) and social characteristics of the place (e.g. closeness to family and friends) reflecting the place dimension of the PPP framework. Several psychological functions were also noted as important (e.g. their house as a haven).

In a mixed-methods analysis on 'sense of place' (of which place attachment was one constituent dimension) in Banks Peninsula, New Zealand, Hay (1998) drew a number of important conclusions on the developmental process of people-place relationships in New Zealand. The author also identified notable differences between Pakeha (European descent)

and Māori groups in terms of their 'cultural' sense of place. Specifically, Māori participants had a unique cultural relationship to their place that was varied and rich; for example "Kaumatua see their 'place' in a social sense, as tribal elders; in an emotional sense, as part of themselves; and in a spatial sense, covering all Ngai Tahu territory, not just the Peninsula" (Hay, 1998, p.14). Despite this, the author did not find statistically significant differences in the intensity of sense of place felt by Pakeha or Māori. Cultural elements are therefore pivotal to how Māori relate to their important places, meaning that place attachment may have collectively held meanings for certain groups in New Zealand (e.g. Māori). Consistent with the PPP framework (Scannell & Gifford, 2010a), these cultural attachments appear to span physical, social, and emotional meanings for Māori.

Further, in the international literature, New York participants were interviewed about their relationship with their important and meaningful places (Manzo, 2005). Using a grounded theory approach, the author outlined three significant themes in people's relationships with places (subthemes in parentheses): experience in places (evolving identity, bridges to the past, safety, threat, and belonging); experience in the residence (disconnection from the residence, dynamics over the lifespan); and process of developing meaning with place (incrementally over time, and flashpoint/pivotal moments). These themes primarily emphasise the cognitive processes of place attachment in terms of personal development, identity-formation, and meaning-making over time. They also provide some indication of the psychological functions that can be cultivated through place attachment (e.g. safety and belonging). Another United States study used in-depth interviews and found that homeownership is not a necessary precondition for place attachment and that a sense of 'at home-ness' and rootedness may be more important, therefore highlighting psychological functions of attachment that are independent from ownership status (Windsong, 2010). Additionally, Scannell and Gifford (2017b) content analysed Canadian residents' comments about places they were attached to. In order of prevalence, the authors identified the following categories as central to place attachment: memories, belonging, relaxation, positive emotions, activities, comfort-seeking, personal growth, entertainment, freedom-control, nature, practical, aesthetics, and privacy. Consistent with the PPP framework (Scannell & Gifford, 2010a), these themes are aligned with several dimensions of place attachment including affective processes (e.g. positive emotions), cognitive processes (e.g. memories), and physical characteristics of place (e.g. nature). Other categories reflect various

psychological functions (e.g. belonging, comfort, and privacy) that are not directly included in the PPP framework.

In research conducted outside of North America, Devine-Wright and Howes (2010) used free association data (i.e. first word or phrase that 'comes to mind') to determine how Welsh residents thought about their towns. The most common themes identified were aesthetic beauty, pleasant living, holiday resort, coastal features, rundown, home, and undesirables. These indicate a tendency towards physical characteristics, and evaluations of these, when people think about their places (e.g. beauty and rundown). However, they also consider lifestyle factors (e.g. pleasant living) and social characteristics (e.g. undesirable people residing there) as important. Also corroborating the importance of social characteristics, using thematic analysis of interviews with United Kingdom students transitioning from home to university, Chow and Healey (2008) noted that social elements were central to people's emerging conceptions of place attachment (e.g. establishing and maintaining social relationships). Also important was the value of 'home', as well as continuity, dislocation, and familiarisation of place (reflecting important psychological functions of attachment). Lastly, in an Australian study of attachment to natural areas, content analysis supported a tripartite model of attachment comprised of functional, cognitive, and affective components (Lin & Lockwood, 2014). These studies spanning different continents, and using varied methodologies, offer some support for the different dimensions of Scannell and Gifford's (2010a) PPP framework but also present a rich and varied picture of place attachment that is not perfectly captured by the three dimensions put forward by the authors. Further, few studies have used qualitative methods to examine place meaning across different spatial scales of attachment.

Place Attachment and Spatial Scale

Based on prior findings, houses and neighbourhood attachment appear to be weaker in strength (compared to large-scale attachment: Casakin, Hernández, & Ruiz, 2015; Hidalgo & Hernández, 2001; Laczko, 2005; Lewicka 2010) but share a greater association with disaster preparedness (Study 1). This suggests that there is something specific about the nature of attachment to smaller-scale places that is important for preparedness. Using quantitative methods, Lewicka (2010) found that physical (e.g. type and size of building), social (e.g. neighbourhood ties), and demographic (e.g. age and length of residence) factors each predicted attachment at different spatial scales to varying extents. Physical factors, for

example, best predicted smaller-scale attachment (apartment and building), whereas social factors were important for middle-scale places (building, neighbourhood, and city district). This research reflects an intersection of components from the 'place' dimension of Scannell and Gifford's (2010a) framework, such that both spatial scale and place characteristics are important to attachment. However, as noted by the authors, these predictors do not give any insight into the nature of these associations. Qualitative research is needed to further disentangle the aspects of place that are important at different spatial scales.

Despite the pressing need for qualitative research, limited qualitative studies have examined these differences. One study conducted in China concluded from mixed quantitative and qualitative analysis of place attachment at two different spatial scales (community centre and city), that the process of 'place-making' is closely related across spatial scales, rather than entirely separated (Qian, Zhu, & Liu, 2011). Place meanings are likely to overlap at different spatial scales rather than being entirely distinct. Most relevant to the current study, Scannell and Gifford (2017b) found notable differences in place attachment according to different types of places (e.g. houses versus cities) using content analysis. In their study participants freely determined a place of their choosing and, as a result, final groupings according to place type were small (e.g. 15 participants chose a city, and 21 chose a house). They found that houses provided greater physical and psychological comfort, as well as practical needs (i.e. amenities) than cities, whereas cities provided greater activities, belonging, memories, and personal growth. The authors concluded that categories of place attachment depend greatly on the type of place and the scale of that place and that these differences between places may explain why attachment strength varies from place to place. In turn, these differences may also explain why the relationship between place attachment and disaster preparedness depends on spatial scale. The findings from Scannell and Gifford's (2017b) study provide the rationale to conduct the current study. Instead of allowing participants to report on any place they choose, in this study, I collect data on places varying in four spatial scales (house, neighbourhood, city, and country).

Summary and Research Questions

It is necessary to examine place attachment at different spatial scales using qualitative methods to fill the current gaps in the literature. Quantitative analyses dominate the place attachment literature thus far, however, a better understanding of the subjective experience of place attachment is needed. More research is needed to understand how place scale may

influence the meaning associated with people's place attachments. The current study will fill this gap and unpack, using qualitative methods, the components of place attachment at four different spatial scales: house, neighbourhood, city, and country. Insights from these qualitative findings will be used to better understand findings from Studies 1-4 of this thesis. The research questions guiding this chapter are as follows: What aspects of place are important for place attachment? How does this vary by spatial scale (house, neighbourhood, city, and country)?

Study 5
Method

Design and Participants. Data for this study was collected at the same time as data presented in Study 1 (85% women, M=31 years). The survey asked the following free-response question: "Attachment is our emotional bond to certain people, things, or places. Please list all of the different ways in which you consider yourself attached to your house. If you feel no emotional bond to your house, please list your reasons." This question was asked in relation to house, neighbourhood, city (Wellington), and country (New Zealand). The number of responses for each place type were substantial (House: n=245; Neighbourhood: n=215; City: n=201; Country: n=192). There were no instructions on how many words to write or how much time to spend on the question and, as such, response length ranged greatly, from single-word responses to multi-sentence paragraphs. Further, 'neighbourhood' was not defined for participants when they answered this question. This reflects previous research which suggests that it is difficult to find one single objective definition of what a 'neighbourhood' encompasses and that personal definitions of neighbourhood differ significantly from Census-defined units of neighbourhood (Coulton, Korbin, Chan, & Su, 2001).

Analysis. In any thematic analysis, it is necessary to identify oneself as a researcher. I undoubtedly brought certain biases to this research by nature of who I am and the experiences I have had. While my approach towards the data was data-driven, I had already immersed myself in the place attachment literature at the point of analysis, meaning that my identification of themes may have been coloured by my previous reading and, therefore, expectations from the data. I also hold my own personal interpretations of what place attachment means to me. This means that my interpretations may have been unknowingly impressed on the themes I identified, and the meaning that I inferred from these themes (as

outlined in the subsequent results section). The steps I took to minimise my own biases in the data analysis stage are outlined below.

My thematic analytic approach used both NVivo 12 software and manual data organisation. Adhering to guidelines for thematic analysis (Braun and Clarke, 2006), I ensured that my approach included comprehensive familiarisation with the data, multiple read-throughs, and extensive notetaking throughout. In line with a data-driven approach to thematic analysis, every unit of text was coded, and no data was ignored. At the thematic grouping stage, all codes with shared meanings were grouped in tentative categories and themes that were subsequently reviewed, refined, and renamed. In this study, themes were defined as 'patterned responses of meaning within the data set'' (Braun & Clarke, 2006, p.82). All categories and themes were named and defined at a semantic level, rather than latent level, to ensure that they remained grounded in the data as opposed to my own imposed meanings.

I decided at the outset of data analysis that I would not take a naïve realist approach to the analysis. This decision was made because, while the data would reflect the experience of the participants, all analysis would inevitably be influenced by my interpretation of the experiences as the principal researcher, as outlined above (Madill, Jordan, & Shirley, 2000). I also acknowledged that the data would also be influenced by the context of the data collection (i.e. a disaster preparedness survey) as well as other social forces at play (e.g. social desirability bias causing people to respond in certain ways). Therefore, I rejected the premise that my thematic analytic approach operated by 'giving voice' to an objective reality of place attachment. Instead, in line with a more constructionist view (i.e. emphasising that all responses are the effects of wider social discourses operating in society), I took a contextualist approach to the analysis. This was chosen in opposition to the realist approach. This contextualist approach meant that I understood all responses to be dependent on the context in which information was provided. For example, participants provided their responses to this question in the context of a disaster preparedness survey; meaning that certain themes may have already been already primed for them (e.g. risk). Responses were also collected online through a free-response text box, rather than face-to-face, meaning that the data may not capture the richness, or social cues, of other forms of data collection (e.g. interview). Therefore, in making conclusions from this data, I acknowledge that there is no one objective reality and that findings are firmly grounded in the experience and context of each participant within my sample, as well as my own biases as a researcher.

Results and Discussion

Using thematic analysis, I identified six key categories of place attachment across four place types: social; residential; sentimental, functional, physical, and psychological. These categories shed light on the varied meanings of place attachment. I also found some variations in the patterns of attachment for each place depending on spatial scale (house, neighbourhood, city, and country). I will discuss each key category in turn, as well how themes within each category varied according to each place type. Some themes were constant across all multiple spatial scales while others were specific to one spatial scale only. Within each category, I will discuss each theme separately, starting with those that were common across all or multiple spatial scales, followed by those that were specific to one place type only. For an overview summary of categories and themes for each place type, see *Table 4.1*.

Category 1. Social

1.1 Family. Across the social category, the importance of people within a place was cited by participants across all four place types. These patterns reflect the importance of social characteristics of a place, as stipulated by the 'place' dimension of the PPP framework (Scannell & Gifford, 2010a). Consistent with previous place attachment research, family was a substantive social theme noted across all four spatial scales (Chow & Healey, 2008; Collins & Kearns, 2010; Wiles et al., 2009). At the house level, it was commonly cited that one's house was a family house ("It's a family orientated home"), that family lived nearby ("It's close to my family"), or that it was simply where family lived ("It's my home, where all my immediate family live"). This theme reflects the importance of family for the making of a 'home', reinforcing the traditional notion of a 'family home' as an institution that forms the foundation for day-to-day living. Participants also regularly noted that family lived in the place and/or that it was a great area to raise a family at the neighbourhood level ("Close to all our family and friends… great for raising family") and the city level ("…the majority of my extended family live here and we are all very close… Wellington is an excellent place to raise a child"). At the country level, many participants felt it important to note that their family lived in the same country as a key way that they were attached ("NZ is where my family and my friends are"), and some also mentioned that it was a good place to raise children ("New Zealand is a wonderful place to live and raise a family"). There may be dual explanations for the importance of family for place attachment at larger spatial scales

(neighbourhood, city, and country). One process relates to the simple presence of family in, or nearby, a place for facilitating place attachment. The second process refers to the potential for that space to foster attachment by being a good place to raise a family.

1.2 Friends. A second social theme that was common to three out of four spatial scales (neighbourhood, city, and country) was that of friends. Friends and family were often mentioned in the same sentence as two parts of the same phenomena representing the people 'closest' to them. Friends were most often referred to as important simply because they were present in the place ("I'm attached to my neighbourhood as many of my friends live there") or had made friends in this place ("I've met all my closest friends here"). There was very little variation in how participants talked about friends, which indicates that irrespective of spatial scale (house excluded), the presence of friends in a place plays an important role in formulating attachment to that place. Closeness to both family and friends was reported as important in research by Wiles and colleagues (2009) in Auckland, New Zealand. This study supports these findings and suggests that the presence or closeness to these important people is highly relevant for place attachment at different spatial scales.

1.3 The people. At a much broader level, the third shared theme within the social category was that of 'the people', which was common for neighbourhood, city, and country attachment. This theme reflects a conceptual difference between those people that you know (family and friends) and those undefined people that generally make up a place. While some participants referred to 'the people' without any accompanying context (e.g. "attached to the people here"), others applied a number of positive descriptors including friendly, nice, open-minded, and welcoming (e.g. "I also love the people who are friendly and welcoming"). This theme may be indicative of a type of positive in-group identity that also contributes to place attachment. Through positive evaluation of this in-group, people may use 'the people' as a symbolic facet of their attachment to that place.

1.4 Culture. Culture was a theme relevant only to large-scale place attachment (attachment to city and country). Many participants simply cited the culture of their place as being important without any accompanying context, while other participants attributed positive descriptors to the culture of their place (e.g. "The culture is amazing") or noted that they loved the culture of their place (e.g. "I love New Zealand and Māori culture"). One way that culture can be understood is through shared norms that influence cognition, attitudes and behaviour (Fischer et al., 2009). It is important to note that these shared norms only appeared relevant for place attachment to one's city or country but not one's house or neighbourhood.

This is congruent with the idea that culture emerges with larger groups of people and emphasises the importance of the intangible norms of a place for the formation of bonds with that place.

1.5 Housemates. Housemates was a theme related to the importance of those people that participants shared their houses with. I have termed this theme 'housemates' to reflect this, but the content within this theme varied from mention of flatmates, friends, to partners (note here that references to family or children were instead classified under the theme of family discussed above). This relationship can be understood through the following excerpt: "I feel very connected to my house. Mostly because that is where my best friends live also…" The participant appears to acknowledge a connection to their house and attributes that connection to the fact that they share the house with people who are important to them. In the same way that friends and family are important to attachment, housemates appear to contribute to the social experience of a place and, therefore, people's attachment to that place.

1.6 Gathering space. Another theme for the social category of house attachment relates to the house as a gathering space. While previous themes relate to specific social connections within a place (i.e. friends or family), this theme relates to the function of a place for facilitating that social connection. Some example excerpts include: "this house is the one where everyone come over to spend time together", "As a place to unwind, have friends over", and "This is where we have family lunch every Sunday". These excerpts range from broad ("everyone") to specific ("friends" and "family") but all reflect the role of the house in facilitating social gatherings. Through virtue of this facilitation, these responses suggest that these gatherings also facilitate an attachment to the house itself. Attachment to one's house is therefore not always bound by tangible aspects of the place (i.e. people or things) but also by the potentiality of the space and what it can provide.

1.7 Community. Community was a concept cited frequently by participants when discussing their neighbourhood and it was labelled in several different ways. Some people referenced the spirit of community ("It is a unique place with a strong community spirit where people pull together") while others emphasised the sense of community ("The strong sense of community and friendliness"). It also appeared important for many participants that their community was available to help out in troubling times (e.g. "community is always willing to help out in times of need"). However, this particular trend may be a product of the context of the survey in which data was collected such that participants were primed to be thinking about disaster preparedness. As evidenced in previous literature, the conceptual

distinction between a 'sense of community' and 'place attachment' has been confused by some people but these findings suggest that community bonds constitute one contributing factor to the meaning of a place. There appears to be something significant about the joining of people at a neighbourhood level that constitutes 'community'. Supporting this, neighbourhood ties were found to be particularly important for neighbourhood attachment in previous research (Lewicka, 2010)

Category 2. Residential

2.1 Residence length. At the residential level, residence length was one theme that was common across all four spatial scales. Firstly, participants regularly cited that they had lived in a place all of most of their lives ("Attached to Wellington because I've lived here my entire life"), or for a long time ("Have lived here for a long time"). Secondly, participants noted that they had been born and raised in a place, indicating that they have spent all of their lives in that place (e.g. "I was born and raised in the Wellington area" and "NZ is home for me where I was born and raised that's the emotional bond"). The connection between residence length and place attachment is one that is regularly cited (with some studies even using residence length as a proxy measure for place attachment e.g. Riger & Lavrakas, 1981). While residence length is not analogous to place attachment, it does act as a robust predictor (Lewicka, 2011) meaning that the greater time spent in a place, the greater time there is for bonds to be developed. People are also likely to stay longer in a place that they are attached to, therefore creating a bidirectional relationship between residence length and place attachment.

2.2 Residential mobility. Mobility was also noted by some participants when discussing their house and neighbourhood attachment. The common sentiment expressed under this theme was that frequent movement from house to house, or neighbourhood to neighbourhood, impeded the development of place attachment to that place. This is evidenced in the following excerpts: "I'm from overseas originally and have lived in 6 countries and too many houses to bother counting. It's just a house, I'll move out of it too someday" and "I have gotten used to moving around during my life so I don't really get attached to the neighbourhood". Here, it appears that participants use their previous experiences (moving often) to prevent a current attachment to their place due to future-forecasting (that they will likely leave soon). This suggests that there may be an active component to the formation of place attachment which can be inhibited at will. Second, it

also suggests that there may be emotional consequences for forming an emotional attachment if that place does not have permanence in one's life. Research has shown that it is not uncommon to view residential mobility and place attachment as contradictory, however, others are able to build attachment despite high residential mobility (Gustafson, 2001). Mobility and place attachment are therefore not mutually exclusive but do share an important relationship (for a theoretical perspective on this, see Di Masso et al., 2019).

2.3 Homeownership. At the house level, I found a strong pattern for participants mentioning their homeownership status (or lack thereof as renters). The following participant reports that homeownership is a source of pride as well as attachment: "We've only owned it for just over a year so we are hugely attached to it. It is our first home that we've owned so we take great pride in it". On the flip side, many participants conflated place attachment with homeownership and negated that they could feel attached to a rental (e.g. "No emotional bond because is not mine and I'm just flatting" and "I don't feel emotionally attached due to it being a rental for us and not owned by us"). The association between homeownership and place attachment may come down to a sense of autonomy over that place (i.e. able to make changes to the house), a sense of permanence (in that renting can imply temporary accommodation), or a sense of ownership (i.e. being 'mine'). Nevertheless, many participants also cited an attachment to their house while also renting it ("I live in a rental property… I am pretty attached to the house now"), indicating that homeownership is not a prerequisite for house attachment. Prior research corroborates this finding and warns researchers not to conflate homeownership with place attachment (Windsong, 2010).

2.4 All I know. Lastly, many participants noted the importance of New Zealand being 'all they know' at the country attachment level. This appeared to be a defining contributor to attachment for some participants (e.g. "It's the only home I know. Of course I'm attached!") while others referred to their travel history to certify that they do not know what any other country is like (e.g. "I've never been out of NZ so have nothing to compare it to, guess I'm attached" and "The only country that I know of only been out of the country once many years ago"). While residence length represents the objective time spent in a place, this theme relates to the ability to compare this place with another place. For attachment to New Zealand, participants felt it important to note whether they had other comparison points (experiences of other countries) as a gauge for being attached. My inference here is that place attachment to one place can be undermined if a person has experienced another place to which they are more attached or view more positively.

Category 3. Sentimental

3.1 Memories. Memories were an important theme contributing to sentimental attachment to places at different spatial scales. This was only the case for house and city attachment, however. At the house level, participants alluded to the positive nature of memories they had in their houses (e.g. "A lot of fond memories in this flat…") and the relational nature of memories they shared with others (e.g. "Where memories have been made for the last 6 years with my family"). For memories at the city-level, participants noted that Wellington was the place where all memories were held (e.g. "This is where all my happy memories are" or simply where a lot of memories have occurred (e.g. "I have had a lot memories in this city which makes it special to me"). These excerpts indicate that places can act as a cognitive repository for memories, reflective of the cognitive process component of the PPP framework (Scannell & Gifford, 2010a). Indeed, research suggests that active remembering of positive memories in a place can help to assign positive evaluations to the place in question, and therefore increase place attachment (Ratcliffe & Korpela, 2018). Developmental theories of place attachment have highlighted the important role of childhood memories in formulating place attachment, further emphasising the importance of adult remembrance in facilitating place ties (Morgan, 2010). The importance of memories has also been found in previous qualitative research into place attachment (Collins & Kearns, 2010; Scannell & Gifford, 2017b; Wiles et al., 2009).

3.2 Love. For city and country attachment, I found a pattern for participants citing that they 'love' their place. For the most part, this involved a simple expression of love for the place itself (e.g. "I love Wellington" and "Love NZ!!") while others expanded on the reason for their love (e.g. "I love living here as everything I love is here" and "I love New Zealand because it is a friendly and safe place to be"). These expressions of love are indicative of an affective bond to a place which matches the process element of the tripartite model of place attachment (Scannell & Gifford, 2010a) in that emotions can be a manifestation of place attachment. Love being important only for larger-scale places may be partly attributable to greater residential mobility at the house and neighbourhood level (and, therefore, reduced length of residence), whereas people were more likely to remain in their city or country of birth. This patterned responding is in line with previous findings relating place attachment to feelings of positive emotions such as love and affection (Scannell & Gifford, 2017b; Manzo, 2005).

3.3 First. At the house-level, the importance of a house being one's 'first' was important amongst participants. For some, this was the first house with certain family members (e.g. "First house with just myself and my kids"), the first house they owned (e.g. "My house is the first house that I have owned on my own, and where my daughter and I have lived on our own"), or the first house they rented (e.g. "I feel attached to my house because it's the first flat I've rented/lived in and it holds a special place in my heart because of that"). I have categorised these 'firsts' together under the sentimental theme because they appear to reflect a similar sense of achievement or nostalgia over doing something for the first time. The importance of a house being a 'first' exemplifies the pivotal role of the house in achieving certain milestones in life (e.g. moving out of parent's home, buying a house, or providing shelter for one's family). From the data, I infer that being a 'first' house (for any reason) can increase place attachment through the associated sentimental significance of achieving a goal, therefore acting as an important predictor of attachment. Life milestones are important for personally held place attachments according to the 'person' dimension of Scannell and Gifford's PPP framework (2010a). They are also referenced in qualitative studies finding that pivotal moments in a person's life are crucial for meaning-making in that place (Manzo, 2005).

Category 4. Functional

4.1 Amenities. Amenities were an important theme for three out of four spatial scales of place (excluding country attachment). This label was chosen to group all responses that referenced having access to certain services or certain places. These services included shops such as supermarkets (e.g. "This is a nice area in terms of proximity to the city center and shops (like the supermarket)"), public transport (e.g. "…being close to a train station makes me want to stay in this area and never use buses again!") as well as access to natural places such as the beach (e.g. "It is a great place to live, close proximity to shops, beach and city, also to work"). Participants also noted when a place had everything they needed, indicating convenience (e.g. "it's small and convenient to get around and everything is at hand when you need it (except a car park)" and "I feel very attached to Wellington. It has everything I need"). Interestingly, amenities were not a common theme for country attachment. It is likely that people do not rely on their country for their day-to-day functioning in the same way that they do their house, neighbourhood, and city. Because cities, neighbourhoods, and houses exist *within* the wider country (i.e. are nested within one another), it is hard to extricate

amenities of the country independent of these places. Prior research conducted in New Zealand corroborates the importance of amenities in a place, wherein older adults living in Auckland also reported attachment to their residential places due to closeness to amenities (Wiles et al., 2009).

   4.2 Work and university. Work and university were commonly cited as important for attachment to neighbourhood and city. I have treated this as a separate theme because many participants mentioned that their attachment was associated with the simple fact that they work or study in a place. The following excerpts provide examples of this: "My neighbourhood is where I work, live and study so it is a main part of my day to day life" and "Most of my friends are here, my University, my work, it is my home now and I see a future for myself here." This theme was relevant for neighbourhood and city attachment but not house and country attachment, likely because the location of one's work or university is generally viewed at the scale of the neighbourhood or city. I infer that the workplace and the university are important for place attachment because a) it indicates embeddedness within the place through daily interaction, and b) it offers a symbolism as the place where one can achieve their goals. These inferences are backed by previous research finding that place attachment is associated with psychological needs such as familiarity and self-efficacy (Chow & Healey, 2008; Twigger-Ross & Uzzell, 1996; Wiles et al., 2009).

   4.3 Survival. Two additional themes were relevant for house attachment. The first, survival, consists of references to elements of the house that facilitate human rights for survival such as food (e.g. "…[it] has a fireplace I can use for cooking. I have a garden for food. So attached to it"), shelter and warmth (e.g. "It's a roof over my little family's heads" and "'shelter - safety - warmth - keeps us dry"), and a place to sleep ("It's where I sleep"). In a very basic sense, this theme reflects the ability of the house to keep people warm, dry, fed, and rested. Also important to note, however, is that for some participants a house in its most basic sense was just a house and that this was not sufficient to foster attachment (e.g. "It's just a house it's our lives that matter" and "…it serves a purely practical purpose to me"). For some people, a house that meets basic requirements (e.g. shelter, dry, warm etc) was pivotal to their attachment while for others it served a purely practical function that was not related to place attachment.

   4.4 Investment. Investment was also important for house attachment with many participants citing that they had invested time, money, or effort into their houses (e.g. "I have a very strong bond with… the time invested into its upkeep and improvement" and "We have

redecorated the inside ourselves, which was a lot of hard work"). This investment is categorised under a functional way of being attached because it reflects the practical relationship between an investor and their investment (i.e. they want their investment to do well in order to earn dividends). When one invests in a place, they are putting energy in to improve that place (through renovations, redecorating, maintenance etc.). While these improvements are also undoubtedly related to place attachment, it is interesting to note that participants emphasise the time/money/effort that produced these improvements rather than just remarking on the improvements alone. This theme suggests that there is a payoff in attachment when someone puts energy into a place, irrespective of the improvements that result from that energy.

4.5 Entertainment. At the city level, entertainment was an important theme for attachment. Encompassing this, participants frequently cited that Wellington was a great place to do activities and to see things (e.g. "There is always something fun happening in the city - some kind of event" and "There is always things to do or shows to go to"). This theme reflects the role of the city in providing entertainment and engagement. This theme also replicates those qualitative findings by Scannell and Gifford (2017b) wherein activities proved important for city attachment, but not house attachment. Through facilitating entertainment, it is evident that these activities also foster a sense of attachment to the place. This contributes to the idea that the dynamic nature of a place, and its ability to always be changing and entertaining, is important for attachment in addition to more stable aspects of place (e.g. nature and layout).

Category 5. Physical

5.1 Nature. Across all spatial scales, nature was important as a physical way of being attached to place. This label is broad in its connotations and responses were similarly broad. At the house attachment level, participants regularly mentioned their garden, the trees, or the wildlife (e.g. "…it has a patch of grass and gets good sunlight and has a nice tree and lots of birds" and "[it] has a lovely deck in the sun and a cute front garden"). For neighbourhood attachment, nature was talked about more broadly with respect to the outdoors, nature, and the area being 'green' (e.g. "The area is so green and fresh" and "good walking tracks and outdoor space"). At both the city and the country level of attachment, the weather was regularly cited (e.g. "I'm so used to the weather! Crappy, great, good weather!"), as well as the scenery (e.g. "Great scenery") and natural features of the environment such as beaches,

coastline, mountains, and forests (e.g. "Nature, awa, maunga, beaches"[5]). Aspects of the natural environment can be associated with place attachment through different processes. Nature can offer a place for social engagement or it can offer a place to escape depending on how developed (Stedman, 2003). Natural aspects of a place have been cited as important for place attachment in previous New Zealand based studies (Collins & Kearns, 2010; Ryan & Aicken, 2010), as well as internationally (Devine-Wright & Howes, 2010; Scannell & Gifford, 2017b).

5.2 Possessions. The remaining themes are all specific to one spatial scale only. The first three are related to house attachment. At the house level, many participants cited their possessions as being important for their attachment (e.g. "It has all my personal possessions inside"). While many participants cited their possessions as contributing to their attachment, a number of people also distinguished between their house attachment and their attachment to their possessions as two distinct things (e.g. "No bond to house as rental but attached to my personal items inside"). Therefore, for some people but not others, possessions were a part of house attachment. Regarding the importance of the possessions themselves, research has concluded that they can, among other functions, symbolise one's pasts and one's attachments to people, offer safety, promote social status, or serve as an extension of one's self (Belk, 1992). From a physical point of view, the house serves here as a physical space that allows for these important possessions to be stored and it is perhaps through this storing that the attachment is facilitated to the place itself.

5.3 Layout. Second, layout was also cited as relevant at the house level. This encompassed responses relating to the amount of space in or outside the house (e.g. "Big space outdoors"), the physical sturdiness of the structure (e.g. "I'm attached because it is a strong 1970's wooden house which they built well in those days"), and physical layout of the house itself (e.g. "Patio in the house really great. Great lounge area we have in the house"). Previous research has found positive associations between residential characteristics (e.g. building style and building type) and place attachment (Lewicka, 2011; Wiles et al., 2009), indicating that this physical theme of attachment is well-supported in the literature.

5.4 Location. Location was also important for participants at the house level. For this theme, participants appeared to ground their houses within a wider space such that their attachment depended on their evaluation of this space. Examples of these responses include:

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[5] Note: 'awa' translates to 'river' and 'maunga' translates to 'mountain' in Te Reo Māori

"love the area and location" and "Its [a] nice area to stay in". This theme evidences how house attachment is not limited to the parameters of the physical house/property. Instead, it situates the house within a larger area and determines that the properties of that area (whatever these may be) are consequential for attachment. This theme is in line with previous findings, where the importance of location on place attachment in New Zealand has been concluded (Wiles et al., 2009).

 5.5 Quiet. At the neighbourhood level, the noise level of the environment was important for participants. For many participants, this meant commenting on how quiet their neighbourhood was (e.g. "It is a nice, quiet area") while, for others, it involved a comment on the noise level as a detractor from neighbourhood attachment ("No real attachment. It has a lot of busy streets so can be quite noisey [sic]"). Here I assume a pattern such that lower noise levels in a neighbourhood (i.e. quiet) relates to higher attachment whereas higher noise levels relate to lower attachment. This theme is categorised under the physical theme because it relates to a sensory experience of a place (hearing) that is often linked to physical aspects of the environment such as crowding or traffic. While not explicit from participant responses, it is possible that noise levels within a neighbourhood contribute to attachment through psychological processes of peacefulness or relaxation.

 5.6 Size. For city attachment, the size of the city and its level of crowding was relevant. For example, many participants made positive comments about the city being small (e.g. "It's a beautiful little city" and "It's a wonderful and compact city"). Regarding the level of crowding, participants were positive about Wellington not being too crowded (e.g. "good population, not to [sic] crowded" and "It's not to [sic] crowded & nor too big"). One can postulate that size and crowding are significant for city attachment because crowded cities are often associated with traffic, an over-saturation of services, and a reduction of peacefulness and quiet. In line with this, a 'small' city invites connotations of a peaceful place that is not overdeveloped or hard to move around from point-to-point. This theme is in line with previous research finding the size of a place important (Lewicka, 2010; Scannell & Gifford, 2017b; Wiles et al., 2009).

 5.7 Beauty. Lastly, beauty was particularly associated with attachment to one's country. For example, participants remarked that the country was beautiful using various iterations of the same sentiment (e.g. "New Zealand is such a beautiful country" and "have traveled [sic] a lot around this beautiful country"). This was chosen as a theme because of the frequency of use of this particular descriptor. While relatedly similar to the nature theme, this

repetition of 'beauty' suggests a greater association with the aesthetic physical appeal of a place as opposed to the more concrete environmental features. Adjectives were used to describe places at all other spatial scales, but not in any patterned way. That beautiful was used as a descriptor so frequently at the country-level indicates something significant about the aesthetic quality of a country for determining attachment. Research finds that perceived aesthetic beauty of a place is associated with community satisfaction with that place, as well as place attachment to specific places (Collins & Kearns, 2010; Florida, Mellander, & Stolarick, 2011; Ryan & Aicken, 2010; Scannell & Gifford, 2017a). This theme extends that finding, suggesting that perceived beauty is predominantly associated with place attachment at the country level.

Category 6. Psychological

6.1 Home. The final category relates to psychological aspects of place attachment. Across all spatial scales, participants mentioned "home" as a concept having important connotations for psychological function. Supporting previous research warning against the conflation of 'house' with 'home' (Windsong, 2010), many participants made a distinction between a house and a home, indicating the psychological weight that 'home' carries (e.g. "It's also the first place to feel like home" and "I am not attached to the house itself, mostly just the idea that it is my home"), while others chose to refer to their house as their home, often using a possessive tone indicating ownership or bondedness (e.g. "It's my home"). This matter-of-fact categorisation of a place as 'home' carried throughout the data into all spatial scales including neighbourhood where the 'feeling' of home was important (e.g. "I love our neighbourhood it feels like home"), city (e.g. "Wellington is and always will be my home"), and country (e.g. "Even though I was born in England I consider New Zealand my home"). This notion of 'home' has been identified across numerous qualitative studies into place attachment (Chow & Healey, 2008; Devine-Wright & Howe, 2010; Windsong, 2010) and has been posited as providing psychological benefits including refuge, security, and assurance (Sigmon, Whitcomb, & Snyder, 2002).

6.2 Safety. In line with previous research, safety was relevant to participants' attachment to place at the house and the country level (Manzo, 2005). For house attachment, it appeared that the house served as an important respite (e.g. "I feel safe in my house" and "It's my home, my safe space"). This suggests that the house operates as a buffer zone against the outside environment, a place where people may feel safe and free from other dangers

while also seeking refuge (e.g. "My safe haven" and "It is the place to go and escape the world"). At the country level, however, safety was cited as a more global evaluative comment about the state of danger in the country as a whole (e.g. "It is a safe country to live in" and "I love New Zealand because it is a… safe place to be"). Safety in each of these places, therefore, appears to symbolise a respite or an escape from things that are happening elsewhere. This theme relates to the literature on interpersonal attachment theory wherein the target of secure attachment is usually treated as a 'safe haven' or a 'secure base' such that one can explore the outside environment but retreat to that place for protection (Scannell & Gifford, 2014).

     6.3 Comfort. Comfort at the house-level was important for participants. Examples from participants include "…is where I feel most comfortable" and "it just has the vibe of being safe and comfortable". The fact that comfort, being comfortable, or being comforting, were important for house attachment speaks to the notion of a house being a place to retreat and relax. Being 'at home' is defined as being "relaxed and comfortable" (Sigmon et al., 2002, p.26). Previous research finds that comfort and relaxation are psychological benefits that arise from, and give rise to, place attachment (Scannell & Gifford, 2010a; Scannell & Gifford, 2017a). These findings are congruent with this. This theme also corroborates findings from Scannell and Gifford (2017b) in that psychological comfort was important for house attachment, but not for city attachment (or, in my study, city, neighbourhood or country attachment). This illuminates an important and unique function of house attachment.

     6.4 Familiarity. Familiarity was regularly cited for neighbourhood attachment. Participants felt that it was important to be familiar with the environment that they lived in and noted that their attachment was greater due to familiarity (e.g. "It's familiar and I now [sic] my way around which is why I'm attracted to it" and "I am familiar with all the facilities in the area"). The psychological benefit of familiarity may be due to high predictability and, therefore, low cognitive load while interacting with that place. This benefit is likely important at the neighbourhood level specifically because interaction with the neighbourhood requires a certain threshold level of familiarity. This is not so pertinent at the city or country level because each of these places does not require the same intricate knowledge or familiarity to facilitate daily functioning. In support of this, research shows that space appropriation, through exploration, and knowledge of landmarks within a place, amongst other processes, may be a mechanism by which place attachment develops (Rioux, Scrima, & Werner, 2017).

Familiarisation with a place has also been noted as important for place attachment in prior research (Chow & Healey, 2008).

6.5 Identity. Lastly, identity was an important psychological theme at the country-level only. For some, this involved simply labelling themselves as a Kiwi or a New Zealander, therefore invoking a sense of in-group identity (e.g. "I am a New Zealander"), and for others, this involved a statement of the extent of their 'Kiwiness' (e.g. "Kiwi through & through" and "I'm 200 per cent kiwi"). Importantly, pride was cited as being relevant to place-related identity for several participants (e.g. "I'm immensely proud to call myself a New Zealander" and "I will always be proud to be a NZer"). This identity-related theme appears to have considerable overlap with conceptualisations of social identity where in-group categorisation (i.e. 'I am a Kiwi') leads to the transference of certain positive traits, therefore contributing to positive affect. This place-related identity, therefore, has implications for self-esteem and belongingness to a place. This theme is supported by previous research (Droseltis & Vignoles, 2010; Manzo, 2005) and is commonly measured as one dimension of the wider place attachment concept (Williams & Vaske, 2003).

General Discussion

I used thematic analysis to examine the attachment that people experience with their different places, and how these place attachments differ by spatial scale. Through this, I identified six key categories in the data: social; residential; sentimental; functional; physical; and psychological. To summarise prominent themes, place characteristics that appeared to contribute to all spatial scales of place attachment included its natural features and the presence of family members. Participants who lived in their place for a long time, and who called that place 'home' also cited these as reasons for being attached to a place. Certain themes of attachment are therefore shared across all spatial scales, although perhaps to varying degrees. This reflects a previous research finding that place meanings at different spatial scales can be closely related (Qian et al., 2011). However, certain themes and categories also greatly varied by spatial scale. The implications of these variations will be discussed below, as they relate to each category and previous research. I will also discuss how these findings can be interpreted alongside the findings from previous chapters regarding the link between place attachment and disaster preparedness. Finally, the strengths and limitations of the study will be explored.

Summary of Findings

Regarding the social aspects of place attachment, each of the social themes (e.g. friends, family, community) reflected an entwinement of place and people such that one cannot be experienced without the other. Social aspects appear inextricably linked to places, and, accordingly, place attachment is greater than just the physical attributes of a place. This reflects the third 'place' dimension in the PPP framework put forward by Scannell and Gifford (2010a), where the attributes of a place (i.e. social and physical) contribute to attachment. Of significance, findings reflect similarities (e.g. family) and distinctions (e.g. culture) between the elements of social place attachment that are relevant at different spatial scales. While friends, family, and neighbourhood ties have been established as important in previous research (e.g. Chow & Healey, 2008; Collins & Kearn, 2010; Lewicka, 2010; Wiles et al., 2009), I found additional social meanings at larger spatial scales in the form of 'the people' or the 'culture'. Representing the flipside of the dichotomy laid out by the PPP framework, these social characteristics were also accompanied by reports of physical characteristics that were important for different attachments including layout at the house level and size at the city level. Across each of these physical themes, it became clear that physical aspects of the place were important for place attachment at different spatial scales, and in ways that were largely consistent with themes established in previous research. Given that both social and physical themes were relevant at all spatial scales, these findings reinforce the complementary, rather than opposing, nature of social and physical characteristics in determining attachment (Stedman et al., 2004).

At the residential level, a number of themes were important for place attachment at different spatial scales, including length of residence, mobility, ownership and travel history. Many of these themes are likely attributable to the behavioural process of place attachment (i.e. staying in a place for a long time or, adversely, moving often; Scannell and Gifford, 2010a). These behaviours also relate to aspects of interpersonal attachment theory wherein people maintain closeness to the target of their attachment (Scannell & Gifford, 2014), as well as previous research identifying ownership and residence length important for attachment (Lewicka, 2010; Lewicka, 2011; Windsong, 2010). However, the importance of a place being unchallenged by other places (or 'All I know') was raised as a novel contributor to place attachment at the country level. Further to these residential components, there were a considerable number of functional elements to attachment including amenities, work/university, and entertainment. Of significance is that the functional theme did not relate

to country attachment in this dataset. This may be because most people do not directly rely on their country for providing the means to achieve goals, complete desired activities, or to survive (at least not on the day-to-day level). While several functional themes identified here have been raised in previous research (e.g. closeness to amenities: Wiles et al., 2009; and activities and practicality: Scannell & Gifford, 2017b), a number reflect new contributions to the literature (e.g. investment and survival).

Additionally, there were various sentimental and psychological aspects of people's place attachment. Sentimental aspects included memories, which were important to people's cognitive experience of place attachment, whereas love was central to their affective experience (both of which are highlighted as important in the 'process' component of PPP framework; Scannell & Gifford, 2010a). The importance of a place as being 'first' was also commonly cited at the house level, and this presents a novel theme that previous research has not captured, highlighting the unique importance of autobiographical milestones in forming an attachment. Notably, neighbourhood attachment did not have any sentimental patterns inherent in the data. Neighbourhoods are often found to possess the weakest levels of place attachment compared to house, city, and country attachment (e.g. Hidalgo & Hernández, 2001; Laczko, 2005). This may be due, in part, to a lack of sentimental significance, however, this assumption should be quantitatively tested. Regarding psychological aspects of attachment, Scannell and Gifford (2010a) highlighted in their theoretical paper that certain psychological outcomes may be functions of place attachment (e.g. safety). Under this supposition, place attachment fosters wellbeing and may indeed be adaptive because of the function it provides in the form of psychological benefits (e.g. Scannell & Gifford, 2017a; Scannell & Gifford, 2017b). The themes presented here (safety, familiarity, home, identity, comfort) are supportive of this idea. Many of them also map onto previously reported psychological benefits of place attachment (Droseltis & Vignoles, 2010; Manzo, 2005; Scannell & Gifford, 2017b), therefore giving credibility to these claims.
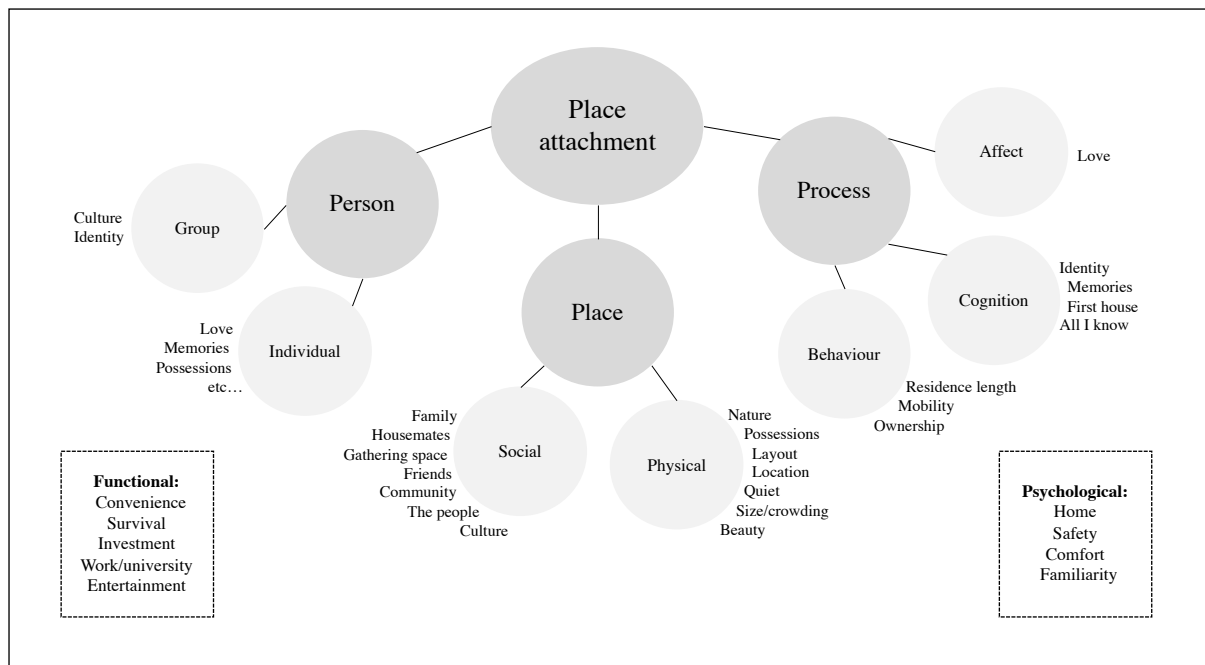
Figure 4.2. Mapping study themes (outer circles) onto dimensions of the Person-Process-Place (PPP) framework for place attachment (inner circles; Scannell & Gifford, 2010a)

The themes I identified in this chapter provide some support to the defining Person-Place-Process (PPP) framework put forward by Scannell and Gifford (2010a). Mapping these themes onto Scannell and Gifford's three dimensions (and their sub-dimensions) shows important similarities and differences (see *Figure 4.2*). The social and physical categories of my qualitative research, for example, broadly map onto the two sub-dimensions of the 'place' dimension identified by the original authors. Additionally, there was some evidence of group (e.g. culture and identity) vs individual (memories, possessions) variation in the themes identified by people, as per the 'person' dimension of the original framework. Despite this, individual-level themes were more prominent in my research than themes of collective attachment. Lastly, there was some evidence of themes that spanned the affective, cognitive, and behavioural components of the 'process' dimension. However, people more commonly reported psychological components of their attachment (e.g. home, safety, comfort) than they reported affective, cognitive, or behavioural dimensions. The psychological benefits of attachment were noted by Scannell and Gifford (2010a) in their original paper but were not included as a key dimension. My findings suggest that psychological aspects of attachment, alongside functional aspects (e.g. survival and investment), should be better represented in future iterations of place attachment frameworks. Therefore, while the PPP framework provided a useful guiding framework for comparing my themes with previous theoretical

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work (and found some important overlaps), there are gaps in the theory that qualitative studies such as this one can fill. In doing so, researchers can design a more comprehensive framework of place attachment representing the state of knowledge one decade after the original paper was published.

Finally, there appears to be an effect of specificity versus abstraction at different spatial scales of attachment in my findings. At the house level, for example, people reported more specific social themes (e.g. family and housemates) compared to more abstract themes at larger spatial scales (e.g. the people and culture). This effect held for other categories of attachment, where participants moved from specific concepts at the house level that were tied to lived experience and autobiographical memories (e.g. first house, possessions, homeownership) through to more abstract themes at larger spatial scales (e.g. identity, love, or beauty). This effect of specificity at smaller spatial scales suggests that attachment at these levels (e.g. house attachment) may be more grounded in intimate and concrete experiences or memories, whereas attachment at larger spatial scales may reflect more abstract, identity-based, or group-level bonds without the same levels of personal engagement. These findings are suggestive of an effect of psychological distance (i.e. that as the spatial scale grows larger, places become represented by more abstract high-level construals; Trope & Liberman, 2010), however further research is needed to confirm this effect. This is an important discovery and one that should be included in future theoretical reviews of place attachment to clarify how attachment differs by spatial scale.

To summarise these key findings, the place meanings associated with place attachment appear dependent on the category of that attachment, and the spatial scale being examined. While some broad aspects of place attachment may be universally important (e.g. nature or length of residence), place attachment appears dependent on the specific features of that place and the specific requirements of each individual. Further, while a number of themes have been identified in this study that are consistent with previous research (e.g. memories, family, nature), I have also identified a number of novel themes (e.g. investment, 'first', and 'the people') that are central to attachment. These new themes span all categories of place attachment (social, physical, functional etc) and vary according to spatial scale. They shed light on the previously unexamined aspects of place attachment as well as the importance of spatial scale for determining place meaning. These insights should be used to guide future place attachment research and theory as researchers continue to understand the 'what' of place attachment, rather than just the 'how much' (Lewicka, 2011).

Implications for Disaster Preparedness

A key aim of this chapter was to situate these qualitative findings alongside those from the previous two chapters as a way of understanding and explaining the relationship between place attachment and disaster preparedness. In Study 2, I found that house attachment was associated with mitigation preparedness behaviour (e.g. reducing risk by strengthening foundations of homes and fastening furniture to the wall). I theorised that this association was due to a place-protective function where people who were more attached to their homes also wanted to protect those homes from damage. This proposed mechanism is supported, in part, by findings in this chapter. For house attachment, physical possessions were cited as important by participants, alongside the layout of their house, and the investment that they had put into that house. Each of these themes represents a type of house attachment that would be threatened by damage to the house in a natural hazard event (e.g. if the house collapsed or if furniture was damaged). Through attachment that has physical or functional meanings, people have much to gain from protecting their investment and their physical house by engaging in mitigation preparedness behaviours. Further, in Study 2 I also found that participants were more likely to have undertaken community-based preparedness actions if their neighbourhood attachment was high. In this study, community was regularly cited when participants talked about their neighbourhood attachment and they indicated that an important part of the community spirit was that the neighbours would help one another out in times of need. This finding is consistent with the rationale associated with community-based preparedness behaviours. It is, therefore, possible that neighbourhood attachment comes, in part, from a sense of community which, in turn, increases one's propensity to help that community out by engaging in community-based preparedness behaviours. These proposed relationships also corroborate the conclusions drawn in Chapter 2, namely that place attachment may be most associated with preparedness when both variables are matched at the same spatial scale (e.g. house attachment with house mitigation behaviours). Using this reasoning, I propose that physical aspects of house attachment (e.g. layout and possessions) may predict mitigation preparedness behaviours, whereas social aspects of neighbourhood attachment (e.g. community) may predict community preparedness behaviour. In support of this, previous research has found that different types of place attachment can differentially predict behaviour (e.g. physical place attachment, but not social place attachment, predicts pro-environmental behaviours: Scannell & Gifford, 2010a).

Implications for Place Visualisation Techniques

The previous chapter (Studies 3 and 4) found that a place-based visualisation task was not effective in increasing people's intentions to prepare or their subsequent preparedness behaviour. I offered multiple explanations in the previous chapter as to why these findings negated my hypothesised trends. The findings in this chapter point to another possible explanation: that the visualisation task did not fully engage the aspects of place attachment most important to people. The visualisation task that I used to manipulate place attachment in the intervention design was based on previous research (Scannell & Gifford, 2017a). In it, participants were instructed to visualise themselves inside their houses or their neighbourhoods and the sensory aspects of what they saw, what they smelt, what they heard, and what they felt. Excluding the feelings component of this visualisation task (where participants described the feelings and emotions that arose from being in the place), few of these sensory aspects were cited as particularly important to participants according to data studied in the current chapter. One component of the visualisation task did include noting the emotions and feelings that arise from being in that place in which psychological themes from this chapter (such as comfort, familiarity, and escape) may have come up. Despite this, findings from this chapter do not inspire confidence in the ability of the previously tested visualisation task to adequately prime the psychologically and personally important elements of place attachment. This may explain why the manipulation check for the visualisation task (testing to see if place attachment increased from pre-test to post-test) was unsuccessful at detecting a main effect on attachment.

Future Research

Based on the current findings, and the gaps in knowledge relating to disaster preparedness, several streams of research should be pursued. First, while the field of place attachment would benefit from greater use of qualitative and mixed methods research (due to a dominant quantitative approach: Ives et al., 2017), there is potential for qualitative research to enrich quantitative methods. For example, the field of place attachment research would benefit from quantifying place attachment according to different categories (e.g. social vs physical vs functional) to determine whether components differentially predict important outcomes (e.g. disaster preparedness behaviour). In doing so, steps can be taken to better understand the specific processes underpinning disaster preparedness behaviour (or any other

outcome variable of interest). Further, insights from such research can be used to shape future place attachment interventions to ensure precise targeting (e.g. targeting physical place attachment to increase mitigation preparedness behaviour). Future manipulations of place attachment in an experimental design should consider findings from this research and design a task that includes one or all of the key themes of attachment (social, residential, sentimental, functional, physical, and psychological). Researchers should also consider how attachment varies according to different place types and, depending on the target of the manipulation, should cater their strategy to use this knowledge.

The qualitative findings in this study could also be used to challenge the way that place attachment is traditionally measured. Quantitative studies of place attachment commonly use multi-dimensional models (Hernández et al., 2014). However, the current findings suggest that such scales may be targeting the wrong dimensions, over-simplifying the dimensions that make up attachment, and/or incorrectly generalising across different place types. While it is not feasible to suggest that a new scale is created for each possible place type, there are overarching categories of attachment that appear relevant for most spatial scales (social, residential, physical, functional, sentimental, and psychological). Future research would benefit from considering how to measure these categories so that richer insights can be drawn when using these expanded quantitative scales.

Strengths and Limitations

One strength of this study was its analytic approach. While responses to the question prompt were mostly short and limited in context (i.e. bullet-pointed), through using thematic analysis and manually coding and sorting the data myself, I am confident that my approach captured many of the nuances of place attachment at each spatial scale. Further, this approach ensured thoroughness. No piece of data was ignored, and my coding was inclusive and comprehensive. From this, I was able to group codes under over-arching categories and themes that captured their similarities despite varied terminology. All of this leads me to conclude that the themes I present here are largely reflective of the data, while also acknowledging the bias I may have imparted as a researcher. Another key strength of my study is my decision to structure place attachment in relation to four different spatial scales and to centre these analyses around between-place differences and similarities. Through this, I can add depth to what we know about place attachment as a construct and add insight to findings from previous chapters.

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It is also important to note the limitations of my study. Because of my analytic approach, I could not determine which themes were stronger or weaker than others, therefore limiting the conclusions I can draw for the strength of some themes for certain spatial scales compared to others. Instead, I could only make between-place comparisons on the presence or absence of certain themes. Further, while this study focuses on the attachment of those who physically reside within the places being studied, it is necessary to note that lengthy residence, or residence at all, is not pivotal to the formation of place attachment. Future research should aim to include studies of place attachment at different spatial scales to include places that people may not necessarily reside within.

My analyses in this chapter do not include a discussion of the cultural dimension of place, specifically the relationship between the indigenous population of New Zealand and the land. Place attachment is a traditionally 'Western' concept and may not capture the unique relationship that Māori people have with their places (Hay, 1998). Indeed, several participants did make note of their connection with the land as part of their Māori heritage or culture (e.g. for country attachment: "I'm 200 per cent kiwi I am tangata whenua of the land if [sic] the long white cloud. Say no more" and for neighbourhood attachment: "My iwi is here Ngati Toa this is where my ancestors are from. It's home"). These responses invoke the importance of ancestry and heritage for different types of place attachment, especially given those participants of Māori descent are the tangata whenua; the descendants of the original inhabitants of New Zealand. I did not include these as major substantive themes because few participants referred to this unique relationship (likely due to the low demographic representation of Māori participants in this study: n=9). However, it is important that future research on place attachment (in a New Zealand context) incorporates knowledge and insights from Māori and their unique connection with their places. Indeed, research has long noted that place attachment to certain places will always be stronger for some individuals compared to others and that it may be experienced and expressed differently from culture to culture, and this appears to be especially true for Māori (Duncan & Duncan, 2001; Hay, 1998; Schroder, 2008).

Conclusion

In summary, in this chapter, I explore qualitative data from a sample of Wellington region (New Zealand) residents to understand the attachments that people have with their different places, and how these place attachments vary according to spatial scale (house,

neighbourhood, city, and country). Some themes were identified that were common across all spatial scales (nature, family, home, and residence length) while others were place-specific (e.g. 'identity' for country attachment, 'gathering space' for house attachment, and 'quiet' for neighbourhood attachment). Despite this, six key overarching categories showed important variations in place attachment. These themes captured a picture of place attachment that is socially, residentially, sentimentally, functionally, physically and psychologically relevant. The findings in this chapter provide a deeper understanding of the relationship between house attachment and mitigation preparedness behaviour, and the relationship between neighbourhood attachment and community preparedness behaviour that I observed in previous chapters. Further, I use these findings to argue that the place visualisation exercise tested in Studies 3 and 4 may benefit from a re-design that incorporates the various themes discussed in this chapter. Place attachment is made up of rich and varied themes that are held both individually and collectively, expressed through emotion, cognition and behaviour, and vary by spatial scale, place characteristics, and function. Future research in this space should be responsive to these varied themes.

Table 4.1. Themes within categories for each place type

	Social	*Residential*	*Sentimental*	*Functional*	*Physical*	*Psychological*
House	Family Housemates Gathering space	Residence length Mobility Ownership	Memories First house	Amenities Survival Investment	Nature Possessions Layout Location	Home Safety Comfort
Neighbourhood	Family Friends The people Community	Residence length Mobility	-	Amenities Work/university	Nature Quiet	Home Familiarity
City	Family Friends The people Culture	Residence length	Memories Love	Amenities Work/university Entertainment	Nature Size/crowding	Home
Country	Family Friends The people Culture	Residence length All I know	Love	-	Nature Beauty	Home Safety Identity

Chapter 5: Evaluating Place Visualisation using Insights from Intervention Data

Introduction

In Studies 1 and 2, I reported a significant positive association between place attachment and disaster preparedness, a finding that is supported by the broader literature (e.g. Anton & Lawrence, 2016; Mishra, Mazumdar, & Suar, 2010, van Valkengoed & Steg, 2019). Yet, a place attachment intervention did not produce changes in preparedness intentions or behaviour in Studies 3 and 4. To understand these null effects, in the previous chapter (Study 5) I analysed qualitative data and found six key categories of place attachment (social, residential, sentimental, functional, physical, and psychological). From these findings, I suggested that my place attachment intervention may have failed to change preparedness behaviour because it did not engage the aspects of attachment that matter most to people. This question will be explored in greater depth in the current study by exploring data collected during the intervention itself.

Because of the way my place attachment intervention was implemented, I am able to analyse qualitative and quantitative data that was collected during, and as part of, the intervention itself. From this, I can investigate the conditions under which the intervention was not effective in changing preparedness behaviour. This approach has parallels with the 'intervention fidelity' approach used in the behaviour change literature. Intervention fidelity refers to the use of methods to ensure that an intervention was delivered as intended in terms of reliability and validity (Gearing et al., 2011). In the context of my thesis, the goal of this chapter is to evaluate the fidelity of the place attachment intervention by assessing its internal validity (i.e. assessing whether the intervention manipulated the cause (place attachment) to produce the intended effect (disaster preparedness), assuming that there is indeed a cause-effect relationship). This will give me confidence that I am not committing any 'Type III errors' by surmising the effectiveness of the intervention as a failure when it may not have been adequately implemented (Mars et al., 2013). In sum, the intervention fidelity approach can be used to explain previous study findings, identify and minimise confounds and variability, and revise interventions for future testing (Borrelli et al., 2005).

To recap the place attachment intervention design, in three separate tasks participants visualised what they saw (Task 1), what they smelled, heard, and felt (Task 2) and the emotions they experienced in that place (Task 3; see *Table 5.1*). As well as visualising these components of place (visualisation phase), participants were also instructed to write down the

key things that they visualised in each task (writing phase). This data provides unique insights into intervention fidelity that many interventions do not have, or do not utilise (Borrelli et al., 2005). It offers insights into what each participant visualised, therefore elucidating how participants approached the tasks, their adherence to instructions, and the general patterns of the places they visualised. In addition, the online survey platform allowed extraction of the time spent on each phase, and how many words they wrote during the writing phase. Examining the average time spent on each phase gives broad insight into the level of engagement with the intervention. The number of words written in the writing phase also offers additional insight into engagement. This insight is achieved through examining one possible indicator of how thoroughly participants visualised their place (while controlling for whether what they wrote was 'on-task'). Using this rationale, a greater number of words written would be reflective of greater engagement with the visualisation task. While not without limitations (i.e. there are many influences on how much people may write), each of these data-points can be used as a starting point to evaluate the internal validity of the study and, therefore, draw conclusions on intervention fidelity.

Through exploratory analysis of the qualitative and quantitative data collected during the intervention tested in Studies 3 and 4, I will explore different factors that may contribute to the internal validity of the study and explain why the intervention was not effective at changing preparedness behaviour. I will draw conclusions on the feasibility of place attachment interventions for increasing disaster preparedness intentions and behaviours, and the implications of these for future research directions. I pose the following exploratory research questions to guide this study:

Research Question 1 (RQ1): Using qualitative data from the writing phases of the intervention, to what extent did participants complete and comprehend what was required of them for the visualisation intervention?

Research Question 2 (RQ2): How much time did participants spend on the overall intervention, as well as each phase, and each task of the intervention? Does this vary by condition (place attachment vs. neutral)? Does time spent on intervention influence the effect of the intervention on preparedness outcomes when tested in a regression model?

Research Question 3 (RQ3): How many words did participants write during the writing phases of the intervention? Does this vary by task or by condition (place attachment vs. neutral)? Does word count influence the effect of the intervention on preparedness outcomes when tested in a regression model?

Research Question 4 (RQ4): Using qualitative data from the writing phases of the intervention, what did people most frequently visualise during the intervention? Does this vary by task or by condition (place attachment vs. neutral)?

Research Question 5 (RQ5): Using qualitative data from the writing phases of the intervention, are there any patterned differences in the way that participants approached the visualisation intervention?

Study 6
Method

Participants. The data for this study was collected as part of the intervention run with a community sample outlined in Study 4. The control group with no visualisation is excluded. Therefore, the relevant data is from participants in the place attachment visualisation condition (n=113) and the neutral place visualisation condition (n=126, total N = 239). The majority of this sample were women (85%), with an average age of 35-44 years. Most participants (83%) had a tertiary qualification (including trade or polytechnic) and the median income was between NZD$40,000 and $59,000. Half of the participants (50%) lived in a house that they owned and more than half (54%) had lived in their houses for at least three years. Three-quarters of the sample (77%) labelled themselves as New Zealand European/Pakeha.

Of those in the place attachment condition, 84% (n=95) visualised their own houses, while the remainder visualised their neighbourhoods. In the neutral place visualisation condition, over half of participants freely chose to visualise their supermarket (62%: n=78). Other common choices were a library (n=8), mall (n=7), petrol station (n=4), gym (n=4), university (n=4), or café/restaurant (n=4).

Procedure. The visualisation intervention outlined in Study 4 of Chapter 3 was based on the original study by Scannell and Gifford (2017a). All participants in the two active visualisation conditions were first asked to choose a place that they would visualise (place choice phase, see *Table 5.1*). Participants then completed three separate visualisation tasks. The first task instructed participants to visualise the sights in their place, and the second task instructed participants to visualise the experiences of their other senses. The third and final task instructed participants to visualise how their place made them feel (see *Table 5.1* for exact wording). Within each of these tasks, there were three phases. The instruction phase was included so that participants could understand what was required of them during the

visualisation phase before that phase began. Then participants visualised their place (visualisation phase) and wrote about what they visualised (writing phase). While there was no time limit on how long participants spent on the instructions phase, the visualisation and the writing phases were timed for one minute each with a countdown timer visible to participants. The expectation was that participants would spend approximately six minutes on the intervention in total. See *Table 5.1.* for a breakdown of the intervention by task and phase.

Table 5.1. Breakdown of visualisation intervention design by task and phase

	1. Instructions phase	2. Visualisation phase	3. Writing phase
Task 1	"Next, we would like you to please relax, close your eyes, imagine yourself in the place you selected, and visualise it in as much detail as possible for at least *the next minute*. What does this place look like? What do you see? Is anything happening there? When you are ready to begin, please click the 'arrow' button below."	"What does this place look like? What do you see? Is anything happening there?" *[Timed for one minute]*	"Please spend at least *the next minute* writing down as many of the things you saw during your visualisation as you can (bullet points are fine)" *[Timed for one minute]*
Task 2	"We would like you to close your eyes once again, relax, and imagine yourself back in the same place. Please spend *another minute* thinking about your other senses. What are the smells of this place? What sounds do you hear? Can you feel anything touching your skin? When you are ready to begin, please click the 'arrow' button below."	"What are the smells of this place? What sounds do you hear? Can you feel anything touching your skin?" *[Timed for one minute]*	"Please spend at least *the next minute* writing down as many of the sensory observations (smells, noises, feelings) you had during your visualisation as you can (bullet points are fine)" *[Timed for one minute]*
Task 3	"We would like you to close your eyes one final time, relax, and imagine yourself back in this place. Please spend at least *the next minute* considering how you feel in this place. What emotions come up when you are here? Does this place make you feel a	"What emotions come up when you are here? Does this place make you feel a particular way?" *[Timed for one minute]*	"One last time, please spend at least *the next minute* writing down as many of the feelings or sensations you noted during your

particular way? When you are
ready to begin, please click the
'arrow' button below."

visualisation as you can
(bullet points are fine)"

[Timed for one minute]

Results

RQ1: Task completion and comprehension. For the neutral place visualisation condition, all participants wrote something for at least one of the writing phases (no blank responses). One participant only participated in the first writing phase, while two participants only participated in the first and second writing phases. A further participant only participated in the first and third writing phases. The remaining participants (n=122) wrote something for all three writing phases. For the place attachment place visualisation condition, two participants did not participate in any of the writing phases, while two participants only participated in the first and second phases. An additional participant only participated in the second and third writing phases. The remaining participants (n=108) wrote something for all three writing phases.

A total of nineteen participants (neutral condition: n=11; place attachment condition: n=8) showed evidence of misunderstanding the task instructions and visualised a natural hazard scenario in their place, as shown by their responses during the writing phases. For seven participants, this misunderstanding was self-corrected in the second or third tasks, where they proceeded to visualise their place as normal, whereas the remaining twelve participants visualised a natural hazard scenario for all three tasks. An example of this is seen in the following response: "Furnature [sic] broken, walls cracked, photos fallen, food in pantry fallen [Task 1]… Alarms, people yelling, car alarms going off, people panicking, dogs barking [Task 2]… Scared about my family who are elderly, scared, freaked out and panicking [Task 3]".

An additional five participants indicated broad confusion about what was required of them during the intervention, as shown by their responses during the writing phases (Neutral condition: n=1; Place attachment condition: n=4). Of these, two participants still participated in the tasks as instructed despite confusion (e.g. "I don't understand the question? Visualize it empty? I saw the furniture and possessions as left when I leave the house, the bird hopping around its cage, the clock ticking and the tap dripping but otherwise just quiet and still"). The

remaining participants showed confusion throughout all three tasks (e.g. "Confused… This is not what I expected… I fail to see the relevance in thus [sic]").

For all subsequent analyses, I excluded participants who failed to complete all three writing phases, visualised a natural hazard event, or showed confusion at task instructions (n=33). The demographic profile (e.g. age, gender, education, income, homeownership) for these participants did not substantially vary when compared to that of the remainder of the sample. The only difference was found for length of residence, where those in the excluded group had lived longer in their houses (median 5-10 years) compared to the rest of the sample (median 3-5 years).

I re-ran analyses for the hypotheses outlined in Study 4 (Chapter 3) with these participants excluded and found no variation in the findings. Specifically, I found no significant between-group differences for survival preparedness intentions ($X^2(2)$=1.27, p=.530, ε^2=.00), mitigation preparedness intentions ($X^2(2)$=2.32, p=.313, ε^2=.01), or community preparedness intentions ($X^2(2)$=.71, p=.710, ε^2=.00). I also did not find a significant interaction between preparedness type (survival, mitigation, or community), time (T1 or T2), and condition ($F(4, 268)$=.33, p=.858, η_p^2=.00). Further, when I ran separate repeated-measures ANOVA for each type of preparedness behaviour, controlling for Time 1 preparedness, I found no significant interaction between time and condition: for survival preparedness behaviour ($F(2, 148)$=1.88, p=.156, η_p^2=.02), mitigation preparedness behaviour ($F(2, 144)$=.13, p=.880, η_p^2=.00), or community preparedness behaviour ($F(2, 140)$=.61, p=.545, η_p^2=.01). As was reported in Study 4, effect sizes were small indicating no meaningful effect of the intervention on disaster preparedness.

RQ2: Time spent on visualisation. The average total time spent on the place visualisation intervention (across all three tasks) for those in the place attachment condition was between six and seven minutes (M=382.61 seconds, SD=234.16) with response times ranging between two minutes and 22 minutes. The median overall time spent on tasks was 326.22 seconds (between five and six minutes). For those in the neutral place visualisation condition, the average total time spent on the visualisation intervention (across all three tasks) was between five and six minutes (M=350.23 seconds, SD=175.31) with response times ranging between two minutes and 16 minutes. The median time spent on tasks was 299.41 seconds (five minutes). There was no statistically significant difference between the average time spent by those in the place attachment condition compared with those in the neutral place visualisation condition ($t(237)$=-1.22, p=.225, d=-.16, 95% CI [-84.76, 20.01]). These

findings show general adherence to task instructions, with participants of both conditions spending an average of five to six minutes on the intervention. This is slightly lower than the expected time spent on the intervention (six minutes), however, it still reflects adequate engagement with the task. *Table 5.2* reports descriptive statistics on time spent on each phase, within each task, across both conditions.

Participants spent significantly different amounts of time on each of the three tasks comprising the visualisation exercise for both the place attachment visualisation condition (Task 1: M=151.80, SD=153.28), Task 2: M=120.44, SD=110.11, Task 3: M=86.17, SD=63.80, F(2, 224)=10.82, p<.001, $\eta^2 p$=.09) and the neutral visualisation condition (Task 1: M=124.90, SD=103.18), Task 2: M=103.18, SD=58.61, Task 3: M=83.57, SD=59.11, F(2, 250)=36.70, p<.001, $\eta^2 p$=.23). Using post-hoc tests with Bonferroni corrections, in both conditions participants spent significantly less time on the third task compared to the first task (place attachment: t(224)=4.65, p<.001; neutral: t(250)=8.56, p<.001) and the second task (place attachment: t(224)=2.43, p=.048; neutral: t(250)=4.06, p<.001). In the neutral condition only, participants spent less time on the second task compared to the first task (t(250)=4.50, p<.001). In sum, regardless of condition, participants spent less time on later tasks compared to earlier tasks.

While participants were instructed to spend equal amounts of time on the visualisation phases and the writing phases, participants spent significantly longer on the writing phases than the visualisation phases in both the place attachment condition (visualisation: M=85.09, SD=138.82, writing: M=212.66, SD=156.70, t(112)=-6.74, p<.001, d=-.63, 95% CI [-165.09, -90.05]) and the neutral place visualisation condition (visualisation: M=61.33, SD=66.04, writing: M=204.88, SD=113.87, t(125)=-14.15, p<.001, d=-1.26, 95% CI [-163.63, -123.48]).

There were no significant differences between those in the place attachment and the neutral place visualisation conditions on time spent on any of the tasks (Task 1, Task 2, or Task 3), or on the visualisation and writing phases (see *Table 5.2*). There was a significant difference between the conditions on time spent on the instruction phases (t(237)=-2.45, p=.015, d=-.32, 95% CI [-27.42, -2.97]). Participants in the neutral condition (M=45.44, SD=38.79) spent less time on instructions than those in the place attachment visualisation condition (M=60.62, SD=56.32).

To explore the interaction between timing and intervention condition on preparedness intentions, I ran three linear multiple regression models. At Step 1, I entered the intervention condition as a dummy-coded variable. Because I did not have timing data for those in the

control condition, the intervention condition variable was dummy coded into place attachment visualisation and neutral place visualisation (with the no visualisation control condition excluded). Then, at Step 2, I entered the timing variable, before entering the interaction term (intervention*timing) in Step 3. I found no significant association between timing and any type of preparedness intentions, either when presented as a single variable in Step 2, or in interaction with intervention condition in Step 3 (see *Table 5.5*). Time spent on intervention did not influence the strength of the place attachment intervention at changing preparedness intentions.

For preparedness behaviour, I examined the interaction between timing and intervention condition on three outcome variables: survival preparedness behaviour, mitigation preparedness behaviour, and community preparedness behaviour. In Step 1, I entered Time 1 preparedness to control for pre-existing preparedness rates then, at Step 2, I entered the dummy-coded intervention condition variable (place attachment vs neutral). At this point, I found a significant association between intervention condition and Time 2 survival preparedness behaviour (β=.20, p=.050, 95% CI [.00, .40]). Replicating findings from Study 4, participants in the place attachment condition were more likely to have greater survival preparedness at Time 2, controlling for T1 preparedness. At Step 3, I entered the timing variable then, at Step 4, I entered the interaction term (intervention*timing). I found that timing was a significant predictor of Time 2 survival preparedness (β=.34, p=.036, 95% CI [.02, .65]), but only when controlling for the interaction term (indicating a possible suppression effect). The greater time spent on the intervention, the greater people's survival preparedness at Time 2, irrespective of intervention condition. I found no significant predictors of mitigation or community preparedness behaviours at Time 2 when controlling for Time 1 preparedness (see *Table 5.6*).

RQ3: Word count. Participants in the place attachment condition wrote an average of 50 words totalled across all three writing phases (*M*=49.98, *SD*=47.71) which did not differ significantly from those in the neutral place visualisation condition who wrote an average of 59 words totalled across all three writing phases (*M*=58.72, *SD*=43.96, $t(110)$=1.36, p=.175, d=.13, 95% CI [-3.95, 21.43]). In line with findings on time spent on each task, participants wrote more words in the first writing phase compared to the third writing phase, both for those in the neutral place visualisation condition ($F(2, 250)$=3.56, p=.030, η^2p=.03, $t(250)$=2.67, p=.024) as well as those in the place attachment condition ($F(2, 220)$=7.29, p<.001, η^2p=.06, $t(220)$=3.76, p<.001). In the place attachment condition,

participants also wrote significantly more words in the second writing phase compared to the third writing phase (t(220)=2.46, p=.044). For descriptive statistics on word count for each group, see *Table 5.3*.

I ran two linear multiple regression models to examine whether total word count during the intervention exercise influenced the strength of the intervention on three preparedness intentions outcomes (survival, mitigation, community). After entering the intervention condition (Step 1), word count (Step 2) and the interaction term (intervention*word count: Step 3), I found no significant association between timing and any type of preparedness intentions, either when presented as a single variable, or in interaction with intervention condition (see *Table 5.7*). Word count during writing phases did not influence the strength of the place attachment intervention at predicting preparedness intentions.

For preparedness behaviour, I tested three models on three dependent variables: survival preparedness behaviour, mitigation preparedness behaviour, and community preparedness behaviour. In Step 1, I entered Time 1 preparedness, in Step 2 I entered intervention condition, and in Step 3 I entered the word count variable. Finally, in Step 4 I entered the interaction term (intervention*word count). In addition to intervention condition being a significant predictor of survival preparedness behaviours (as previously reported; *ß*=.20, *p*=.050, 95% CI [.00, .40]), intervention condition was a significant predictor of community preparedness behaviour (*ß*=.48, *p*=.032, 95% CI [.04, .92]). This was only true, however, when controlling for word count, and interaction between word count and intervention condition (indicating a possible suppression effect). There were no significant associations between word count and any type of preparedness behaviours, either when presented as a single variable, or in interaction with intervention condition (see *Table 5.8*). Word count did not influence the strength of the intervention at predicting preparedness behaviour.

RQ4: Word frequency. The top fifteen keywords most frequently used by participants to summarise what they had visualised in each of the tasks are presented in *Table 5.4*, ranked in order of the number of mentions. The content of words used in each of the three tasks reflects broad adherence to the instructions. In the first task, participants were instructed to visualise the sights of their place and, in line with this, most words were nouns (e.g. house, room, kitchen, people, shelving, cars). Several words frequently used in this task were also associated with an action (e.g. walking or shopping). This may reflect an embedded

approach to the visualisation where participants imagined themselves moving through the place as they visualised it (e.g. "I imagined walking through each room of the house"). Additionally, many participants also noted that they observed the movement of other people during their visualisations (e.g. "people shopping looking at food walking around with trolleys lining up for checkout"). Previous research has compared the social characteristics of a place with the physical characteristics, as key elements to place attachment (Hidalgo & Hernández, 2001; Scannell & Gifford, 2010a). In line with this, it is apparent that those in the place attachment visualisation condition more readily noted physical aspects of their place (e.g. kitchen, bed, trees) than they did social aspects (e.g. kids, people, family).

In the second task, as instructed, most words used frequently were either explicitly related to the senses (e.g. hear, smell, noise, sounds) or implicitly related to the senses (e.g. wind, warm, cold, talking, fresh). These words indicate compliance with the instructions for the second task, such that greater focus was placed on the smells, sounds, and touch associated with the place, compared with the sights that were emphasised in the first task. Further in line with this, the most frequently used words in the third task generally reflected emotional associations with the place across both conditions (e.g. safe, relaxed, happy, busy, calm, comfortable). These words show adherence to task instructions. They also reflect successful manipulation of place target such that those in the place attachment visualisation condition exclusively reported positive emotional states only (e.g. relaxed, happy, peaceful) whereas those emotions reported in the neutral place visualisation condition were more diverse (e.g. relaxing, stressful, happy, busy, tired). This suggests that participants in the place attachment condition showed greater positive emotional attachment to the place they visualised than those in the neutral place visualisation condition as would be expected.

The words chosen across each of the three tasks broadly indicate that participants stayed on topic during their visualisations. For those in the place attachment condition, the most frequently used words reflected a largely domestic scene relating to either their house (e.g. kitchen, cooking, family, bed, table) or their neighbourhood (e.g. trees, cars, birds, traffic). Further, for those in the neutral condition, most participants chose to visualise a supermarket as their neutral place. Reflecting this, most words related to a retail environment (e.g. trolleys, shelving, checkouts, aisles, food, bread). This provides further evidence that most participants adhered to task instructions.

RQ5: Response dimensions. Through comprehensive familiarisation with the data including multiple read-throughs, a number of patterns were identified reflecting variation in

how participants visualised the visualisation task. These patterns were condensed, reviewed, and refined to five key dimensions on which many participants differed in their visualisation approaches. Because the dimensions existed on a continuum, and many participants varied their responses along these dimensions, it was not possible to code these response types for quantitative moderation analysis. Further, because many participant responses were brief (e.g. 2-3 bullet-pointed words), much of the coding would have been difficult to validate and the final sample sizes representing opposite ends of each continuum would have been too small to meaningfully analyse using quantitative methods. Nevertheless, this qualitative data shed insight into how different people interpret instructions differently (and how this might have ultimately influenced the strength of the intervention).

The first dimension relates to the level of specificity where participants' responses ranged from low specificity ("my room") to high specificity ("I can see my closet with one of the doors open, my stripey [sic] duvet cover…"). The second dimension reflects variation in the scale in which participants visualised their places: ranging from small scale ("Computer, TV, bookcase") through to large scale ("House, garage, driveway"). Both of these dimensions show an important distinction between high-level and generic overviews of a place and descriptive low-level visualisations that focus in on more idiosyncratic details.

The third dimension related to the first-person involvement of the participant in their visualisation. Some participants showed low-level involvement through a de-personalised and observational approach to the visualisation ("Windows, doors, garden, cat…"), while others involved themselves in their visualisation ("The dog is in his basket, I am sitting by the fire"). Relatedly, a fourth dimension found that some participants were static in their visualisation ("My family, my cat, the fire going…") while others were more dynamic by visualising themselves moving through their place ("Walk further down and the computer room is on the left"). A fifth dimension related to the extent to which the visualisation was based on recollection ("I usually get quite impatient while waiting to be served") or a current devised scenario ("Bit bored Why is everyone so slow? What am I going to have for dinner? Yawning Why did I come at this time? Come on people, shuffle on!") Each of the three latter dimensions reflect a broader spectrum of personal embeddedness; which determined whether their place visualisation involved themselves as a key actor, whether they were moving or static in that place, and whether their involvement was recollected or current.

Discussion

In this chapter, I have analysed qualitative and quantitative data gathered as part of the intervention outlined in Chapter 3. I used these exploratory analyses to examine variations in how participants responded to the tasks. In the analyses, I found that participants generally adhered to intervention instructions in both visualisation conditions, as evidenced by time spent on the overall visualisation exercise and word frequency analysis. On average, participants appear to have stayed on track during the visualisation and spent sufficient time engaging with the overall intervention.

At the same time, I also identified individual differences in the way participants approached the visualisation phase. These include variations in specificity, scale, and personal embeddedness. The word count and response time patterns showed that participants engaged with the three tasks unequally: they spent less time on the visualisation phases than the writing phases. These findings paint a complex picture of the internal validity of the intervention. They suggest that the visualisation may not have been a strong enough manipulation of place attachment to produce a meaningful effect. I discuss these findings below in the context of three different possible directions for future research: re-running the same intervention, re-designing the intervention, or taking a different experimental approach.

Some participants did not complete all three writing phases or indicated that they did not understand or comprehend what the visualisation asked of them. Notably, a number of participants incorrectly visualised what would happen if there were a natural hazard event in their place of choice, an important finding when it comes to minimising confounds for future studies. It would be straight-forward to re-run the intervention with greater clarification on the task instructions to prevent future issues of comprehension and completion. Nevertheless, when these participants were excluded from analysis, there was no change in terms of the effect of place visualisation on preparedness outcomes. This suggests that re-running the current intervention to resolve issues of task completion or comprehension would likely not alter the overall findings. This likelihood is especially true given the low effect sizes reported between place attachment visualisation and disaster preparedness. It appears likely that the intervention in its current form does not influence disaster preparedness intentions or behaviour.

While most participants spent at least five to six minutes on the overall intervention, as expected, findings show that this time was not spread evenly among the tasks. Participants spent less time, and wrote fewer words, on later tasks (visualising emotions in their place) than they did on earlier tasks (visualising the sights of their place). Considering qualitative

findings reported in Study 5, psychological and sentimental aspects of attachment are significant components of place attachment. It could be that the third task was more relevant for motivating people to take action than other sensory observations in Task 1 and 2, yet insufficient time was spent on it. Further, participants spent less time on the visualisation phases than they did on the writing phases. This suggests that the intervention was not tightly controlled, and participants did not adhere to the instructions as closely as they could have (therefore undermining the internal validity of the study). This is a serious limitation of the intervention. The most obvious solution to this problem of controllability is through a re-design of the intervention, for example, having a research assistant present to administer the intervention. While this is a possible next step for the research, it does not reflect the goals and aims set out in this wider research project. The current design was trialled to test a low-cost and novel intervention that could be easily scaled to reach a larger population. When additional resources are needed in administering the intervention, this aim of scalability is undermined. Further, while there were significant variations in word count and time spent on the intervention across participants, neither of these variables influenced the strength of the intervention at predicting preparedness outcomes. This suggests that even if a more tightly controlled intervention were possible without compromising on resources or scalability, this greater control is not likely to influence the effectiveness of the intervention to any significant degree.

Finally, moving beyond word count and timing, word frequency statistics showed broad adherence to task instructions and offered evidence to show that participants largely stayed on-task with their visualisations. These statistics also showed a picture of the content of these visualisations. Those in the place attachment condition more frequently cited physical elements of their environment than they did social elements of their environment. As mentioned earlier, they also spent longer visualising these physical elements than they did visualising the way those places made them feel. The visualisation task did not, therefore, engage the many central themes deemed important for place attachment by participants in Study 5 (social, psychological, sentimental, functional, physical, or residential). Further, I cannot yet determine how important each of these themes is for manipulating place attachment, or for motivating action to prepare. For example, visualising the social, rather than physical, aspects of one's neighbourhood may be crucial to encouraging community preparedness behaviour. Several participants took a large-scale approach to their visualisation, failing to consider the personal elements of their house that make up their

attachment. Other participants did not appear to embed themselves in their places of choice and, instead, took a broader observational approach to the visualisation exercise. In doing so, they may have failed to engage the personally relevant aspects of that place that may contribute to their attachment. Qualitative research shows that there is a myriad of factors that are central to people's experiences of place attachment (Study 5) and it is clear that the current intervention did not engage each of these. From this, I conclude that the visualisation task is not an adequate manipulation of place attachment for the purpose of increasing preparedness behaviours. We do not yet know which aspects of attachment (as identified in the previous qualitative study) are conceptually relevant for disaster preparedness. These associations should be tested in further quantitative (e.g. survey) research first to ensure that future iterations of a place visualisation intervention are effective.

In summary, the variables examined in this chapter (task comprehension, task completion, word count, timing) did not significantly influence the effectiveness of the place attachment intervention at predicting preparedness behaviour. A deeper examination into the content of what people visualised revealed three main takeaway points: 1) that, while participants broadly stayed on-task with their visualisations indicating initial internal validity, 2) these visualisations did not sufficiently tap into the myriad elements of a place identified as important by people, and 3) individual differences in their approach to the visualisation may have undermined the effectiveness of the intervention. The influence of the latter two points cannot be easily mitigated through the replication or re-design of the current visualisation task, without compromising on eventual scalability of the intervention. Greater insight is needed into the elements of place attachment that are conceptually relevant to disaster preparedness before future interventions are trialled with greater internal validity.

Table 5.2. Time spent on place visualisation intervention (seconds)

	Task 1 (sights)				Task 2 (smells, sounds, touch)			Task 3 (emotions)		
	Place choice phase	Instructions phase	Visualisation phase	Writing phase	Instructions phase	Visualisation phase	Writing phase	Instructions phase	Visualisation phase	Writing phase
Place attachment visualisation										
Mean	24.21	25.02	33.56	93.22	20.75	29.44	70.25	14.87	22.10	49.20
Median	14.46	18.86	12.55	67.78	11.49	7.38	63.19	8.45	3.88	50.00
S.D.	57.40	27.86	95.02	118.88	39.25	56.39	54.12	28.36	32.40	38.86
Min	3.72	2.48	3.30	11.17	1.38	0.86	2.56	1.66	0.34	4.54
Max	548.19	250.95	1003.03	1044.44	329.49	428.43	515.83	219.02	167.75	307.89
Neutral place visualisation										
Mean	38.58	20.98	24.15	79.77	13.61	20.42	69.15	10.85	16.76	55.96
Median	31.98	12.36	13.07	65.49	10.77	6.92	63.59	7.66	3.74	57.90
S.D.	28.05	23.05	24.57	49.21	12.62	25.07	44.01	14.05	23.58	3.35
Min	11.32	1.85	2.80	13.59	3.00	0.41	1.40	0.74	0.20	1.71
Max	197.59	150.49	124.25	344.15	108.79	105.59	265.14	103.35	72.10	17.90

Table 5.3. Word count for place visualisation writing phases

	Task 1	Task 2	Task 3
Place attachment visualisation			
Mean	20.09	17.45	12.44
Median	16.00	14.00	7.00
S.D.	28.78	12.25	15.20
Minimum	0.00	1.00	0.00
Maximum	292.00	62.00	101.00
Neutral place visualisation			
Mean	21.69	19.71	17.79
Median	17.00	16.00	11.50
S.D.	19.32	15.87	17.62
Minimum	1.00	0.00	0.00
Maximum	123.00	97.00	81.00

Table 5.4. Word frequencies for each task by condition, ordered by number of mentions in parentheses

	Place attachment visualisation			Neutral place visualisation		
	Task 1	Task 2	Task 3	Task 1	Task 2	Task 3
1	House (34)	Smell (56)	Feel (46)	People (142)	Smell (111)	Get (44)
2	Room (24)	Feel (40)	Safe (40)	Shelving (53)	People (55)	Feel (43)
3	Kitchen (22)	Hear (33)	Relaxed (32)	Cars (52)	Talking (50)	Relaxing (23)
4	Bed (18)	Birds (28)	Happy (32)	Trolleys (47)	Trolleys (40)	People (22)
5	Trees (18)	Cooking (18)	Home (29)	Food (43)	Feel (38)	Calm (20)
6	Walking (16)	Noise (17)	Peaceful (17)	Shopping (29)	Sound (30)	Stressful (20)
7	Lounge (16)	Sounds (17)	Comfortable (17)	Checkouts (26)	Music (28)	Happy (19)
8	Cat (16)	Warm (17)	Warm (16)	Staff (24)	Food (27)	Hungry (17)
9	Door (15)	Cars (16)	Love (16)	Fruit (23)	Noise (26)	Rushing (15)
10	Bedroom (15)	Kids (15)	Content (16)	Lots (22)	Hear (23)	Busy (15)
11	Kids (15)	Wind (15)	Calm (16)	Aisles (22)	Cold (22)	Place (15)
12	People (15)	Air (14)	Family (14)	Section (22)	Air (20)	Tired (14)
13	Playing (15)	Dog (14)	Secure (11)	Park (21)	Coffee (18)	Home (13)
14	Table (15)	Comfortable (14)	Place (10)	Lights (19)	Fresh (18)	Shopping (13)
15	Family (14)	Traffic (12)	House (9)	Counter (18)	Bread (16)	Just (12)

Note: Number of mentions includes stemmed words (e.g. "walk", "walked", and "walks")

Table 5.5. Standardised regression coefficients for predictors of preparedness intentions (time spent on intervention)

Variable	Survival intentions (β)			Mitigation intentions (β)			Community intentions (β)		
	1	2	3	1	2	3	1	2	3
Dummy (place attachment condition vs. neutral)	-.02	-.04	-.25	.08	.08	-.33	-.06	-.06	-.01
Timing	-	.06	-.14	-	-.07	-.44	-	-.06	-.02
Dummy*Timing	-	-	.24	-	-	.45	-	-	-.05
Model Fit: R^2	.00	.00	.01	.00	.01	.02	.00	.01	.01

Note. R^2 significance levels indicating p-value for ΔR^2

* = significant at the level of p < .05. ** = significant at the level of p < .01. *** = significant at the level of p <.001

Table 5.6. Standardised regression coefficients for predictors of Time 2 preparedness behaviour (time spent on intervention)

Variable	Survival behaviours (β)				Mitigation behaviours (β)				Community behaviours (β)			
	1	2	3	4	1	2	3	4	1	2	3	4
Preparedness behaviours Time 1	**.88*****	**.86*****	**.87*****	**.86*****	**.80*****	**.78*****	**.78*****	**.79*****	**.83*****	**.82*****	**.82*****	**.81*****
Dummy (place attachment condition vs. neutral)	-	**.20***	.19	**.48***	-	.14	.14	-.19	-	.16	.18	.45
Timing	-	-	.09	**.34***	-	-	-.01	-.28	-	-	-.08	.16
Dummy*Timing	-	-	-	-.30	-	-	-	.34	-	-	-	-.29
Model Fit: R^2	.77	**.78***	.79	.80	.63	.64	.64	.64	.69	.70	.70	.71

Note. R^2 significance levels indicating p-value for ΔR^2

* = significant at the level of $p < .05$. ** = significant at the level of $p < .01$. *** = significant at the level of $p < .001$

Table 5.7. Standardised regression coefficients for predictors of preparedness intentions (word count)

Variable	Survival intentions (β)			Mitigation intentions (β)			Community intentions (β)		
	1	2	3	1	2	3	1	2	3
Dummy (place attachment condition vs. neutral)	-.02	-.03	-.14	.08	.06	.06	-.06	-.08	-.12
Word count	-	-.03	-.17	-	-.08	-.07	-	-.07	-.12
Dummy*Word count	-	-	.16	-	-	-.01	-	-	.05
Model Fit: R^2	.00	.00	.00	.00	.01	.01	.00	.01	.01

Note. R^2 significance levels indicating p-value for ΔR^2

* = significant at the level of $p < .05$. ** = significant at the level of $p < .01$. *** = significant at the level of $p < .001$

Table 5.8. Standardised regression coefficients for predictors of Time 2 preparedness behaviour (word count)

Variable	Survival behaviours (β)				Mitigation behaviours (β)				Community behaviours (β)			
	1	2	3	4	1	2	3	4	1	2	3	4
Preparedness behaviours Time 1	**.88***	**.86***	**.86***	**.85***	**.80***	**.78***	**.80***	**.79***	**.83***	**.82***	**.82***	**.81***
Dummy (place attachment condition vs. neutral)	-	**.20***	**.22***	**.43***	-	.14	.07	.24	-	.16	.18	**.48***
Word count	-	-	.05	.25	-	-	-.11	.06	-	-	.04	.34
Dummy*Word count	-	-	-	-.21	-	-	-	-.18	-	-	-	-.31
Model Fit: R^2	.77	**.78***	.78	.79	.63	.64	.65	.65	.69	.70	.70	.71

Note. R^2 significance levels indicating p-value for ΔR^2

* = significant at the level of $p < .05$. ** = significant at the level of $p < .01$. *** = significant at the level of $p < .001$

Chapter 6: Examining Issues of Implementation and Scalability in Behaviour Change Interventions

Introduction

The previous chapter (Study 6) outlined an analysis of data collected on participants' engagement with the place attachment intervention. Using insights from this data, I found broad adherence to the intervention instructions but substantial variation in the approaches used within the visualisation phase of the intervention. Further, I noted that the place attachment intervention did not engage with the many different categories of place attachment found to be important in Study 5 (Chapter 4). From this, I recommended that research should invest in understanding those aspects of place attachment that are most relevant for preparedness before future interventions are trialled.

The previous chapter was concerned with investigating the internal validity of the intervention (i.e. was the intervention an adequate manipulation of place attachment?) whereas the current chapter will explore issues of external validity. These issues highlight the possibility that the intervention may have failed due to underlying issues in translating correlational patterns into broad community behaviour change. Two research questions will guide my investigation into issues of external validity; namely, how do we design interventions for disaster preparedness to ensure that findings are generalisable to the 'real-world'? What steps can be taken to conduct intervention research that is both effective and able to be implemented at scale? I will discuss these questions in the context of prominent theoretical perspectives with reference to my intervention design. The following recommendations for the future of disaster preparedness intervention research will be covered: utilising the science of implementation; conducting rigorous design, testing, and evaluation; and coordinating personalised approaches.

Utilising the Science of Implementation

Interventions are not always as effective in changing people's behaviour as one might expect. One such example is 'nudging'; 'nudges' have grown in popularity as behavioural interventions because they are inexpensive, easily implemented, and scalable (Selinger & Whyte, 2011). However, the effectiveness of behavioural nudges appears highly dependent on the target population, the behaviour, and the implementation strategy. In one recent high-profile research project, across several studies, well-established behavioural nudges failed to

alter commuting behaviour. This occurred despite a high-powered study methodology with a sample of nearly seventy thousand participants (Kristal & Whillans, 2020). The critique of nudges presented by Kristal and Whillans (2020) reflects a broader critique of behavioural science and its ability to scale up evidence-based interventions to the extent that they can create widespread behaviour change (Hagger & Weed, 2019). This 'scale-up problem' is acknowledged by behavioural scientists who argue that researchers need to fully understand and recognise the science of implementation before research insights can be used to change public behaviour (Al-Ubaydli, Lee, List, Mackevicius, & Suskind, 2019).

Implementation science is defined as "the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice" (Eccles & Mittman, 2006, p.1) or, more simply, the study of methods that translate research into practical and useful outcomes (Rapport et al., 2018). Much of the literature on implementation science seeks to reduce situations where treatment effect sizes dramatically reduce, or even disappear, when an intervention is 'scaled-up' or implemented at the community or population level (e.g. Kristal & Whillans, 2020). This compromised intervention effect can be due to a number of reasons including replication failures, low behavioural control, low external validity, or publication bias, among others, and it is conjectured that it is partly responsible for slow rates of research adoption by policymakers and practitioners (Al-Ubaydli, List, & Suskind, 2019). Researchers in this area have proposed several suggestions that should be considered by researchers and policymakers when translating experimental research into action (Al-Ubaydli, List, & Suskind, 2017): statistical inference; representativeness of the population; and representativeness of the situation. First, there must be appropriate benchmarks made for deciding when evidence should be enacted (i.e. statistical inference), a process which involves multiple replication attempts, greater publishing of non-significant results, and increased pre-registration of studies. Further, effect sizes should be examined alongside tests of statistical significance to determine practical utility. Second, efforts should be made to ensure population and cross-cultural representativeness in the samples used during research studies to increase the likelihood that the population will behave in the same way when an intervention is implemented. Third, researchers should aim to ensure that experimental conditions match the conditions of implementation as closely as possible. This may involve loosening control over the delivery of the intervention (e.g. having community members deliver, rather than trained research assistants). These three considerations support work by Bauer and colleagues (Bauer,

Damschroder, Hagedorn, Smith, & Kilbourne, 2015) who argue that effective implementation of interventions can be achieved through proactively balancing the external validity of studies with their internal validity (i.e. 'effectiveness' rather than 'efficacy' studies), among other recommendations.

Situating my research within the wider science of implementation (Al-Ubaydli et al., 2017; Bauer et al., 2015; Rapport et al., 2018) reveals several strengths. My preliminary survey relating place attachment and disaster preparedness together (Study 1, Chapter 2) was sourced from a community sample. Using the same methods, a second community sample was recruited to test the intervention (Study 4, Chapter 3). These decisions meant that the intervention was not tested in a controlled lab setting. Instead, attempts were made to recruit a heterogeneous sample that would be representative of the wider public. Additionally, delivering the place visualisation tasks online in a self-directed manner gave insight into their effectiveness if this intervention were to be implemented widely. While a more tightly controlled experiment (e.g. delivered by a research assistant) may have shown significant effects on preparedness behaviour, the practical scalability of these results for widespread implementation would be limited. Further, through reporting statistically non-significant findings and low effect sizes, I provide research transparency to advance the field of behaviour change and pave the path for the discovery of intervention solutions that *can* be implemented successfully. Each of these decisions based on external validity and research transparency increased the likelihood that, in the event my intervention had significantly increased preparedness behaviours, there is a greater likelihood that it would have been able to be implemented successfully at large.

Moving forward, research in the domain of disaster preparedness behaviour change should maintain principles of implementation science at the forefront. This includes using representative samples, realistic delivery methods, and appropriate statistical inferences. Furthermore, it is crucial that studies are replicated with well-powered samples in different settings to ensure that the effect size is reliable before it can be implemented at large in society. Implementation science reminds us of what is at stake when we design research for the goal of widespread behaviour change. It is common for interventions to fail when they are scaled up and, as such, appropriate consideration must be put into designing a feasibly scalable intervention, rather than one that is only effective in a tightly controlled laboratory setting. Without doing so, interventions may be implemented at a large scale, but to no effect. Or, perhaps more concerningly, practitioners and policymakers may choose to reject

evidence-based research altogether. The science of implementation highlights that it can be difficult to produce a meaningful effect from intervention studies but that this is not a valid reason to abandon these research efforts. With the principles of implementation science in mind, the remainder of this chapter will use different theories to illustrate how future preparedness interventions can be designed to ensure effective, and scalable, outcomes.

Intervention Design, Testing, and Evaluation

The first step in ensuring that interventions are effective and scalable is through rigorous design, testing, and evaluation. The Experimental Medicine (EM) approach is one example of a framework that can guide this process for creating and testing interventions for behaviour change (Sheeran, Klein, & Rothman, 2017). As the name suggests, this approach has been used primarily for changing public health behaviours. However, the approach can also be used in other fields of behavioural science. It offers guidance on how to identify, design, and evaluate interventions according to the science of behaviour change through four steps (Path A-D: see *Figure 6.1*).
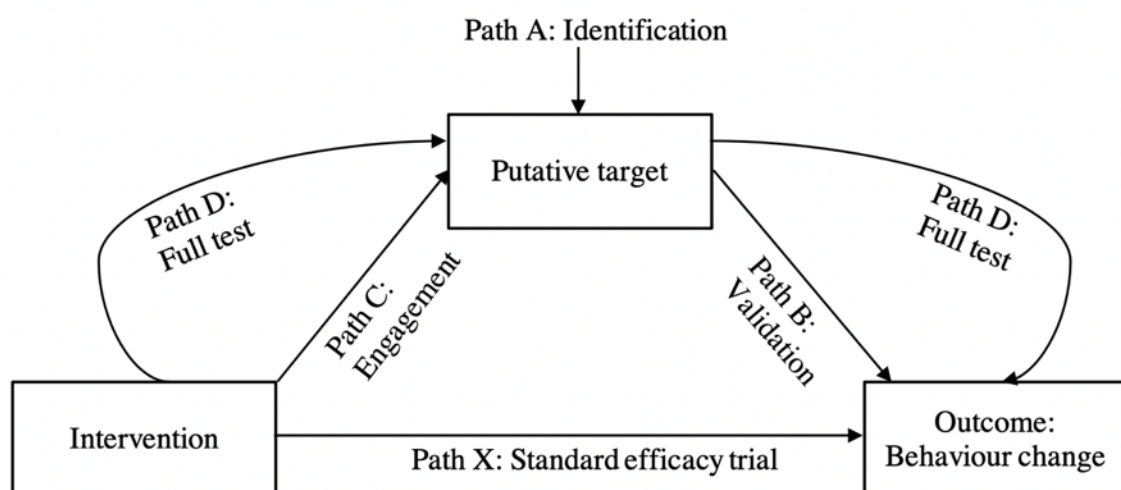
Figure 6.1. The experimental medicine approach to behaviour change (Sheeran et al., 2017)

In line with the EM approach to behaviour change, the design of an intervention should begin with the identification of a factor (e.g. place attachment) that relates to the desired behaviour (e.g. preparedness) and could potentially be altered or manipulated (Path A, see *Figure 6.1*). The second step (Path B) involves the validation of the relationship between these two variables (e.g. by experimental or longitudinal research) to confirm that they are related. As part of the third step (Path C), one should then assess the extent to which

an intervention tool can engage the target variable through successful experimental manipulation (e.g. using place visualisation to manipulate place attachment). Ideally, during this step, a researcher would test multiple intervention tools to determine which one best engages the target variable. Finally, the intervention should be fully tested with a randomised controlled trial to confirm that it produces the desired change in behaviour (Path D). This experimental medicine approach to designing and testing a behaviour change intervention is in contrast with traditional standard efficacy trials which often skip the aforementioned steps (Path X; Sheeran et al., 2017). Combining this EM approach with the implementation science approach would see at least two additions to this model. First, both Path C and Path D should involve rigorous evaluation to ensure internal validity (i.e. ensuring that the dependent variable is changing due to changes in the independent variable) and rule out confounding factors. Second, Path D (full test) should be replicated multiple times with different populations in naturalistic settings to ensure 'real-world' effectiveness.

While the studies in my thesis were not designed from the outset using the EM approach, this approach can help to identify the next steps for this area of research. Related to Path B, for example, my Study 1 and 2 confirmed that there was a positive and significant association between the variables in my target population (Wellington region, New Zealand). I was also able to further explore the conditions under which this association appeared true (through analysis by spatial scale of place attachment and type of preparedness). Then, relating to Path C, I undertook manipulation checks in Study 3 to test the effectiveness of place visualisation at altering place attachment (with mixed results), before undergoing a full test of the intervention (Path D) in Study 4.

Using this EM approach to intervention design as a guiding framework, I recommend the following steps for future intervention research in the field of disaster preparedness, and specifically for the future use of place attachment as an intervention tool. First, and where possible, a causal relationship should be established between target variables and outcome variables prior to intervention design. When using place attachment research for preparedness behaviour change, for instance, longitudinal studies examining the causal pathway between place attachment intensity and preparedness would be particularly illuminating. Building on recommendations made at the end of the previous chapter, this would involve testing to determine which aspects of place attachment are most relevant for preparedness and then ensuring that these pathways are causal. Further, alternative manipulations should be trialled and evaluated. These should include rigorous manipulation checks to ensure that the

experimental tool is manipulating the target variable in the manner expected and with the greatest effect size. In the case of place attachment and preparedness, studies should test multiple tools against each other, for example comparing place visualisation against a competing tool (such as place attachment message framing). Lastly, preparedness interventions should be rigorous in evaluating the effectiveness of tests using behavioural measures. These tests should consider and account for problems that may occur when attempting to scale-up the intervention at large through running naturalistic experiments and coordinating replication attempts.

Personalised Approach to Intervention

My final recommendation for research moving forward relates to the importance of tailored solutions for different populations. Even when intervention design is rigorous and theory-informed, interventions may still fail in the implementation phase if they do not consider the heterogeneity of their population. As a solution to this dilemma, the central tenet of personalised medicine is that interventions should be tailored individually to each patient. At its core, personalised medicine uses molecular mechanisms (e.g. genetics) to determine drug response, with evidence showing that individual factors such as age, nutrition, and health status play an important role in treatment efficacy (Hamburg & Collins, 2010; Vogenberg, Isaacson Barash, & Pursel, 2010). Beyond medicine, this approach can also be used to inform behaviour science in other areas. A personalised medicine approach to behaviour change acknowledges that there are no 'one size fits all' solutions to widespread behaviour change. Instead of settling for a solution that works for most people, it is possible to determine personalised solutions.

This approach sits congruently with the social marketing 'audience segmentation' approach. Research shows that behavioural campaigns are more successful when they appeal to different 'segments' (Noar, Benac, & Harris, 2007). In other words, audience segmentation involves "trying to figure out what strategies and messages will work with what people" (Slater, Kelly, & Thackeray, 2006, p.170). McKenzie-Mohr (2000) combines psychology with social marketing to produce a four-step guide to community-based social marketing: 1) identifying barriers to behaviour for different segments, 2) selecting which behaviour to promote, 3) designing and testing an intervention for that behaviour, and 4) evaluating that intervention. The social marketing approach has shown success in increasing pro-environmental behaviours and improving climate change communication (Haldeman &

Turner, 2009; Hine et al., 2014). It has also been offered as a useful framework for increasing disaster preparedness (Guion, Scammon, & Borders, 2007). Like the experimental medicine approach to behaviour change, this approach uses a multi-phase process to determine the best intervention to use, and thoroughly evaluates that intervention. Unlike the experimental medicine approach, the social marketing approach also explicitly considers the barriers to behaviour and considers that these barriers may vary across groups.

Applying principles of personalised medicine or audience segmentation to preparedness interventions may be key to ensuring maximum effectiveness when implemented in a community sample. In the case of place attachment, for example, future research may determine that reminding people of their physical attachment to their house is important for mitigation preparedness, but only for homeowners. Alternatively, emphasising social attachment to one's neighbourhood (e.g. through priming existing neighbourhood social norms to prepare) may be important for encouraging community-based preparedness, but only if that person has lived in their neighbourhood for longer than one year. Research by Schroder (2008) supported this idea and found that different dimensions of attachment were important for different subpopulations of New Zealanders (e.g. homeowners showed greater sentimental attachment whereas people with children in the household increased the likelihood of being attached to social aspects of place such as family and friends). In addition, in their study exploring how people visualise their local coastal area, Newell and Canessa (2018) found that demographic variables (e.g. gender and length of residence) influenced the content of people's visualisations. The authors also found that demographic variables (e.g. age and gender) influenced how people positioned themselves in their visualisations (e.g. standing on the beach facing the ocean vs. standing on a boat facing land). Because of this, they concluded that some visual elements and visualisation approaches may be more significant to different groups of people when visualising their places.

Considering this, while I found null effects from my intervention, the intervention may still have worked for a subset of my sample based on their individual profiles and histories (e.g. homeowners or those that have lived in their place for a long time). Moreover, the intervention effect could be improved if these subpopulations received tailored visualisation instructions relevant to the aspect of place attachment most important to them. Future studies could begin this process by taking a personalised or segmented approach to visualisation research by looking at associations between demographic factors, place visualisation content, and preparedness behaviour outcomes. It is also important to note here

that a visualisation task, however simple, still requires a very specific and compliant cognitive mindset. Not all people will be willing or motivated to engage fully with a visualisation exercise or be persuaded by its effectiveness. An intervention such as this may be better suited to those who are already comfortable with the act of visualisation (e.g. people who practice mindfulness). Future research in this area could increase the chance of successful behaviour change interventions through understanding the specific challenges of the people looking to be targeted, pro-actively employing audience segmentation, and designing interventions with these segments in mind. This may allow for interventions to be implemented effectively with a subset of specific populations, rather than being implemented ineffectively with an at-risk population at large.

Conclusion

In this chapter, a review of theory across medicine and public health, behavioural science, preparedness, and implementation science has revealed numerous directions for future research into preparedness behaviour change. This theoretical review also highlighted several recommendations for the design and delivery of interventions. Each recommendation is made in the pursuit of producing evidence-based interventions that are internally valid and able to be externally replicated and scaled up at large. These recommendations include using a behaviour change framework to rigorously design, test, and evaluate interventions, and considering targeted approaches for different populations (e.g. determining the groups of people who are more likely to benefit from a place visualisation exercise). All of these recommendations are guided by principles of implementation science which aim to minimise the risk that pre-tested interventions become ineffective when implemented with a larger population.

Research is needed in this space to ensure that preparedness communications strategies, and behavioural campaigns, are optimised to reflect the many and varied factors that influence individual decisions to prepare. However, caution must be taken to ensure that this research is methodologically rigorous and practically meaningful. Future research should add to current knowledge by considering the recommendations outlined in this chapter from the outset of intervention design, and balancing innovation with the knowledge of what works.

Chapter 7: General Discussion

This thesis began with a description of the Kaikōura earthquake that struck North Canterbury, New Zealand late in 2016. The earthquake, and its accompanying spike in household preparedness, served as the contextual backdrop to my PhD journey which began just four months later. However, as mentioned in Chapter 1, preparedness rates returned to their baseline levels not long after the event. This indicates that experiencing the earthquake did not necessarily result in sustained changes in people's preparedness. At the time of submitting this thesis, the most recent estimates in New Zealand indicate that absolute levels of preparedness remain low, with just over one in ten people indicating that they are have completed all three survival preparedness behaviours included in the Ministry of Civil Defence and Emergency Management's annual preparedness survey (i.e. have a comprehensive emergency plan, stored water, and emergency supplies) (2019: *Figure 1.1*).

The apparent lack of preparedness indicates that much work needs to be done to increase preparedness in New Zealand (and globally). In response to this, in this thesis, I presented findings from a series of studies to investigate the relationship between place attachment and disaster preparedness in the Wellington region of New Zealand. Using mixed-methods research, I examined place attachment as a novel predictor of preparedness and examined how place attachment may be utilised to increase preparedness behaviours in Aotearoa New Zealand. In this final chapter, I critically review and integrate my findings and their relevance for theory, research, and practice.

Place Attachment and Disaster Preparedness: Quantitative Insights

Supporting previously observed correlational patterns (e.g. Anton & Lawrence, 2016; Mishra, Mazumdar, & Suar, 2010), my research confirmed that place attachment is a useful and significant predictor of preparedness intentions and behaviours in two cross-sectional surveys with Wellington region, New Zealand residents (Study 1 and 2). Pooled estimates of the zero-order correlations across studies are presented in *Figure 7.1*). These numbers reflect an overall significant and positive association between place attachment and different types of preparedness intentions and behaviours. These associations were upheld even when controlling for a range of relevant socio-demographic factors (e.g. age, length of residence, natural hazard experience, education, and income; see *Table 2.10* and *Table 2.11*). Specifically, in Study 2, I found significant associations when place attachment scale

corresponded with the scale of preparedness behaviours. For example, when house attachment was high, people also reported having undertaken more mitigation preparedness behaviours (e.g. strengthening their houses). And, when neighbourhood attachment was high, people also reported having undertaken more community preparedness behaviours (e.g. checking on vulnerable neighbours). These patterns were also largely replicated when pooling zero-order correlations across Studies 1-3 (see bolded boxes in *Figure 7.1*). Correlations between attachment and preparedness were stronger on average when the spatial scale matched (although the strength of this pattern was stronger when holding other attachment and demographic variables constant).

Further, in Study 1 and 2, I examined place attachment as a mediator between people's length of residence/homeownership and preparedness and found significant results. These results indicate that place attachment at least partly explains the relationship between two robust demographic predictors of preparedness. Length of residence, for example, appears to be associated with mitigation preparedness behaviour through the mechanism of house attachment, implying that increased time living in a place increases the attachment to that place, which in turn is associated with a greater likelihood to take steps to prepare for actions that mitigate the possible effects of damage in case of a natural hazard event.

From the perspective of the Experimental Medicine approach to behaviour change (Sheeran, Klein, & Rothman, 2017; Figure 6.1), these correlations validated the relationship between place attachment and disaster preparedness, meaning that my target variable (place attachment) was shown to be important for the behaviour I had set out to change (disaster preparedness). Importantly, they also refined the spatial scales of place attachment and types of preparedness for which this association is valid. The strength of these correlations is weak according to traditional interpretations of correlation coefficients (Hinkle, Wiersma, & Jurs, 2003). However, given that place attachment explained a significant amount of additional variance in preparedness behaviours over and above established demographic predictors of preparedness (up to 6%; see *Table 2.4*), and mediated the relationship with several established predictors, I chose to test a novel visualisation intervention using place attachment as a tool to increase preparedness (adapted from Scannell & Gifford, 2017a).

Before fully testing the intervention with a community sample, I pilot-tested the design with undergraduate students (Study 3). I found that participants in the place attachment visualisation condition reported greater attachment to the place they visualised compared with those in the neutral place visualisation condition. This result replicates the

manipulation check used by Scannell and Gifford (2017) in their original study. However, no significant main effects were found of the intervention on self-reported place attachment using an omnibus statistical test (the 'engagement' step in the Experimental Medicine model, Sheeran et al., 2017: *Figure 6.1*). There were only weak and non-significant effects when I compared place attachment of people in the place attachment visualisation condition with people in the neutral place visualisation condition ($d=.24$ for house attachment, $d=.18$ for neighbourhood attachment). I proceeded with testing the intervention given that the results were consistent with those reported in the literature, while also noting that the effect of the intervention on place attachment may be less robust than previously indicated (when explicitly testing for changes in attachment).

	Survival preparedness intentions	Mitigation preparedness intentions	Community preparedness intentions	Survival preparedness behaviours	Mitigation preparedness behaviours	Community preparedness behaviours
House attachment r^a (Studies 1-3)	**.20**	**.26**	.18	**.23**	**.21**	.22
Neighbourhood attachment r^a (Studies 1-3)	.22	.24	**.26**	.11	.17	**.25**
Place visualisation r^b (Studies 3)	.07	.03	.00			
Place visualisation r^b (Study 4)	.02	.07	.02	.11 [c]	09 [c]	08 [c]

[a] Pooled *r* estimate obtained from meta-analysing zero order correlations with place attachment across Studies 1-3
[b] *r* value converted from Cohen's *d*: mean comparison between place attachment visualisation condition and neutral place visualisation condition
[c] *r* value converted from Cohen's *d*: calculated using estimated marginal means of Time 2 preparedness behaviours while controlling for Time 1 preparedness behaviours

Figure 7.1. Strength of associations (r) between variables across Studies 1-4 (bolded squares indicate that attachment and preparedness are matched on spatial scale)

As can be seen in *Figure 7.1*, in both Study 3 and 4 the effect size of the place attachment visualisation condition (compared with the neutral place visualisation condition) was close to zero for most measures of preparedness intention and small for measures of preparedness behaviours (Hinkle et al., 2003). Further, I found no significant main effect of place attachment visualisation on any measure of preparedness intentions or behaviours using omnibus ANOVA tests. The only exception to this was for survival preparedness behaviours.

I found a significant difference in survival preparedness between those in the place attachment condition and the neutral visualisation condition (but not the control condition) while controlling for Time 1 survival preparedness. In other words, the place visualisation intervention did not increase survival preparedness any more than would have occurred without any intervention at all. This final test of the intervention is in line with the 'full-test' step of the Experimental Medicine model (Sheeran et al., 2017; *Figure 6.1*) and showed overall non-significant and weak effects of the intervention on preparedness intentions and behaviours.

The range of associations found in this thesis are presented in two path diagrams that help to summarise the evidence linking place attachment with disaster preparedness intentions and behaviours across four studies (see *Figure 7.2*). As can be seen in these diagrams, the associations between preparedness and attachment are weak according to traditional interpretations of effect size (Hinkle et al., 2003). In particular, it appears that cross-sectional associations are poor estimates for intervention studies given that associations were not upheld to the same strength when place attachment was manipulated using a place visualisation tool. The link between place visualisation and place attachment was non-significant in my research, as was the link between place visualisation and disaster preparedness (intentions and behaviour). Based on these findings, I cannot recommend the usage of the current place visualisation intervention as an effective manipulation of place attachment, or an effective tool to increase preparedness.

While I did not find a statistically significant effect of place attachment visualisation on preparedness intentions or behaviours (relative to visualising a neutral place or visualising no place at all), the observed effects reported in *Figure 7.1* may still be meaningful when implemented at large. A weak effect ($r=.11$) across New Zealand's population of five million, for example, may still produce practically significant changes in behaviour across a sizable cross-section of people. Moreover, when one considers the snowball effect of social norms when it comes to preparing (i.e. when one person prepares, other people are also more likely to prepare: Becker, Paton, Johnston & Ronan, 2014; van Valkengoed & Steg, 2019), these effects may be practically relevant. Community preparedness behaviours were significantly associated with neighbourhood attachment, even when controlling for other types of attachment and other socio-demographic predictors, and so it is important to consider the indirect effects of this community preparedness. If neighbourhood attachment can be used to increase community preparedness, there are likely to be numerous indirect network effects

from this preparedness. For example, if one person harnesses their neighbourhood attachment to talk to another community member about preparing, or to check up on a vulnerable neighbour, then it becomes more likely that behaviour change will spread through that network. Therefore, if a place attachment intervention can increase community preparedness behaviour at the individual level, even if the effect is small, the ongoing effects may be cumulatively significant.
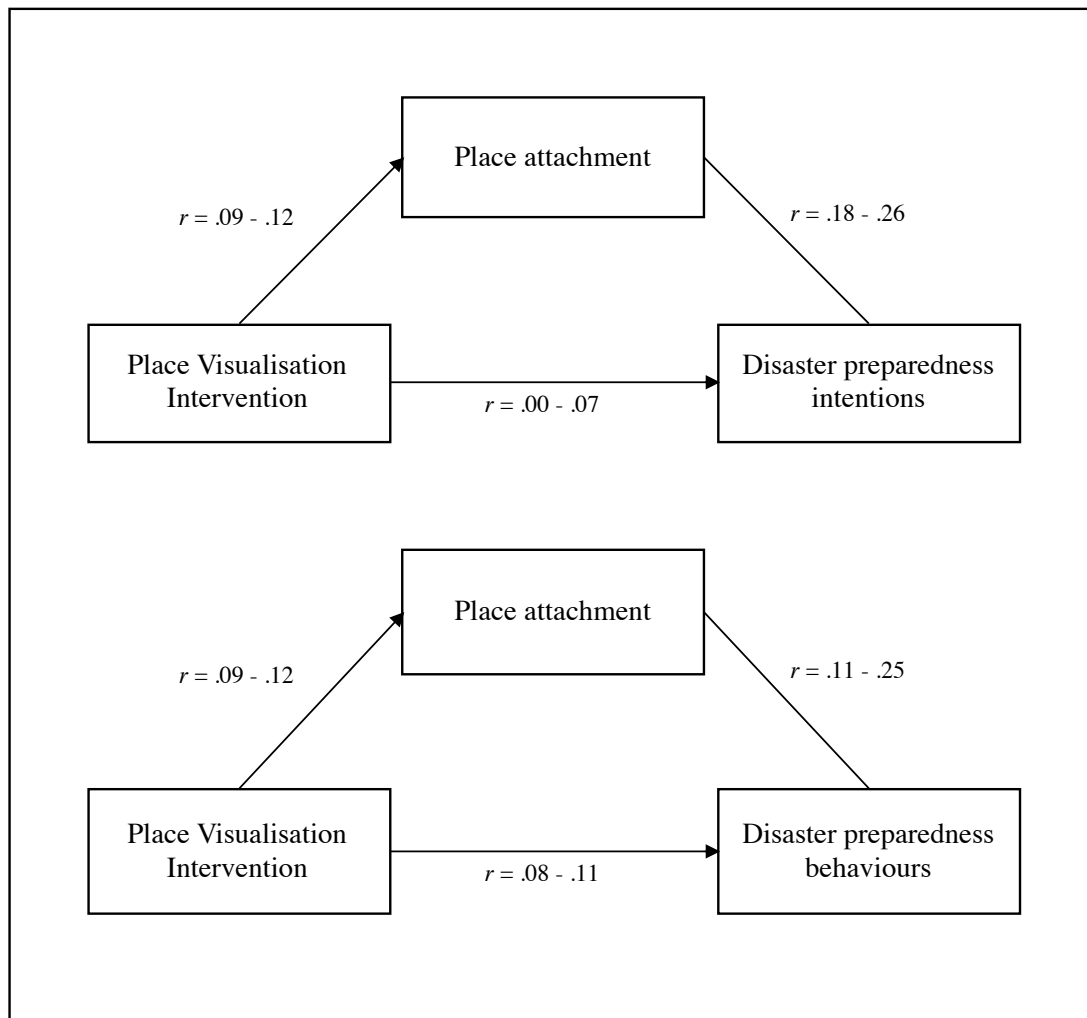
Figure 7.2. Path diagram showing associations between place attachment, place visualisation, and disaster preparedness intentions and behaviours across Studies 1-4

Effect sizes must always be viewed from the lens of what is meaningful in a particular field of research. Across those prior intervention studies presented in Chapter 1 (*Table 1.1*), only one study reported effect sizes. Welton-Mitchell and colleagues (Welton-Mitchell, James, Khanal, & James, 2018) found a medium effect (*r*=.24) of their three-day facilitated

community intervention on disaster preparedness behaviour (N=240). The effect sizes found in my research are lower than those reported in previous intervention research. However, my place visualisation intervention was also considerably lower cost, shorter in duration (lasting approximately seven minutes) compared to a three-day intervention. It can also be more easily scaled-up to a large population. My intervention did not significantly shift preparedness behaviours on an individual level and therefore cannot be recommended for the purposes of preparing a specific individual (an individual-level effect). However, it is worth considering the value such an intervention could have for society if implemented at large (provided the principles of implementation science are adhered to, as outlined in Chapter 6). It is not feasible to assume that the preparedness of a nation's population can be increased rapidly through community workshops alone, however valuable these may be. For widespread behaviour change, future research should continue to explore low-cost preparedness interventions as a complementary tool to the more resource-intensive options.

I also recommend that future research on preparedness interventions is rigorous in its recording and interpretation of effect sizes, alongside significance tests, so that 'meaningful changes' can be better defined in this field of research and so that evidence-based options are available when it comes to designing and implementing large-scale preparedness campaigns (such as those sponsored by the New Zealand Earthquake Commission or the Ministry of Civil Defence and Emergency Management). Further, I strongly recommend that large-scale preparedness behavioural campaigns are evaluated rigorously to test whether they are producing meaningful changes in behaviour. While it appears that simple informational approaches do not work (Ballantyne, Paton, Johnston, Kozuch, & Daly, 2000), evaluation research will continue to expand what we know about what *does* work for increasing preparedness, a woefully under-researched topic.

Regarding the next steps for place visualisation and based on effect sizes reported in *Figure 7.2*, I recommend that future research explore the pathways between place attachment and preparedness and between place visualisation and place attachment in greater depth. Further exploring these pathways (e.g. examining the specific aspects of place that are most important for preparedness or the visualisation prompts that best manipulate attachment) will strengthen the rationale and the effectiveness of future experimental and intervention studies. The work in this thesis has already achieved greater clarity on which spatial scales of attachment are associated with which types of preparedness. The thesis also advances our knowledge regarding where place attachment fits as a mediator alongside other robust

predictors of preparedness and, in doing so, it has shed light on much of the uncertainty reported in previous reviews of the relationship (Bonaiuto, Alves, De Dominicis, & Petruccelli, 2016; van Valkengoed & Steg, 2019).

However, it is important to further unpack the mechanism through which place attachment is associated with preparedness. In the discussion of Chapter 2, I postulated several theoretical explanations for the association. These included a place-protective function (between house attachment and mitigation preparedness) and greater community social resources (between neighbourhood attachment and community preparedness). Future research could test these proposed pathways in a longitudinal design to identify whether these mechanisms are valid. Findings from such a study would be instrumental in establishing why and how place attachment is related to preparedness and, therefore, how place attachment insights can be used practically to minimise natural hazard risk. Further suggestions for research are outlined in the next section through the lens of my qualitative findings.

Place Attachment and Disaster Preparedness: Qualitative Insights

Throughout my thesis, I examined place attachment in three ways: psychometrically (place attachment scale), experimentally (place visualisation intervention), and qualitatively (thematic analysis of place attachment). First, in Studies 1-4, I quantitatively examined the strength of place attachment with a two-dimensional scale that measured place identity (emotional and symbolic bonds with a place e.g. "My house is very special to me") and place dependence (functional bonds with a place e.g. "My house is the best place for what I like to do"). I chose this measure because it was an established measure of place attachment and had been used in previous studies with disaster preparedness (Anton & Lawrence, 2016; Williams & Vaske, 2003). Supporting this, I found positive and significant associations between the place attachment scale and disaster preparedness (for certain spatial scales of attachment and types of preparedness). For the place visualisation intervention, however, in order to experimentally manipulate place attachment, I instructed participants to visualise what they could see, hear, smell, and feel in their house or neighbourhood. This sensory approach to place visualisation was trialled in research by Scannell and Gifford (2017a) and was found to be an effective manipulation of place attachment. As noted above, when using the same criteria as the original authors, I replicated the overall effectiveness of the intervention using a post-intervention manipulation check. However, when testing the effectiveness of the intervention directly by focusing on strengthening place attachment from pre-test to post-test,

I did not find any main effect of visualisation on place attachment scores (using the two-dimensional scale). This may reflect a weak manipulation of place attachment. However, it is worth noting that the visualisation instructions and the place attachment measure were not focused on the same dimensions of attachment. While the visualisation focused on grounded sensory and emotional observation, the quantitative measure focused on more abstract emotional, symbolic, and functional bonds.
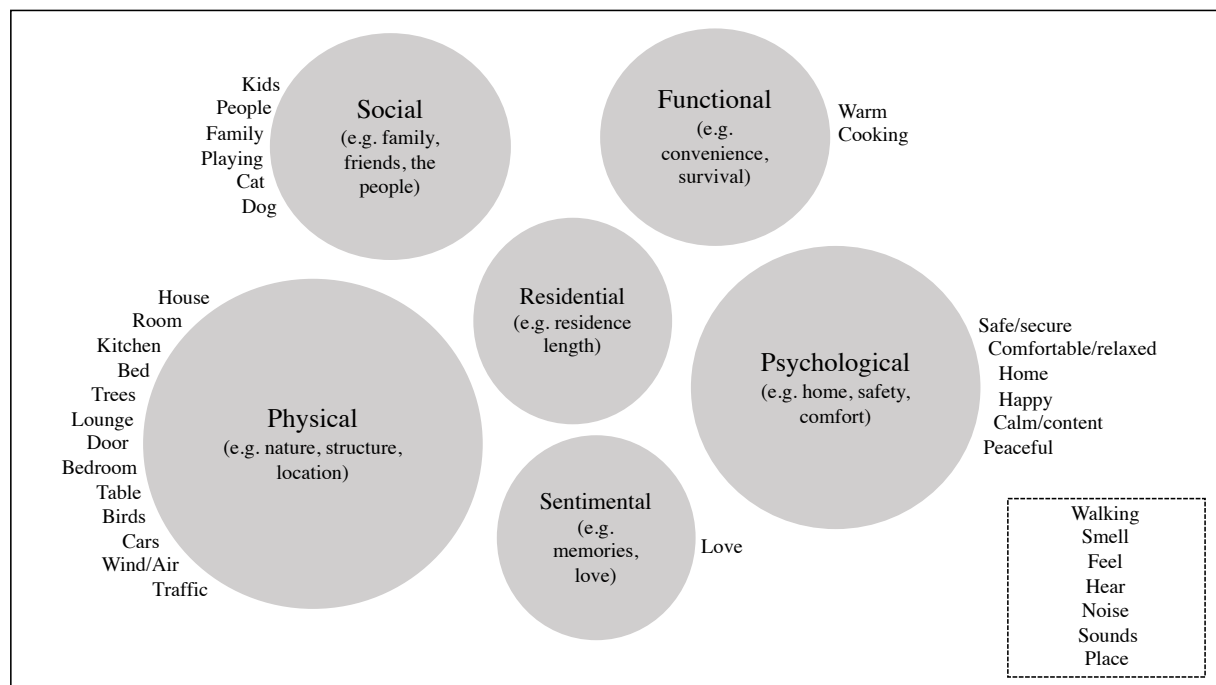
Figure 7.3. Keywords from place attachment visualisation (outer circles) mapped onto the six categories of place attachment (inner circles; sized by keyword representation)

To add further complexity and nuance, when I thematically analysed how people thought about their various places (house, neighbourhood, city, and country), I found six different categories of place attachment: social, physical, residential, functional, sentimental, and psychological (see *Table 4.1*). My analysis demonstrates a large variety in how people think about their important places. Importantly, the two-dimensional scale I used to measure place attachment across Studies 1-4 did not reflect the complex themes that were identified through qualitative methods in Study 5. In Study 6, I also analysed qualitative data collected during the visualisation intervention. During the intervention, participants were asked to visualise their place, and then write down what they had visualised. I analysed the word frequencies of this collated data to determine what people most frequently visualised (see

Table 5.4 for keywords). As can be seen from mapping the keywords from the place attachment visualisation onto the six categories of place attachment identified in Study 5 (*Figure 7.3*), there is some overlap. For example, several psychological themes identified in my qualitative research were also reported during the place visualisation (e.g. home, safety, and comfort). In addition, family was an important qualitative social theme and was regularly reported by participants while visualising their house or neighbourhood.

However, certain categories were overrepresented in the visualisation intervention and were less salient in the free responses about place attachment more broadly. As instructed, participants predominantly visualised the things they could see in their place (physical category) and the emotions they were feeling (psychological category). While some participants visualised social aspects of their place (kids, family, etc), the social category, alongside the functional, residential, and sentimental categories of place attachment, were not well-represented in participants' visualisations during the intervention.

Future research can build on these qualitative insights in three important ways. Firstly, it is worth considering the disconnect between how people think about their place attachment, and how researchers traditionally measure place attachment. Considerable amounts of research have been concerned with how to appropriately measure place attachment in a way that is valid, generalisable, and reliable. My research findings do not dispute this, and these scales may be the best available tools for preliminary measurements of place attachment across different place types and contexts (e.g. Williams & Vaske, 2003). However, based on my findings, there are missed opportunities to continue with the current line of research (exploring place attachment and disaster preparedness) without adopting an expanded measurement tool. When it comes to people's attachment to houses, neighbourhoods, cities, and countries, for example, I recommend that researchers measure a broader range of dimensions that capture the categories of place attachment that are relevant for individuals. Future research could design a tool based on the qualitative findings of Chapter 4, using multiple items from each category of place attachment. The items comprising this tool could then be factor analysed to identify relevant underlying structures. I was not able to quantify the relative strength or importance of the categories (social, physical, residential, functional, sentimental, and psychological) of attachment identified in Study 5 due to the limitations of qualitative data. However, this new instrument could be used to explore the quantitative relationships between place attachment, spatial scale, and different types of preparedness. This avenue of research would provide greater insight into the

specificities of the attachment-preparedness link and, therefore, pave the way for more contextually grounded intervention research seeking to increase preparedness.

Secondly, when applying the place visualisation tool to any applied setting, not just disaster preparedness, I recommend that researchers take care in ensuring internal validity of the visualisation exercise. While place visualisation may be an appropriate tool to manipulate place attachment experimentally on the surface level, more comprehensive manipulation checks in Study 3 showed mixed findings when it came to its effect on actually strengthening place attachment. In line with the Experimental Medicine approach to behaviour change (Sheeran et al., 2017), this suggests that there was inadequate 'engagement' of the visualisation with the core concept of interest (place attachment). Effect sizes presented in *Figure 7.2* corroborate this, showing an overall weak activation of place attachment. I proposed, using findings from Chapter 4 and 5, that this may be due to a visualisation focus on the physical and psychological categories of place attachment, with insufficient attention paid to other important categories (e.g. residential, sentimental, and functional). More broadly, any application of the place visualisation tool to manipulate place attachment should follow rigorous steps with pre-testing to ensure that the place aspects being visualised are congruent with the aspects of place most important to people and that the subsequent pre and post-test measures can capture any measurable changes in attachment.

Finally, there is scope to consider whether future iterations of preparedness interventions can be tailored towards specific groups of people. As laid out in Chapter 6, there is a significant theoretical rationale for a personalised medicine (Hamburg & Collins, 2010) or audience segmentation (Noar, Benac, & Harris, 2007) approach to intervention research (Newell & Canessa, 2018). Indeed, supporting this, I found in my evaluation of the intervention in Chapter 5 that there was a great range in the time spent on the visualisation tasks, words written, and approaches to the visualisation itself (e.g. low specificity vs high specificity or static vs. dynamic). Further, approximately 10% of participants expressed some confusion, misunderstanding, or non-completion of the intervention task, indicating that for a sizeable number of participants the intervention did not make sense. One possibility is that there are certain people for whom a visualisation task may work better at motivating action (e.g. disaster preparedness). As outlined in Chapter 6, these people may fit a certain demographic profile (e.g. homeowners) or be more likely to engage with a visualisation task (e.g. those who are already familiar with mindfulness exercises). This suggests that one-size-fits-all interventions are perhaps not all that well suited for a roll-out to large populations and

that, instead, these may be better optimised by targeting specific groups instead. This has been achieved already in multiple fields, for example with targeted advertisements on social media that use machine learning algorithms to deliver personally tailored messages to specific groups (Lee, Hosanagar, & Nair, 2018; Zhang et al., 2017). While the ethical implications of such highly personalised content have not gone without scrutiny (e.g. Baglione & Tucci, 2019), it is worth considering what the field of preparedness intervention research can gain from a more segmented approach to intervention design. My qualitative research on people's interaction with the place visualisation exercise opens windows for further exploration into this important avenue for both research and application.

Next steps in place attachment research could include filtering intervention content obtained from visualisations to determine whether certain groups of people are more likely to prepare as a result of visualising a place that they are attached to. For example, given that house attachment mediates the relationship between homeownership and mitigation preparedness, do homeowners benefit more from visualising the physical aspects of their house? The use of sophisticated methodologies (e.g. machine learning algorithms) could answer this through two research agendas looking into: a) what people visualise about their place that makes them more likely to prepare, and b) what the characteristics are of people who are more likely to prepare as a result of place visualisation. It might also be possible to survey people on the dimensions of place attachment most salient to them, and then use those answers to tailor specific attachment exercises. Answers from such studies could prompt the creation of tailored intervention approaches, therefore using place attachment as a tool to create a meaningful effect on behaviour among those that are most likely to benefit.

Other qualitative approaches are also needed to complement the thematic analyses of free-response data conducted in this thesis. For example, content analysis might be a useful complementary tool when analysing large text datasets, in order to validate the key themes determined in Chapter 4. When it comes to exploring the relationship between place attachment and preparedness, future research should also consider conducting semi-structured interviews with people who are already somewhat prepared for natural hazard events. These interviews could explore people's relationships with their important places, and the extent to which these relationships played a role in motivating their preparation actions. In analysing these interviews, a researcher may be able to better determine, corroborate, or validate the mechanisms through which place attachment may lead to preparedness. Conducting interviews would also be a rich way of capturing the most important aspects of

place for each person which is difficult to determine through analysing free-response survey questions alone. Conducting semi-structured interviews may also lend itself to the grounded theory approach. Should this approach be taken, interview data could be coded, grouped, and a theory proposed to link attachment and preparedness.

Place Attachment: Research and Theory

In Chapter 4, I outlined the main tenets of an organising framework for understanding place attachment: the Person-Process-Place (PPP) framework (Scannell & Gifford, 2010a). In it, the authors synthesised various definitions and insights from place attachment research into three key dimensions reflecting a) the personal vs collective experience of attachment, b) the different processes through which it is manifested, and c) the characteristics of a place. I will now discuss how my thesis findings contribute to this theoretical framework, and what this means for future place attachment research.

As stated in Chapter 1, I focused predominantly on the individual processes of place attachment and preparedness due to the psychological lens of my thesis. However, I also found through analysing the data from my studies that the process of place attachment cannot be confined only at the individual level. Neighbourhood attachment was found to predict community preparedness over and above other socio-demographic predictors, suggesting that there is a collective community-mindedness that is important for our attachment to our neighbourhoods. Given the varied themes that were found to be important for neighbourhood attachment in Chapter 4, it is clear that not all people think about their neighbourhoods in the same way. Therefore, while there are undoubtedly aspects of individual and collectively-held meanings for different places, my findings suggest that these processes can coexist, such that our different place attachment can contain both individually *and* collectively significant themes that may or may not converge. Discerning between a place attachment that is individually held and one that is collectively held may unnecessarily simplify what is a complex, multi-faceted, and dynamic bond with our places.

Further, the varied themes that I identified through qualitative research in Chapter 4 suggest that the primary processes outlined in the PPP framework (affect, cognition, and behaviour) may be limited in their scope. I found six key categories of place attachment that varied greatly in their thematic content according to the spatial scale of place being considered. These varied expressions of place attachment were supported by data collected during place visualisation exercises which showed that people visualise their different places

in different ways (e.g. in terms of physical, psychological, and social properties, see *Figure 7.3*). Therefore, while the processes put forward by Scannell and Gifford (2010a) represent a good starting point for understanding place attachment, future qualitative research, such as that presented in Chapter 4, should work to refine and better define these processes. For example, based on my findings, I suggest that psychological themes (such as safety or comfort), as well as functional themes (such as amenities and survival), should be better integrated into definitions and theories of attachment. In doing so, frameworks that are perhaps more representative of people's experience of place attachment can be proposed. These frameworks will reflect the ever-evolving knowledge base on place attachment and how it is expressed and manifested.

My thesis findings also offer support for the place dimension of the PPP framework. Specifically, I found that analysing place attachment by spatial scale (ranging from people's houses through to their country) produced novel insights into how different place attachments have different implications for different types of behaviour. Moving forward, it is important that researchers critically evaluate the spatial scale of the place attachment that they are measuring, before they include place attachment in their research. My findings clearly show that not all spatial scales of place attachment are related to behavioural outcomes in the same way. I found that behaviours were best predicted by place attachment when the spatial scale of the attachment (e.g. house attachment) matched the spatial scale of the behaviour itself (e.g. house mitigation actions). This insight is important for future applications of place attachment that use people-place bonds to explain other behaviours such as climate change adaptation, where larger scales of place attachment may potentially be more relevant. As such, future place attachment research should provide a strong theoretical rationale for focusing on one spatial scale only or, otherwise, should explicitly compare the effect of spatial scale on their outcome measures.

Further, my thesis reported on place attachment to residential places at four different spatial scales. However, place attachment at the residential level (i.e. places that a person resides in) is unlikely to be the only relevant type of attachment when it comes to preparedness for natural hazard events (e.g. Scannell and Gifford, 2010b). This is a limitation of the studies I present in this thesis. Particularly when it comes to natural hazard events that regularly damage significant natural areas (e.g. floods or wildfires), the risk to these areas may be sufficient to motivate preparedness behaviour if attachment to the areas is high.

Future research should explore the role that attachment to non-residential places (e.g. natural areas) has in understanding preparedness behaviours.

This thesis represents a step forward in the efforts to study place attachment in relation to applied problems in society. The use of place attachment principles to inform and improve policy and practice is a rapidly evolving field in place attachment research (Manzo & Devine-Wright, 2014) and my findings offer a framework from which to consider how this can be done effectively. Specifically, my efforts to translate place attachment into a behavioural intervention reflect the first steps in what will likely be a long series of studies looking to utilise place attachment for behaviour change in different domains. I am pleased to present this thesis as a guiding framework for how these studies can be designed, tested, and evaluated, as well as offer recommendations for how to optimise this process.

Disaster Preparedness: Research and Practice

Finally, I will explore what my findings mean for disaster preparedness in New Zealand. Baseline rates of disaster preparedness remain low across New Zealand, and these findings were corroborated by my findings in Study 1, 2, and 3 where the majority of preparedness actions had been completed by fewer than half of participants (see *Table 2.2*, *Table 2.9*, and *Table 3.5*). Further, my research found that mitigation and community-based preparedness behaviours are generally underperformed compared with survival preparedness behaviours. While this imbalance has been reported before (McClure, Spittal, Fischer & Charleson, 2015), community preparedness has not always been included in these comparisons. My findings should serve as a signpost to practitioners who are responsible for increasing preparedness in their communities. Mounting evidence reports that mitigation measures and community-minded behaviours are crucial to reducing risk and improving outcomes when natural hazard events occur (Paton, 2019). These have often been ignored in preparedness messaging and research, including in those preparedness surveys annually conducted by the New Zealand Ministry of Civil Defence and Emergency Management (MCDEM, 2019). These surveys typically focus on survival preparedness behaviours (e.g. storing food and water or having emergency supplies) compared to mitigation or community-based preparation actions (e.g. identifying vulnerable neighbours or strengthening foundations). Because of this, metrics of national preparedness may over-inflate preparedness rates as well as fail to advise people on the many diverse actions they can, and should, be taking to prepare for natural hazard events. In addition to greater knowledge transfer on

diverse preparedness actions, researchers should carefully consider *how* to increase these less common but highly impactful behaviours. Place attachment serves as one example of a predictor of both mitigation and community preparedness. However, researchers should continue to apply a multi-dimensional approach to preparedness research to ensure that any insights (e.g. identifying predictors or barriers of preparedness) can be attributed to specific types of preparedness. Practitioners and policymakers can then use these empirical insights to inform preparedness policy and practice, especially when it comes to increasing mitigation and community preparedness behaviours.

In addition to considering preparedness *types* when measuring preparedness, it is critical to also consider whether intention or behavioural measures are used. Across Study 1 and 2, I found differing patterns between place attachment and preparedness depending on whether I examined intentions or self-reported behaviours. The mismatch between intention and behavioural measures is not uncommon in research, despite the two being related (according to the Theory of Planned Behaviour: Ajzen & Madden, 1986). However, it is particularly important to distinguish between the two when making decisions about how to increase preparedness. Both house attachment and neighbourhood attachment were associated with all preparedness intentions in my research, for example. However, only house attachment was associated with mitigation preparedness behaviours, and only neighbourhood attachment was associated with community preparedness behaviours when controlling for sociodemographic predictors of preparedness. Intentions and behaviours cannot be used interchangeably as proxies for the other when it is clear that people's perceived projections about their behaviour and their actual behaviour are influenced by different variables. Researchers should take care when drawing conclusions about preparedness behaviour itself based on studies that only measure preparedness intentions. Behavioural measures should also be included where possible.

Future research must be devoted to exploring ways of increasing preparedness using rigorous design, testing, and implementation procedures (see Chapter 6). While this thesis did not find any significant effect of the intervention on preparedness behaviour, it provides a template for future research to build upon. Research can inform practice when it comes to enhancing preparedness, and this can be done in ways that are simple and scalable. However, data from this thesis would suggest that this can only be achieved in meaningful ways when specific types of preparedness are explicitly targeted and measured, behavioural outcomes are measured, and the intervention approach is rigorously pre-tested and evaluated.

Key Personal Lessons

In addition to the research insights that I have reported above, there are numerous personal lessons that I have learnt during the process of working on this thesis. Some research skills include (but are not limited to): survey design, data collection, data analysis using R, data analysis using NVivo, and manuscript preparation. I have also learned several key lessons in practice as a researcher. These are distilled down into three takeaways: that 1) null findings are still 'significant', 2) there is no perfect science, and 3) it is important to adapt. I will expand on these below.

Like most thesis students, I presented and defended my research proposal in the first year of my studies. In it, I laid out a research plan alongside evidence-based rationale for embarking on my chosen research project. The research plan I presented was detailed and practical and the studies I present in Chapter 2-3 follow it closely. However, I did not expect that there would be no effect of the intervention on preparedness. This changed my research direction significantly. At the time of analysing the data, I had already received support from international collaborators to help me run an intervention study in five countries to establish cross-cultural applicability in my research. However, the null findings of the intervention forced me to reshape the direction of my research project. While it was not surprising that my research plans would be disrupted at some point, I was surprised by my reaction to this. It was difficult to reconcile my expectations about the way my research was meant to turn out, with the way that it did turn out. Shortly after analysing data on the effectiveness of my intervention, I presented findings at an international conference. I was disappointed to present null findings and thought that this might undermine my status as a competent researcher at the conference. However, after some time, I realised that this was a product of an internalised 'publication bias'. To confront this, I had to refamiliarize myself with lessons from research methods classes: specifically, that non-significant findings are not insignificant. I embraced writing the final chapters of my thesis upon realising that there was plenty to be learned from my null findings. Importantly, I realised that these did not weaken the strength of my research project as long as I, and other researchers, learnt something from them. I will take these lessons with me to future research projects (and to life more broadly).

Building on the above, I also learned the importance of prioritising 'good' science above 'perfect' science. As someone designing their first-ever study during this research project, I was faced with a decision: to wait until I was sure that these studies were perfectly

infallible, or to use good judgement to create a study that would answer my research questions with confidence. Despite my underlying desire to follow the first course of action to create a perfect thesis, I was forced to take the second option. I learned to become comfortable with the limitations of my research, and the questions that my data could (and could not) answer. In this thesis, I present research that is undoubtedly limited in many ways, despite its strengths. Nevertheless, these limitations emerged from the process of 'doing' research and, therefore, could not be determined from the outset. I was not an expert on my topic when I designed my first study and so, there are aspects that I would change now. However, my current knowledge came from running these studies anyway and learning from things that I may have missed. I have never compromised on best-practice science throughout this research project and, as such, I am proud of the work presented in this thesis. However, this would not have been possible without learning to let go of the notion of 'perfect' science, to do 'good' science through practising reflexivity, collaboration, and learning from my mistakes.

Lastly, I learned to be adaptive to the research process by embracing new opportunities, rather than strict adherence to a pre-determined research plan. For me, this meant accepting the opportunity to study for one year as a Fulbright visiting student researcher in the United States while overseeing this research project. This was an undoubtedly difficult decision and one that strained my ongoing research efforts due to the logistical burden of moving countries (twice) while maintaining full-time student status throughout. However, while this altered the anticipated timeline of my research, it also invaluably enriched the research itself. Opening myself to opportunities such as moving to the United States increased my skills as a writer, as an international collaborator, and as an early-career researcher. I was able to attend and present at international conferences, learn from prominent scholars in the field, and receive useful feedback on my research from people that I would not have otherwise met. The qualitative methods used in Chapter 4, for example, were informed through attending a behavioural science qualitative methods seminar while living in the United States. Being open to adaptation throughout this project opened me up to pursue unique directions with my research (e.g. qualitative methods) and learn more than I would have otherwise. This learned level of adaptability also served me well when I was forced to finish writing my thesis under home quarantine during the global COVID-19 pandemic.

Concluding Remarks

One of the earliest recorded usages of the expression 'no place like home' is attributed to John Howard Page's song, "Home, Sweet Home", released in 1823 for the opera "Clari, or the Maid of Milan". An excerpt of the lyrics sourced from Bennett (2012, p.171) is below:

> "Mid pleasures and palaces, though we may roam,
>
> Be it ever so humble, there's no place like home,
>
> A charm from the sky seems to hallow us there,
>
> Which, seek through the world, is ne'er met with elsewhere.
>
> Home, sweet home!
>
> There's no place like home."

An early depiction of place attachment, this nineteenth-century song mirrors many of the themes that I identified in Chapter 4. It depicts the psychological importance of 'home', with sentimental descriptions of a place that is both sweet and charming. This is also congruent with the 'place dependence' dimension of place attachment used in Chapters 2-3 to measure attachment. Place dependence refers to the functional needs fulfilled by a place that cannot be fulfilled by any other place or, according to the song, "is ne'er met with elsewhere" (Williams & Vaske, 2003). The lyrics of this song are an example of the importance of place for people from centuries past through to the current day.

Alongside cultural references such as the song lyrics above, the importance of people-place relationships has been studied academically for decades. Only more recently have researchers started to introduce these relationships into the field of disaster preparedness. Despite studies repeatedly finding a relationship between place attachment and preparedness, the literature has largely focused on cross-sectional associations rather than establishing a causal pathway. This thesis aimed to address this gap by testing a novel place attachment intervention to increase preparedness. It also sought to examine the conditions under which place attachment may lead to preparedness. Across two studies, I refined this relationship to an association between house attachment and mitigation preparedness behaviour, and between neighbourhood attachment and community preparedness behaviour. However, contrary to hypotheses, findings from a place attachment intervention did not produce

changes in preparedness behaviour. After a thorough evaluation, I recommended that a new approach be trialled and outlined several avenues for future research.

Given the growing economic and psychological impacts of natural hazards, and the vulnerability of many populations to multiple hazards (e.g. the Wellington region of New Zealand), the implications of this thesis are wide-reaching. Crucially, policymakers and practitioners should integrate place attachment in their disaster risk reduction strategies, alongside other evidence-based predictors of preparedness. Future research should build on the foundational research presented here through further exploring the conditions under which place attachment relates to preparedness, and the mechanisms through which this may be. New interventions, considering place attachment as well as other predictor variables, should continue to be designed and tested, using insights from this thesis to increase preparedness in at-risk communities.

References

Abrahamse, W., & Steg, L. (2013). Social influence approaches to encourage resource conservation: A meta-analysis. *Global Environmental Change*, *23*(6), 1773–1785. https://doi.org/10.1016/j.gloenvcha.2013.07.029

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I., Czasch, C., & Flood, M. G. (2009). From intentions to behavior: Implementation intention, commitment, and conscientiousness. *Journal of Applied Social Psychology, 39*(6), 1356–1372. https://doi.org/10.1111/j.1559-1816.2009.00485.x

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behaviour: 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

Altman, I., & Low, S. M. (1992). *Place attachment*. New York, NY: Springer.

Al-Ubaydli, O., Lee, M. S., List, J. A., Mackevicius, C., & Suskind, D. (2019). *How can experiments play a greater role in public policy? 12 proposals from an economic model of scaling*. University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2019-131. https://doi.org/10.2139/ssrn.3478066

Al-Ubaydli, O., List, J. A., & Suskind, D. L. (2017). What can we learn from experiments? Understanding the threats to the scalability of experimental results. *American Economic Review*, *107*(5), 282–286. https://doi.org/10.1257/aer.p20171115

Al-Ubaydli, O., List, J. A., & Suskind, D. L. (2019). *The science of using science: Towards an understanding of the threats to scaling experiments* (No. w25848). National Bureau of Economic Research.

Anton, C. E., & Lawrence, C. (2014). Home is where the heart is: The effect of place of residence on place attachment and community participation. *Journal of Environmental Psychology, 40*, 451–461. https://doi.org/10.1016/j.jenvp.2014.10.007

Anton, C. E., & Lawrence, C. (2016). Does place attachment predict wildfire mitigation and preparedness? A comparison of wildland–urban interface and rural communities. *Environmental Management*, *57*(1), 148–162. https://doi.org/10.1007/s00267-015-0597-7

Ardoin, N. M. (2014). Exploring sense of place and environmental behaviour at an ecoregional scale in three sites. *Human Ecology*, *42*(3), 425–441. https://doi.org/10.1007/s10745-014-9652-x

Baglione, S. L., & Tucci, L. A. (2019). Perceptions of social media's relevance and targeted advertisements. *Journal of Promotion Management, 25*(2), 143–160. https://doi.org/10.1080/10496491.2018.1443312

Ballantyne, M., Paton, D., Johnston, D., Kozuch, M., & Daly, M. (2000). *Information on volcanic and earthquake hazards: The impact on awareness and preparation.* Wellington, New Zealand: GNS Science.

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC Psychology, 3*(1), 1-12. https://doi.org/10.1186/s40359-015-0089-9

Becker, J., Paton, D., Johnston, D. M. (2015). *Communication of risk: A community resilience perspective.* Wellington, New Zealand: GNS Science.

Becker, J., Paton, D., Johnston, D., & Ronan, K. (2014). Societal influences on earthquake information meaning-making and household preparedness. *International Journal of Mass Emergencies & Disasters, 32*(2), 317-352.

Belk, R. W. (1992). Attachment to possessions. In I. Altman, & S. M. Low (Eds.), *Place attachment* (pp. 37-62). New York: Springer.

Bennett, B. (2012). Home songs and the melodramatic imagination: From "Home, Sweet Home" to the birth of a nation. *Journal of American Studies, 46*(1), 171-187. https://doi.org/10.1017/S0021875811001356

Bihari, M., & Ryan, R. (2012). Influence of social capital on community preparedness for wildfires. *Landscape and Urban Planning, 106*(3), 253–261. https://doi.org/10.1016/j.landurbplan.2012.03.011

Blake, D., Marlowe, J., & Johnston, D. (2017). Get prepared: Discourse for the privileged? *International Journal of Disaster Risk Reduction, 25*, 283–288. https://doi.org/10.1016/j.ijdrr.2017.09.012

Bonaiuto, M., Aiello, A., Perugini, M., Bonnes, M., & Ercolani, A. P. (1999). Multidimensional perception of residential environment quality and neighborhood attachment in the urban environment. *Journal of Environmental Psychology, 19*(4), 331–352. https://doi.org/10.1006/jevp.1999.0138

Bonaiuto, M., Alves, S., De Dominicis, S., & Petruccelli, I. (2016). Place attachment and natural hazard risk: Research review and agenda. *Journal of Environmental Psychology, 48*, 33–53. https://doi.org/10.1016/j.jenvp.2016.07.007

Bonaiuto, M., De Dominicis, S., Fornara, F., Ganucci Cancellieri, U., & Mosco, B. (2011). Flood risk: the role of neighbourhood attachment. In G. Zenz, & R. Hornich (Eds.), *Proceedings of the International Symposium on Urban Flood Risk Management* (pp. 547-558). Graz, Austria: Verlag der Technischen Universitat Graz.

Borrelli, B., Sepinwall, D., Ernst, D., Bellg, A. J., Czajkowski, S., Breger, R., … Orwig, D. (2005). A new tool to assess treatment fidelity and evaluation of treatment fidelity across 10 years of health behaviour research. *Journal of Consulting and Clinical Psychology*, *73*(5), 852–860. https://doi.org/10.1037/0022-006X.73.5.852

Bott, S., Cantrill, J. G., & Myers, O. E. (2003). Place and the promise of conservation psychology. *Human Ecology Review*, *10*(2), 100-112.

Bouwer, L. M. (2011). Have disaster losses increased due to anthropogenic climate change? *Bulletin of the American Meteorological Society*, *92*(1), 39-46. https://doi.org/10.1175/2010BAMS3092.1

Bradley, D. T., McFarland, M., & Clarke, M. (2014). The effectiveness of disaster risk communication: A systematic review of intervention studies. *PLoS Currents*, 1-26. https://doi.org/10.1371/currents.dis.349062e0db1048bb9fc3a3fa67d8a4f8

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brenkert-Smith, H. (2006). The place of fire. *Natural Hazards Review, 7*(3), 105-113. https://doi.org/10.1061/(ASCE)1527-6988(2006)7:3(105)

Brown, B., Perkins, D. D., & Brown, G. (2003). Place attachment in a revitalizing neighborhood: Individual and block levels of analysis. *Journal of Environmental Psychology, 23*(3), 259–271. https://doi.org/10.1016/S0272-4944(02)00117-2

Brown, B., Perkins, D. D., & Brown, G. (2004). Incivilities, place attachment and crime: Block and individual effects. *Journal of Environmental Psychology*, *24*(3), 359–371. https://doi.org/10.1016/j.jenvp.2004.01.001

Brown, G., & Raymond, C. (2007). The relationship between place attachment and landscape values: Toward mapping place attachment. *Applied Geography*, *27*(2), 89–111. https://doi.org/10.1016/j.apgeog.2006.11.002

Carrus, G., Scopelliti, M., Fornara, F., Bonnes, M., & Bonaiuto, M. (2014). Place attachment, community identification, and pro-environmental engagement. In L. C. Manzo, & P. Devine-Wright (Eds.), *Place attachment. Advances in theory, methods and applications* (pp. 154-164). Routledge.

Casakin, H., Hernández, B., & Ruiz, C. (2015). Place attachment and place identity in Israeli cities: The influence of city size. *Cities*, *42*, 224–230. https://doi.org/10.1016/j.cities.2014.07.007

Chmutina, K., & von Meding, J. (2019). A dilemma of language: "Natural disasters" in academic literature. *International Journal of Disaster Risk Science*, *10*(3), 283–292. https://doi.org/10.1007/s13753-019-00232-2

Chow, K., & Healey, M. (2008). Place attachment and place identity: First-year undergraduates making the transition from home to university. *Journal of Environmental Psychology*, *28*(4), 362–372. https://doi.org/10.1016/j.jenvp.2008.02.011

Churchman, A., & Mitrani, M. (1997). The role of the physical environment in culture shock. *Environment and Behavior, 29*(1), 64-86. https://doi.org/10.1177/001391659702900103

Collins, T. W. (2008). What influences hazard mitigation? Household decision making about wildfire risks in Arizona's White Mountains. *The Professional Geographer*, *60*(4), 508–526. https://doi.org/10.1080/00330120802211737

Collins, D., & Kearns, R. (2010). "It's a gestalt experience": Landscape values and development pressure in Hawke's Bay, New Zealand. *Geoforum*, *41*(3), 435–446. https://doi.org/10.1016/j.geoforum.2009.11.010

Collins, D., & Kearns, R. (2013). Place attachment and community activism at the coast: The case of Ngunguru, Northland. *New Zealand Geographer*, *69*(1), 39–51. https://doi.org/10.1111/nzg.12005

Coulton, C. J., Korbin, J., Chan, T., & Su, M. (2001). Mapping residents' perceptions of neighborhood boundaries: A methodological note. *American Journal of Community Psychology*, *29*(2), 371–383. https://doi.org/10.1023/A:1010303419034

Cousins, J., Power, W., Destegul, U., King, A., Trevethick, R., Weir, B., Blong, R., & Miliauskas, B. (2008). *Earthquake and tsunami losses from major earthquakes affecting the Wellington region*. Retrieved from http://www.aon.com/attachments/reinsurance/200812_ab_analytics_nz_tsunami.pdf

Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology, 19*(6), 426–441. https://doi.org/10.1002/casp.1004

Devine-Wright, P., & Batel, S. (2017). My neighbourhood, my country or my planet? The
influence of multiple place attachments and climate change concern on social
acceptance of energy infrastructure. *Global Environmental Change, 47*, 110–120.
https://doi.org/10.1016/j.gloenvcha.2017.08.003

Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of
restorative environments: A wind energy case study. *Journal of Environmental
Psychology*, *30*(3), 271–280. https://doi.org/10.1016/j.jenvp.2010.01.008

Devine-Wright, P., Price, J., & Leviston, Z. (2015). My country or my planet? Exploring the
influence of multiple place attachments and ideological beliefs upon climate change
attitudes and opinions. *Global Environmental Change*, *30*, 68–79.
https://doi.org/10.1016/j.gloenvcha.2014.10.012

Di Masso, A., Williams, D. R., Raymond, C. M., Buchecker, M., Degenhardt, B., Devine-
Wright, P., … von Wirth, T. (2019). Between fixities and flows: Navigating place
attachments in an increasingly mobile world. *Journal of Environmental Psychology*,
61, 125–133. https://doi.org/10.1016/j.jenvp.2019.01.006

Dooley, D., Catalano, R., Mishra, S., & Serxner, S. (1992). Earthquake preparedness:
Predictors in a community survey. *Journal of Applied Social Psychology*, *22*(6), 451–
470. https://doi.org/10.1111/j.1559-1816.1992.tb00984.x

Droseltis, O., & Vignoles, V. L. (2010). Towards an integrative model of place identification:
Dimensionality and predictors of intrapersonal-level place preferences. *Journal of
Environmental Psychology*, *30*(1), 23–34. https://doi.org/10.1016/j.jenvp.2009.05.006

Duncan, J. S., & Duncan, N. G. (2001). Sense of place as a positional good: Locating
Bedford in space and time. In P. C. Adams, S. Hoelscher, & K. E. Till (Eds.), *Textures
of Place* (pp. 41–54). Retrieved from https://www.jstor.org/stable/10.5749/j.ctttg77.8

Easthope, H. (2004). A place called home. *Housing, Theory and Society*, *21*(3), 128–138.
https://doi.org/10.1080/14036090410021360

Eccles, M. P., & Mittman, B. S. (2006). Welcome to Implementation Science. *Implementation
Science, 1*(1), 1, 1748-5908-1–1. https://doi.org/10.1186/1748-5908-1-1

Eisenman, D. P., Bazzano, A., Koniak-Griffin, D., Tseng, C., Lewis, M.-A., Lamb, K., &
Lehrer, D. (2014). Peer-mentored preparedness (PM-Prep): A new disaster
preparedness program for adults living independently in the community. *Intellectual
and Developmental Disabilities*, *52*(1), 49–59. https://doi.org/10.1352/1934-9556-
52.1.49

Eisenman, D. P., Glik, D., Gonzalez, L., Maranon, R., Zhou, Q., Tseng, C.-H., & Asch, S. M. (2009). Improving Latino disaster preparedness using social networks. *American Journal of Preventive Medicine*, *37*(6), 512–517. https://doi.org/10.1016/j.amepre.2009.07.022

Eiser, J., Bostrom, A., Burton, I., Johnston, D. M., McClure, J., Paton, D., … White, M. P. (2012). Risk interpretation and action: A conceptual framework for responses to natural hazards. *International Journal of Disaster Risk Reduction*, *1*, 5–16. https://doi.org/10.1016/j.ijdrr.2012.05.002

Enarson, E., Fothergill, A., & Peek, L. (2018). Gender and disaster: Foundations and new directions for research and practice. In H. Rodríguez, W. Donner, & J. E. Trainor (Eds.), *Handbook of Disaster Research* (pp. 205–223). Springer International Publishing. https://doi.org/10.1007/978-3-319-63254-4_11

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*(2), 175–191. https://doi.org/10.3758/BF03193146

Fischer, R., Ferreira, M. C., Assmar, E., Redford, P., Harb, C., Glazer, S., … Achoui, M. (2009). Individualism-collectivism as descriptive norms: Development of a subjective norm approach to culture measurement. *Journal of Cross-Cultural Psychology*, *40*(2), 187–213. https://doi.org/10.1177/0022022109332738

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York, NY: Psychology Press. https://doi.org/10.4324/9780203838020

Florek, M. (2011). No place like home: Perspectives on place attachment and impacts on city management. *Journal of Town & City Management, 1*(4), 346-354.

Florida, R., Mellander, C., & Stolarick, K. (2011). Beautiful places: The role of perceived aesthetic beauty in community satisfaction. *Regional Studies*, *45*(1), 33–48. https://doi.org/10.1080/00343404.2010.486784

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. https://doi.org/10.1111/asap.12076

Fothergill, A., & Peek, L. (2004). Poverty and disasters in the United States: A review of recent sociological findings. *Natural Hazards, 32*(1), 89–110. https://doi.org/10.1023/B:NHAZ.0000026792.76181.d9

Fried, M. (1963) Grieving for a lost home: The psychological costs of relocation. In L. Duhl (ed.), *The urban condition: people and policy in the metropolis* (pp. 359-379). Basic Books.

Gearing, R. E., El-Bassel, N., Ghesquiere, A., Baldwin, S., Gillies, J., & Ngeow, E. (2011). Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. *Clinical Psychology Review*, *31*(1), 79–88. https://doi.org/10.1016/j.cpr.2010.09.007

Geonet. (2020). *Recent quakes*. Retrieved April 6, 2020, from https://www.geonet.org.nz/earthquake

Glik, D. C., Eisenman, D. P., Zhou, Q., Tseng, C.-H., & Asch, S. M. (2014). Using the Precaution Adoption Process model to describe a disaster preparedness intervention among low-income Latinos. *Health Education Research*, *29*(2), 272–283. https://doi.org/10.1093/her/cyt109

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*(7), 493-503. https://doi.org/10.1037/0003-066X.54.7.493

Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73*(1), 186-199. https://doi.org/10.1037/0022-3514.73.1.186

Gould, K. A., Garcia, M. M., & Remes, J. A. C. (2016). Beyond "natural-disasters-are-not-natural": The work of state and nature after the 2010 earthquake in Chile. *Journal of Political Ecology*, *23*(1), 93-114. https://doi.org/10.2458/v23i1.20181

Guion, D. T., Scammon, D. L., & Borders, A. L. (2007). Weathering the storm: A social marketing perspective on disaster preparedness and response with lessons from Hurricane Katrina. *Journal of Public Policy & Marketing*, *26*(1), 20–32. https://doi.org/10.1509/jppm.26.1.20

Gustafson, P. (2001). Roots and routes: Exploring the relationship between place attachment and mobility. *Environment and Behavior*, *33*(5), 667–686. https://doi.org/10.1177/00139160121973188

Gustafson, P. (2014). Place attachment in an age of mobility. In L. C. Manzo, & P. Devine-Wright (Eds.), *Place attachment. Advances in theory, methods and applications* (pp. 154-164). Routledge.

Hagger, M. S., & Luszczynska, A. (2014). Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way

forward. *Applied Psychology: Health and Well-Being*, *6*(1), 1–47.
https://doi.org/10.1111/aphw.12017

Hagger, M. S., & Weed, M. (2019). Debate: Do interventions based on behavioral theory
work in the real world? *International Journal of Behavioral Nutrition and Physical
Activity*, *16*(36), 1-10. https://doi.org/10.1186/s12966-019-0795-4

Haldeman, T., & Turner, J. W. (2009). Implementing a community-based social marketing
program to increase recycling. *Social Marketing Quarterly*, *15*(3), 114–127.
https://doi.org/10.1080/15245000903154618

Hamburg, M. A., & Collins, F. S. (2010). The path to personalized medicine. *New England
Journal of Medicine*, *363*(4), 301–304. https://doi.org/10.1056/NEJMp1006304

Hamling, I. J., Hreinsdóttir, S., Clark, K., Elliott, J., Liang, C., Fielding, E., … Stirling, M.
(2017). Complex multifault rupture during the 2016 M_w 7.8 Kaikōura earthquake,
New Zealand. *Science*, *356*(6334), eaam7194.
https://doi.org/10.1126/science.aam7194

Hay, R. (1998). Sense of place in developmental context. *Journal of Environmental
Psychology, 18*(1), 5-29. https://doi.org/10.1006/jevp.1997.0060

Helsloot, I., & Ruitenberg, A. (2004). Citizen response to disasters: A survey of literature and
some practical implications. *Journal of Contingencies and Crisis Management, 12*(3),
98–111. https://doi.org/10.1111/j.0966-0879.2004.00440.x

Hernández, B., Hidalgo, M.C., & Ruiz, C. (2014). Theoretical and methodological aspects of
research on place attachment. In L. C. Manzo, & P. Devine-Wright (Eds.), *Place
attachment. Advances in theory, methods and applications* (pp. 154-164). Routledge.

Hernández, B., Hidalgo, M.C., Salazar-Laplace, M. E., & Hess, S. (2007). Place attachment
and place identity in natives and non-natives. *Journal of Environmental Psychology*,
27(4), 310–319. https://doi.org/10.1016/j.jenvp.2007.06.003

Hidalgo, M. C., & Hernández, B. (2001). Place attachment: Conceptual and empirical
questions. *Journal of Environmental Psychology, 21*(3), 273–281.
https://doi.org/10.1006/jevp.2001.0221

Hilhorst, D., & Bankoff, G. (2013). Introduction: Mapping vulnerability. In G. Bankoff, G.
Frerks, D. Hilhorst (Eds.), *Mapping Vulnerability: Disasters, Development and
People* (pp. 1-9). Routledge. https://doi.org/10.4324/9781849771924

Hine, D. W., Reser, J. P., Morrison, M., Phillips, W. J., Nunn, P., & Cooksey, R. (2014).
Audience segmentation and climate change communication: Conceptual and

methodological considerations. *WIREs Climate Change*, *5*(4), 441–459. https://doi.org/10.1002/wcc.279

Hinkle, D. E., Wiersma, W., & Jurs, S. G. (2003). *Applied statistics for the behavioral sciences* (Vol. 663). Houghton Mifflin College Division.

Hochheimer, C. J., Sabo, R. T., Krist, A. H., Day, T., Cyrus, J., & Woolf, S. H. (2016). Methods for evaluating respondent attrition in web-based surveys. *Journal of Medical Internet Research*, *18*(11), e301. https://doi.org/10.2196/jmir.6342

Hoeppe, P. (2016). Trends in weather related disasters – Consequences for insurers and society. *Weather and Climate Extremes*, *11*, 70–79. https://doi.org/10.1016/j.wace.2015.10.002

Insurance Council of New Zealand. (2020, January 12). *Cost of natural disasters*. https://www.icnz.org.nz/natural-disasters/cost-of-natural-disasters/

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., … von Wehrden, H. (2017). Human–nature connection: A multidisciplinary review. *Current Opinion in Environmental Sustainability, 26–27*, 106–113. https://doi.org/10.1016/j.cosust.2017.05.005

Joffe, H. (2003). Risk: From perception to social representation. *British Journal of Social Psychology, 42*(1), 55–73. https://doi.org/10.1348/014466603763276126

Joffe, H., Perez-Fuentes, G., Potts, H. W., & Rossetto, T. (2016). How to increase earthquake and home fire preparedness: The fix-it intervention. *Natural Hazards*, *84*(3), 1943–1965. https://doi.org/10.1007/s11069-016-2528-1

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 H. Joffe, T. Rossetto, & J. Adams (Eds.), *Cities at Risk: Living with Perils in the 21st Century* (Vol. 33, pp. 131–148). Springer. https://doi.org/10.1007/978-94-007-6184-1_8

Jorgensen, B. S., & Stedman, R. C. (2001). Sense of place as an attitude: Lakeshore owners attitudes towards their properties. *Journal of Environmental Psychology*, *21*(3), 233–248. https://doi.org/10.1006/jevp.2001.0226

Kelly, B., & Ronan, K. R. (2018). Preparedness for natural hazards: Testing an expanded education and engagement-enhanced social cognitive model. *Natural Hazards*, *91*(1), 19–35. https://doi.org/10.1007/s11069-017-3093-y

Kelman, I. (2020). Disaster by Choice: How our actions turn natural hazards into catastrophes. Oxford University Press.

Kelman, I., Gaillard, J. C., Lewis, J., & Mercer, J. (2016). Learning from the history of disaster vulnerability and resilience research and practice for climate change. *Natural Hazards*, *82*(1), 129–143. https://doi.org/10.1007/s11069-016-2294-0

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*(2), 501–529. https://doi.org/10.1007/s11069-012-0091-y

Kohn, S., Eaton, J. L., Feroz, S., Bainbridge, A. A., Hoolachan, J., & Barnett, D. J. (2012). Personal disaster preparedness: An integrative review of the literature. *Disaster Medicine and Public Health Preparedness*, *6*(3), 217–231. https://doi.org/10.1001/dmp.2012.47

Korkeila, K., Suominen, S., Ahvenainen, J., Ojanlatva, A., Rautava, P., Helenius, H., & Koskenvuo, M. (2001). Non-response and related factors in a nation-wide health survey. *European Journal of Epidemiology*, *17*(11), 991–999. https://doi.org/10.1023/a:1020016922473

Kristal, A. S., & Whillans, A. V. (2020). What we can learn from five naturalistic field experiments that failed to shift commuter behaviour. *Nature Human Behaviour*, *4*(2), 169–176. https://doi.org/10.1038/s41562-019-0795-z

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity*, *47*(4), 2025–2047. https://doi.org/10.1007/s11135-011-9640-9

Kruvand, M., & Bryant, F. B. (2015). Zombie apocalypse: Can the undead teach the living how to survive an emergency? *Public Health Reports*, *130*(6), 655–663. https://doi.org/10.1177/003335491513000615

Kumashiro, M., & Sedikides, C. (2005). Taking on board liability-focused information: Close positive relationships as a self-bolstering resource. *Psychological Science*, *16*(9), 732–739. https://doi.org/10.1111/j.1467-9280.2005.01603.x

Laczko, L. S. (2005). National and local attachments in a changing world system: Evidence from an international survey. *International Review of Sociology*, *15*(3), 517–528. https://doi.org/10.1080/03906700500272525

Lee, D., Hosanagar, K., & Nair, H. S. (2018). Advertising content and consumer engagement on social media: Evidence from Facebook. *Management Science, 64*(11), 5105–5131. https://doi.org/10.1287/mnsc.2017.2902

Lewicka, M. (2010). What makes neighborhood different from home and city? Effects of place scale on place attachment. *Journal of Environmental Psychology, 30*(1), 35–51. https://doi.org/10.1016/j.jenvp.2009.05.004

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology, 31*(3), 207–230. https://doi.org/10.1016/j.jenvp.2010.10.001

Lin, C.-C., & Lockwood, M. (2014). Forms and sources of place attachment: Evidence from two protected areas. *Geoforum, 53*, 74–81. https://doi.org/10.1016/j.geoforum.2014.02.008

MacDonald, E., Johnson, V., Gillies, M., & Johnston, D. (2017). The impact of a museum-based hazard education program on students, teachers and parents. *International Journal of Disaster Risk Reduction, 21*, 360–366. https://doi.org/10.1016/j.ijdrr.2017.01.010

Madill, A., Jordan, A., & Shirley, C. (2000). Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies. *British Journal of Psychology, 91*(1), 1–20. https://doi.org/10.1348/000712600161646

Maguire, B., & Hagan, P. (2007). Disasters and communities: Understanding social resilience. *Australian Journal of Emergency Management, 22*(2), 16–20.

Manzo, L. C. (2005). For better or worse: Exploring multiple dimensions of place meaning. *Journal of Environmental Psychology, 25*(1), 67–86. https://doi.org/10.1016/j.jenvp.2005.01.002

Manzo, L., & Devine-Wright, P. (Eds.). (2014). *Place attachment: Advances in theory, methods, and applications*. London ; New York: Routledge.

Mars, T., Ellard, D., Carnes, D., Homer, K., Underwood, M., & Taylor, S. J. C. (2013). Fidelity in complex behaviour change interventions: A standardised approach to evaluate intervention integrity. *BMJ Open, 3*(11), e003555. https://doi.org/10.1136/bmjopen-2013-003555

Mazumdar, S., & Mazumdar, S. (2004). Religion and place attachment: A study of sacred places. *Journal of Environmental Psychology, 24*(3), 385–397. https://doi.org/10.1016/j.jenvp.2004.08.005

McClure, J., Ferrick, M., Henrich, L., & Johnston, D. (2019). Risk judgments and social norms: Do they relate to preparedness after the Kaikōura earthquake? *Australasian Journal of Disaster and Trauma Studies, 23*(2), 41-51.

McClure, J., Spittal, M. J., Fischer, R., & Charleson, A. (2015). Why do people take fewer damage mitigation actions than survival actions? Other factors outweigh cost. *Natural Hazards Review, 16*(2), 1–8. https://doi.org/10.1061/(ASCE)NH.1527-6996.0000152

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*, 2011-2, 3-10.

McKenzie-Mohr, D. (2000). New ways to promote pro-environmental behavior: Promoting sustainable behavior: An introduction to community-based social marketing. *Journal of Social Issues*, *56*(3), 543–554. https://doi.org/10.1111/0022-4537.00183

McNeill, I. M., Dunlop, P. D., Heath, J. B., Skinner, T. C., & Morrison, D. L. (2013). Expecting the unexpected: Predicting physiological and psychological wildfire preparedness from perceived risk, responsibility, and obstacles. *Risk Analysis, 33*(10), 1829–1843. https://doi.org/10.1111/risa.12037

Meyer, R., & Kunreuther, H. (2017). *The ostrich paradox: Why we underprepare for disasters*. Wharton Digital Press.

Miceli, R., Sotgiu, I., & Settanni, M. (2008). Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. *Journal of Environmental Psychology*, 28, 164-173. https://doi.org/10.1016/j.jenvp.2007.10.006

Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From theory to intervention: Mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied Psychology*, *57*(4), 660–680. https://doi.org/10.1111/j.1464-0597.2008.00341.x

Mikulincer, M., Shaver, P. R., Gillath, O., & Nitzberg, R. A. (2005). Attachment, caregiving, and altruism: Boosting attachment security increases compassion and helping. *Journal of Personality and Social Psychology*, *89*(5), 817–839. https://doi.org/10.1037/0022-3514.89.5.817

Mileti, D. S., & Peek, L. (2002). Understanding individual and social characteristics in the promotion of household disaster preparedness. In T. Dietz, & P. C. Stern (Eds.), *New tools for environmental protection: Education, information, and voluntary measures*,

(pp. 127–132). Washington, DC: The National Academies Press. https://doi.org/10.17226/10401

Miller, T. R., Bergen, G., Ballesteros, M. F., Bhattacharya, S., Gielen, A. C., & Sheppard, M. S. (2014). Increasing smoke alarm operability through theory-based health education: A randomised trial. *Journal of Epidemiology and Community Health*, *68*(12), 1168–1174. https://doi.org/10.1136/jech-2014-204182

Ministry of Civil Defence and Emergency Management. (2007). *National Hazardscape Report*. Wellington, New Zealand: Officials' Committee for Domestic and External Security Coordination Department of the Prime Minister and Cabinet. Retrieved from https://www.civildefence.govt.nz/resources/national-hazardscape-report/

Ministry of Civil Defence and Emergency Management. (2019). *Disaster Preparedness Survey 2019*. Retrieved from https://www.civildefence.govt.nz/assets/Uploads/public-education/2019-Civil-Defence-Disaster-Preparedness-report.pdf

Mishra, S., Mazumdar, S., & Suar, D. (2010). Place attachment and flood preparedness. *Journal of Environmental Psychology*, *30*(2), 187–197. https://doi.org/10.1016/j.jenvp.2009.11.005

Morgan, P. (2010). Towards a developmental theory of place attachment. *Journal of Environmental Psychology, 30*(1), 11–22. https://doi.org/10.1016/j.jenvp.2009.07.001

Mumo, R. K., & Watt, R. (2016). The dual insurance model and its implications for insurance demand and supply post-Christchurch earthquakes in New Zealand. *Insurance and Risk Management, 83*(3-4), 135-166.

Najafi, M., Ardalan, A., Akbarisari, A., Noorbala, A. A., & Elmi, H. (2017). The theory of planned behavior and disaster preparedness. *PLoS Currents, 9*. https://doi.org/10.1371/currents.dis.4da18e0f1479bf6c0a94b29e0dbf4a72

Newell, R., & Canessa, R. (2018). From sense of place to visualization of place: Examining people-place relationships for insight on developing geovisualizations. *Heliyon, 4*(2), e00547. https://doi.org/10.1016/j.heliyon.2018.e00547

Noar, S. M., Benac, C. N., & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behaviour change interventions. *Psychological Bulletin*, *133*(4), 673–693. https://doi.org/10.1037/0033-2909.133.4.673

Noy, I. (2015). Comparing the direct human impact of natural disasters for two cases in 2011: The Christchurch earthquake and the Bangkok flood. *International Journal of Disaster Risk Reduction, 13*, 61–65. https://doi.org/10.1016/j.ijdrr.2015.03.009

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity, 41*(5), 673–690. https://doi.org/10.1007/s11135-006-9018-6

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

Pardini, A. U., & Katzev, R. D. (1983). The effect of strength of commitment on newspaper recycling. *Journal of Environmental Systems*, *13*(3), 245–254. http://dx.doi.org/10.2190/6PN9-MXFP-3BFF-CHHB

Paton, D. (2003). Disaster preparedness: A social-cognitive perspective. *Disaster Prevention and Management*, *12*(3), 210–216. https://doi.org/10.1108/09653560310480686

Paton, D. (2013). Disaster resilient communities: developing and testing an all-hazards theory. *Journal of Integrated Disaster Risk Management, 3*(1), 1-17. https://doi.org/10.5595/idrim.2013.0050

Paton, D. (2019). Disaster risk reduction: Psychological perspectives on preparedness. *Australian Journal of Psychology*, *71*(4), 327–341. https://doi.org/10.1111/ajpy.12237

Paton, D., Bajek, R., Okada, N., & McIvor, D. (2010). Predicting community earthquake preparedness: A cross-cultural comparison of Japan and New Zealand. *Natural Hazards*, *54*(3), 765–781. https://doi.org/10.1007/s11069-010-9500-2

Paton, D., Bürgelt, P. (2017). Facilitating social-environmental adaptation in environmental hazards: Towards a universal theory. In J. A. Daniels (Ed.), *Advances in environmental research* (pp. 35–58). New York, NY: Nova Science Publishers.

Paton, D., Bürgelt, P., & Prior, T. D. (2008). Living with bushfire risk: Social and environmental influences on preparedness. *Australian Journal of Emergency Management*, *23*(3), 41-48.

Paton, D., & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management*, *10*(4), 270–277. https://doi.org/10.1108/EUM0000000005930

Paton, D., & Johnston, D. (2008). *A means-end chain theory analysis of hazard cognitions and preparedness*. Wellington, New Zealand: GNS Science.

Perez-Fuentes, G., & Joffe, H. (2015). An intervention to increase earthquake and fire preparedness. In C. A. Brebbia (Ed.), *WIT Transactions on The Built Environment* (pp. 1183–1194). WIT Press. https://doi.org/10.2495/SD151022

Podlaha, A., Bowen, S., & Lörinc, M. (2019). *Weather Climate & Catastrophe Insight: 2019 Annual Report*. Retrieved from https://www.aon.com/global-weather-catastrophe-natural-disasters-costs-climate-change-2019-annual-report/index.html

Proshansky, H. M., Fabian, A. K., & Kaminoff, R. (1983). Place-identity: Physical world socialization of the self. *Journal of Environmental Psychology*, *3*(1), 57–83. https://doi.org/10.1016/S0272-4944(83)80021-8

ProQuest. (2020). Retrieved May 15, 2020, from www.proquest.com

Qian, J., Zhu, H., & Liu, Y. (2011). Investigating urban migrants' sense of place through a multi-scalar perspective. *Journal of Environmental Psychology*, *31*(2), 170–183. https://doi.org/10.1016/j.jenvp.2011.01.002

Qualtrics. (2020). Qualtrics XM. Provo, UT.

Rapport, F., Clay-Williams, R., Churruca, K., Shih, P., Hogden, A., & Braithwaite, J. (2018). The struggle of translating science into action: Foundational concepts of implementation science. *Journal of Evaluation in Clinical Practice, 24*(1), 117–126. https://doi.org/10.1111/jep.12741

Ratcliffe, E., & Korpela, K. M. (2018). Time- and self-related memories predict restorative perceptions of favorite places via place identity. *Environment and Behavior*, *50*(6), 690–720. https://doi.org/10.1177/0013916517712002

Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community, and environmental connections. *Journal of Environmental Psychology*, *30*(4), 422–434. https://doi.org/10.1016/j.jenvp.2010.08.002

Reese, G., Oettler, L. M. S., & Katz, L. C. (2019). Imagining the loss of social and physical place characteristics reduces place attachment. *Journal of Environmental Psychology, 65,* 1-6. https://doi.org/10.1016/j.jenvp.2019.101325

Riemer, J. W. (2000). Job relocation, sources of stress, and sense of home. *Community, Work & Family*, *3*(2), 205–217. https://doi.org/10.1080/713658901

Riger, S., & Lavrakas, P. J. (1981). Community ties: Patterns of attachment and social interaction in urban neighborhoods. *American Journal of Community Psychology, 9*(1), 55–66. https://doi.org/10.1007/BF00896360

Ringel, N. B., & Finkelstein, J. C. (1991). Differentiating neighborhood satisfaction and neighborhood attachment among urban residents. *Basic and Applied Social Psychology, 12*(2), 177–193. https://doi.org/10.1207/s15324834basp1202_4

Rioux, L., Scrima, F., & Werner, C. M. (2017). Space appropriation and place attachment: University students create places. *Journal of Environmental Psychology*, *50*, 60–68. https://doi.org/10.1016/j.jenvp.2017.02.003

Rosseel, Y. (2012). Lavaan: An R package for structural equation modelling. *Journal of Statistical Software*, *48*(2), 1–36.

Russell, L. A., Goltz, J. D., & Bourque, L. B. (1995). Preparedness and hazard mitigation actions before and after two earthquakes. Environment and Behavior, 27(6), 744–770. https://doi.org/10.1177/0013916595276002

Ryan, C., & Aicken, M. (2010). The destination image gap – visitors' and residents' perceptions of place: Evidence from Waiheke Island, New Zealand. *Current Issues in Tourism*, *13*(6), 541–561. https://doi.org/10.1080/13683500903215008

Said, A. M., Ahmadun, F., Mahmud, A. R., & Abas, F. (2011). Community preparedness for tsunami disaster: A case study. *Disaster Prevention and Management: An International Journal*, *20*(3), 266–280. https://doi.org/10.1108/09653561111141718

Scannell, L., & Gifford, R. (2010a). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology, 30*(1), 1–10. https://doi.org/10.1016/j.jenvp.2009.09.006

Scannell, L., & Gifford, R. (2010b). The relations between natural and civic place attachment and pro-environmental behavior. *Journal of Environmental Psychology, 30*(3), 289–297. https://doi.org/10.1016/j.jenvp.2010.01.010

Scannell, L., & Gifford, R. (2014). Comparing the theories of interpersonal and place attachment. In L. C. Manzo, & P. Devine-Wright (Eds.), *Place attachment. Advances in theory, methods and applications* (pp. 23-36). Routledge.

Scannell, L., & Gifford, R. (2017a). Place attachment enhances psychological need satisfaction. *Environment and Behavior*, *49*(4), 359–389. https://doi.org/10.1177/0013916516637648

Scannell, L., & Gifford, R. (2017b). The experienced psychological benefits of place attachment. *Journal of Environmental Psychology*, *51*, 256–269. https://doi.org/10.1016/j.jenvp.2017.04.001

Schroder, C. J. (2008). Attachment to place in New Zealand. *New Zealand Population Review, 33/34*, 177-212.

Selinger, E., & Whyte, K. (2011). Is there a right way to nudge? The practice and ethics of choice architecture. *Sociology Compass*, *5*(10), 923–935. https://doi.org/10.1111/j.1751-9020.2011.00413.x

Shamai, S. (1991). Sense of place: An empirical measurement. *Geoforum*, *22*(3), 347–358. https://doi.org/10.1016/0016-7185(91)90017-K

Sheeran, P., Klein, W. M. P., & Rothman, A. J. (2017). Health behavior change: Moving from observation to intervention. *Annual Review of Psychology*, *68*(1), 573–600. https://doi.org/10.1146/annurev-psych-010416-044007

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and Personality Psychology Compass*, *10*(9), 503–518. https://doi.org/10.1111/spc3.12265

Sigmon, S. T., Whitcomb, S. R., & Snyder, C. R. (2002). Psychological home. In A. T. Fisher., C. C. Sonn., & B. J. Bishop (Eds.), *Psychological Sense of Community* (pp. 25–41). https://doi.org/10.1007/978-1-4615-0719-2_2

Skurka, C., Quick, B. L., Reynolds-Tylus, T., Short, T., & Bryan, A. L. (2018). An evaluation of a college campus emergency preparedness intervention. *Journal of Safety Research*, *65*, 67–72. https://doi.org/10.1016/j.jsr.2018.02.003

Slater, M. D., Kelly, K. J., & Thackeray, R. (2006). Segmentation on a shoestring: Health audience segmentation in limited-budget and local social marketing interventions. *Health Promotion Practice*, *7*(2), 170–173. https://doi.org/10.1177/1524839906286616

Slovic, P. (1987). Perception of risk. *Science*, *236*(4799), 280–285. https://doi.org/10.1126/science.3563507

Spittal, M. J., McClure, J., Siegert, R. J., & Walkey, F. H. (2008). Predictors of two types of earthquake preparation: Survival activities and mitigation activities. *Environment and Behavior, 40*(6), 798–817. https://doi.org/10.1177/0013916507309864

Spittal, M. J., Walkey, F. H., McClure, J., Siegert, R. J., & Ballantyne, K. E. (2006). The Earthquake Readiness Scale: The development of a valid and reliable unifactorial measure. *Natural Hazards, 39*(1), 15–29. https://doi.org/10.1007/s11069-005-2369-9

Stedman, R. C. (2003). Is it really just a social construction?: The contribution of the physical environment to sense of place. *Society & Natural Resources*, *16*(8), 671–685. https://doi.org/10.1080/08941920309189

Stedman, R. C., Beckley, T., Wallace, S., & Ambard, M. (2004). A picture and 1000 Words: Using resident-employed photography to understand attachment to high amenity

places. *Journal of Leisure Research*, *36*(4), 580–606.
https://doi.org/10.1080/00222216.2004.11950037

Thomas, D. S., Phillips, B. D., Lovekamp, W. E., & Fothergill, A. (2013). *Social vulnerability to disasters*. CRC Press.

Tierney, K. J., Lindell, M. K., & Perry, R. W. (2001). Facing the unexpected: Disaster preparedness and response in the United States. Joseph Henry Press.

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, *117*(2), 440–463. https://doi.org/10.1037/a0018963

Tuan, Y. F. (1977). *Space and Place: The Perspective of Experience*. University of Minnesota Press.

Twigg, J. (2013). Risk Perception, Public Education and Disaster Risk Management. In H. Joffe, T. Rossetto, & J. Adams (Eds.), *Cities at Risk: Living with Perils in the 21st Century* (Vol. 33, pp. 171–182). https://doi.org/10.1007/978-94-007-6184-1_10

Twigger-Ross, C. L., & Uzzell, D. L. (1996). Place and identity processes. *Journal of Environmental Psychology*, *16*(3), 205–220. https://doi.org/10.1006/jevp.1996.0017

UNISDR. (2015). *Sendai framework for disaster risk reduction 2015–2030*. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction. Retrieved from https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

UNISDR. (2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction. Retrieved from https://www.preventionweb.net/files/50683_ oiewgreportenglish.pdf

van Valkengoed, A. M., & Steg, L. (2019). Meta-analyses of factors motivating climate change adaptation behaviour. *Nature Climate Change*, *9*(2), 158–163. https://doi.org/10.1038/s41558-018-0371-y

Vaske, J. J., Beaman, J., & Sponarski, C. C. (2017). Rethinking internal consistency in Cronbach's Alpha. *Leisure Sciences, 39*(2), 163–173. https://doi.org/10.1080/01490400.2015.1127189

Vaske, J. J., & Kobrin, K. C. (2001). Place attachment and environmentally responsible behavior. *Journal of Environmental Education, 32*(4), 16–21. https://doi.org/10.1080/00958960109598658

Verrucci, E., Perez-Fuentes, G., Rossetto, T., Bisby, L., Haklay, M., Rush, D., … Joffe, H. (2016). Digital engagement methods for earthquake and fire preparedness: A review. *Natural Hazards*, *83*(3), 1583–1604. https://doi.org/10.1007/s11069-016-2378-x

Vogenberg, F. R., Isaacson Barash, C., & Pursel, M. (2010). Personalized Medicine. *Pharmacy and Therapeutics*, *35*(10), 560–576.

Wachinger, G., Renn, O., Begg, C., & Kuhlicke, C. (2013). The risk perception paradox — Implications for governance and communication of natural hazards. *Risk Analysis*, *33*(6), 1049–1065. https://doi.org/10.1111/j.1539-6924.2012.01942.x

Wallis, A., Fischer, R., Abrahamse, W. (2020) *Place attachment and disaster preparedness: Examining the role of place scale and preparedness type*. Manuscript submitted for publication.

Webb, T. L., & Paschal, S. (2006). Does changing behavioral intentions engender behaviour change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, *132*(2), 249–268. http://dx.doi.org.helicon.vuw.ac.nz/10.1037/0033-2909.132.2.249

Weigel, R. H., Vernon, D. T. A., & Tognacci, L. N. (1974). Specificity of the attitude as a determinant of attitude-behavior congruence. *Journal of Personality and Social Psychology, 30*(6), 724–728. https://doi.org/10.1037/h0037540

Welton-Mitchell, C., James, L. E., Khanal, S. N., & James, A. S. (2018). An integrated approach to mental health and disaster preparedness: A cluster comparison with earthquake affected communities in Nepal. *BMC Psychiatry, 18,* 1-14. https://doi.org/10.1186/s12888-018-1863-z

White, D. D., Virden, R. J., & van Riper, C. J. (2008). Effects of place identity, place dependence, and experience-use history on perceptions of recreation impacts in a natural setting. *Environmental Management, 42*(4), 647–657. https://doi.org/10.1007/s00267-008-9143-1

Wiles, J. L., Allen, R. E. S., Palmer, A. J., Hayman, K. J., Keeling, S., & Kerse, N. (2009). Older people and their social spaces: A study of well-being and attachment to place in Aotearoa New Zealand. *Social Science & Medicine*, *68*(4), 664–671. https://doi.org/10.1016/j.socscimed.2008.11.030

Williams, D. R. (2014). Making sense of 'place': Reflections on pluralism and positionality in place research. *Landscape and Urban Planning*, *131*, 74–82. https://doi.org/10.1016/j.landurbplan.2014.08.002

Williams, D. R., Patterson, M. E., & Roggenbuck, J. W. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences*, *14*(1), 29–46. https://doi.org/10.1080/01490409209513155

Williams, D. R., & Roggenbuck, J. W. (1989, October). *Measuring place attachment: Some preliminary results*. Paper presented at NRPA Symposium on Leisure Research, San, Antonio, TX.

Williams, D. R., & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. *Forest Science*, *49*(6), 830-840. https://doi.org/10.1093/forestscience/49.6.830

Windsong, E. A. (2010). There is no place like home: Complexities in exploring home and place attachment. *The Social Science Journal*, *47*(1), 205–214. https://doi.org/10.1016/j.soscij.2009.06.009

Xu, D., Peng, L., Liu, S., & Wang, X. (2018). Influences of risk perception and sense of place on landslide disaster preparedness in Southwestern China. *International Journal of Disaster Risk Science*, *9*(2), 167–180. http://doi.org /10.1007/s13753-018-0170-0

Yasunari, T., Nozawa, M., Nishio, R., Yamamoto, A., & Takami, Y. (2011). Development and evaluation of 'disaster preparedness' educational programme for pregnant women. *International Nursing Review*, *58*(3), 335–340. https://doi.org/10.1111/j.1466-7657.2011.00919.x

Zhang, F., Tanupabrungsun, S., Hemsley, J., Robinson, J. L., Semaan, B., Bryant, L., … Hegde, Y. (2017). Strategic temporality on social media during the general election of the 2016 U.S. presidential campaign. *Proceedings of the 8th International Conference on Social Media & Society*, 1–10. https://doi.org/10.1145/3097286.3097311

Appendix A: Supplementary Materials for Studies 1 & 5[6]

Study 1 Information & Consent[7]

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

"Understanding why people in Wellington prepare for natural disasters"
Ethics Application ID number: 0000025441

What is the purpose of this research?

This research will help us to understand why people in Wellington do and do not prepare for natural disasters, including their beliefs about whether it's a common and approved behaviour.

Who is conducting the research?

We are a team of researchers in the School of Psychology at Victoria University of Wellington. Dr Taciano Milfont and A.Prof Ron Fischer are the primary supervisors of this project. Prof John McClure and Dr Wokje Abrahamse are secondary supervisors. 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 respond to a range of different questions such as "Where you live, how likely is it that a natural disaster will occur in the following five years?" as well as letting us know what preparations you've made, and which ones you intend to do.

Some questions will ask you about your previous or potential future experiences of natural disasters which might cause emotional discomfort. You do not have to answer these questions if you are concerned about how they will make you feel.

We will also ask you for some demographic information e.g., age, income, ethnicity. This is so that we can have a deeper understanding of the additional factors that may impact on natural disaster preparation.

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[6] Data collected from Study 1 was also used in Study 5

[7] Data for Study 1 was collected as part of a larger collaborative survey with another PhD student (different research questions). All data and analyses presented in this thesis are mine alone and have not been analysed, published, or presented by anyone else

We anticipate that the survey will take you no more than 15 to 20 minutes to complete. During the research you are free to withdraw at any point before your survey has been completed.

As a token of appreciation, you will be given the opportunity to go into the draw for one of three $100 supermarket gift cards.

Privacy and Confidentiality

This survey is completely confidential. We want to make your responses unidentifiable so please do not enter any identifying information in the text boxes. We will keep your survey responses 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 the researchers at Victoria University of Wellington.

At the end of the survey, you will have the option to provide your email address to enter the prize draw. This information will be kept separate from the survey data so that your responses cannot be linked to you. Email addresses will be held securely on a password-protected database and destroyed immediately after prizes have been allocated (approximately 2 weeks after the survey closes).

What happens to the information that you provide?

The overall findings will form part of two PhD theses and/or be published in scientific journals. If you would like to know the results of this study, they will be available approximately August 2018 through A. Prof Ronald Fischer's research lab website (mindcultureevolution.com).

If you have further questions or concerns you would like answered before taking part in the survey, you can contact the researchers at the email addresses below.

Thank you for considering participation in this research.

I have read the information about this research. I agree to participate in this research. By participating I confirm that I am over the age of 18. I understand that I am able to cease participating and have my data excluded by closing this browser window at any time.

☐ Yes, I agree to participate

☐ No, I do not want to participate

Study 1 Measures

The key measures from Study 1 are presented below. The full survey (exported from Qualtrics) is available to view on Open Science Framework: https://osf.io/hv94t/

Disaster preparedness behaviours:

Please indicate which of these preparations you or someone in your household have made for the specific purpose of a natural disaster. If you've done one of these in the past but can no longer benefit from it (e.g., stored food years ago which you've since thrown out) please respond 'No'. If you have done part of the action (e.g., purchased a torch but not a battery-powered radio) please respond 'Partly'.

	Yes	No	Partly	Unsure	Not applicable
Store water	O	O	O	O	O
Store non-perishable food	O	O	O	O	O
Make an emergency kit	O	O	O	O	O
Make an emergency plan (e.g., knowing where to meet family)	O	O	O	O	O
Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	O	O	O	O	O
Purchase items to use if power is lost such as a torch, radio, or gas cooker	O	O	O	O	O

	Yes	No	Partly	Unsure	Not applicable
Purchase a water tank	O	O	O	O	O
Cloud-store important documents and/or photos on an internet server	O	O	O	O	O
Purchase natural disaster insurance	O	O	O	O	O
Seek out information about the different natural hazard risks posed to my home	O	O	O	O	O
Have the strength of my building checked (or ask landlord to do the same)	O	O	O	O	O
Fasten tall furniture to the wall	O	O	O	O	O

	Yes	No	Partly	Unsure	Not applicable
Secure movable objects in my home (such as computers and TVs)	O	O	O	O	O
Strengthen my house/its foundations (or ask landlord to do the same)	O	O	O	O	O
Ensure that heavy objects are stored on the floor and at the bottom of cupboards	O	O	O	O	O
Identify people in my neighbourhood who need checking up on in the event of a natural disaster	O	O	O	O	O
Store enough emergency supplies to help others not in my household	O	O	O	O	O
Volunteer my time to help my community in the event of a disaster e.g., Community Emergency Hubs	O	O	O	O	O

Disaster preparedness intentions:

For the preparation actions you have NOT taken, please indicate if you intend to do them.

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Store water	O	O	O	O	O
Store non-perishable food	O	O	O	O	O
Make an emergency kit	O	O	O	O	O
Make an emergency plan (e.g., knowing where to meet family)	O	O	O	O	O
Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	O	O	O	O	O
Purchase items to use if power is lost such as a torch, radio, or gas cooker	O	O	O	O	O

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Purchase a water tank	O	O	O	O	O
Cloud-store important documents and/or photos on an internet server	O	O	O	O	O
Purchase natural disaster insurance	O	O	O	O	O
Seek out information about the different natural hazard risks posed to my home	O	O	O	O	O
Have the strength of my building checked (or ask landlord to do the same)	O	O	O	O	O
Fasten tall furniture to the wall	O	O	O	O	O

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Secure movable objects in my home (such as computers and TVs)	O	O	O	O	O
Strengthen my house/its foundations (or ask landlord to do the same)	O	O	O	O	O
Ensure that heavy objects are stored on the floor and at the bottom of cupboards	O	O	O	O	O
Identify people in my neighbourhood who need checking up on in the event of a natural disaster	O	O	O	O	O
Store enough emergency supplies to help others not in my household	O	O	O	O	O
Volunteer my time to help my community in the event of a disaster e.g., Community Emergency Hubs	O	O	O	O	O

House attachment:

How long have you lived in your current **house/apartment/unit/townhouse**?

Months:	
Years:	

"Attachment" is our emotional bond to certain people, things, or places. Please list all of the different ways in which you consider yourself attached to your house. If you feel no emotional bond to your house, please list your reasons.

The questions that follow assess your feelings and thoughts about the house that you currently live in.

Please think about and answer each question separately, and as accurately as possible.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I feel that my house is a part of me	O	O	O	O	O	O	O
I feel that I can really be myself in my house	O	O	O	O	O	O	O
My house is my favourite place to be	O	O	O	O	O	O	O
I really miss my house when I'm away from it for too long	O	O	O	O	O	O	O
My house is not a good place to do the things I most like to do	O	O	O	O	O	O	O
As far as I'm concerned, there are better places to be than in my house	O	O	O	O	O	O	O

Neighbourhood attachment:

"Attachment" is our emotional bond to certain people, things, or places. Please list all of the different ways in which you consider yourself attached to your neighbourhood. If you feel no emotional bond to your neighbourhood, please list your reasons.

The questions that follow assess your feelings and thoughts about the neighbourhood that you currently live in. Please think about and answer each question separately, and as accurately as possible.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I feel that my neighbourhood is a part of me	○	○	○	○	○	○	○
I feel that I can really be myself in my neighbourhood	○	○	○	○	○	○	○
My neighbourhood is my favourite place to be	○	○	○	○	○	○	○
I really miss my neighbourhood when I'm away from it for too long	○	○	○	○	○	○	○
My neighbourhood is not a good place to do the things I most like to do	○	○	○	○	○	○	○
As far as I'm concerned, there are better places to be than in my neighbourhood	○	○	○	○	○	○	○

City attachment:

How long have you lived in **Wellington**?

Months:	
Years:	

"Attachment" is our emotional bond to certain people, things, or places. Please list all of the different ways in which you consider yourself attached to Wellington. If you feel no emotional bond to Wellington, please list your reasons.

The questions that follow assess your feelings and thoughts about Wellington region. Please think about and answer each question separately, and as accurately as possible.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I feel that Wellington is a part of me	O	O	O	O	O	O	O
I feel that I can really be myself in Wellington	O	O	O	O	O	O	O
Wellington is my favourite place to be	O	O	O	O	O	O	O
I really miss Wellington when I'm away from it for too long	O	O	O	O	O	O	O
Wellington is not a good place to do the things I most like to do	O	O	O	O	O	O	O
As far as I'm concerned, there are better places to be than in Wellington	O	O	O	O	O	O	O

Country attachment:

How long have you lived in **New Zealand**?

Months:	
Years:	

"Attachment" is our emotional bond to certain people, things, or places. Please list all of the different ways in which you consider yourself attached to New Zealand. If you feel no emotional bond to New Zealand, please list your reasons.

The questions that follow assess your feelings and thoughts about New Zealand. Please think about and answer each question separately, and as accurately as possible.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I feel that New Zealand is a part of me	○	○	○	○	○	○	○
I feel that I can really be myself in New Zealand	○	○	○	○	○	○	○
New Zealand is my favourite place to be	○	○	○	○	○	○	○
I really miss New Zealand when I'm away from it for too long	○	○	○	○	○	○	○
New Zealand is not a good place to do the things I most like to do	○	○	○	○	○	○	○
As far as I'm concerned, there are better places to be than in New Zealand	○	○	○	○	○	○	○

Study 1 Debrief

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

"Understanding why people in Wellington prepare for natural disasters"

Thank you for participating in this research.

This study examines natural disaster preparation in Wellington. It explores the different barriers that might contribute to people not preparing, as well as other related factors such as experience and perceived risk. One goal of this survey is to understand the reasons why people do or do not prepare for natural disasters in Wellington. This will help us to understand what behaviours need targeting and how to go about targeting them.

Some participants in this survey answered questions about place attachment (emotional bond to a place), while others answered questions about the effectiveness and difficulty of preparing for a disaster. Previous research has shown that these factors, as well as social norms (what behaviours are common and desirable in a social group), contribute to disaster preparation and mitigation. The information we collect in this survey will help us to understand if we can use these factors to purposefully increase disaster preparation.

We hope that the information collected in this survey will help us to construct interventions to encourage Wellingtonians to prepare more for natural disasters. . Should these interventions be successful, they can then be applied to a wider population through advising and working with relevant organizations such as the EQC, Civil Defence, and local councils.

Study 3 & 4 Information and Consent

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

Application ID Number: 0000026881

Amanda Wallis	Prof Ronald Fischer	Dr Wokje Abrahamse
PhD Student	Primary Supervisor	Secondary Supervisor

"Understanding and increasing disaster preparedness in Wellington"

Thank you for considering taking part in our research. We are interested in understanding predictors of disaster preparation here in Wellington, and ways of increasing this preparedness, so that we may be better prepared as a community. Whether you have made any preparations or not, we value your perspective and hope you will consider completing this survey.

[Please note that this survey has two parts. You are welcome to complete just this survey (Part 1). When you have finished, you will be asked if you are willing to complete a shorter follow-up survey (Part 2) sent out via email in approximately two weeks.] Study 4 Time 1

Who is conducting the research?

The lead for this research project is Amanda Wallis, PhD student in the School of Psychology at Victoria University of Wellington (VUW). Professor Ronald Fischer and Dr Wokje Abrahamse are supervising this research project and also conduct research at VUW within the School of Psychology and the School of Geography, Environment and Earth Sciences respectively.

This research has been approved by the Victoria University of Wellington Human Ethics Committee (RMP0000026881). If you have any concerns about the ethical conduct of the research you may contact the Victoria University HEC Convener.

What is involved if you agree to participate?

- You will be asked to answer a range of different questions about how you think about disasters, previous and future disaster experiences, preparations you have made, and intentions to prepare.
- *[You will be asked to provide some demographic information e.g., age, income, ethnicity. This is so that we can have a deeper understanding of the additional factors that may impact on natural hazard preparation. You may skip any questions that you do not feel comfortable answering.*

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[8] Data collected from Study 4 (Time 1) also used in Study 2 and Study 6

- *You may be asked to visualise a place and describe its characteristics. You may also be asked to visualise what impact a disaster might have.]* *Study 3 and Study 4 (Time 1)*
- Some of these questions or tasks might cause involve emotional discomfort and you do not have to complete any questions or tasks if you are concerned about how they will make you feel.
- [Some example questions include *"How likely is it that a disaster will occur in the following five years?"* and *"Have you or someone close to you been harmed in a past disaster?"]* *Study 3 and Study 4 (Time 1)*

[We anticipate that this survey will take up to 30 minutes to complete. During the research you are free to withdraw at any point before your survey has been completed.] *Study 3*

[We anticipate that this survey will take approximately 15 [5-10] minutes to complete. During the research you are free to withdraw at any point before your survey has been completed.

As a token of appreciation, you will be given the opportunity to go into the draw for one of fifteen $50 supermarket gift cards (with an additional entry given to those who participate in the follow-up survey). [As a token of appreciation, you will be given the opportunity to add a second entry into our prize draw for one of fifteen $50 supermarket gift cards.] If you provide your email address to enter this prize draw, this information will be collected separately and will not be able to be linked to the responses you gave in this survey.] *Study 4*

Privacy and Confidentiality

[This survey is completely confidential, so only the researchers will know the identities of the research participants during data collection. You will be identifiable by email address only (should you choose to provide this information) and this information will be held securely on a password-protected computer. Once data collection is complete, and all prize winners have been notified, approximately six [four] weeks from now, all identifiable information will be destroyed.] Study 4

[This survey is completely confidential, so only the researchers will know the identities of the research participants during data collection. Any identifiable information will be held securely on a password-protected computer and once data collection is complete, all identifiable information will be destroyed.] *Study 3*

An electronic version of the aggregated data used for analyses will remain indefinitely in the custody of the researchers at Victoria University of Wellington. Data will be stored securely on a password-protected computer. This data will not contain any identifying information.

In accordance with the requirements of some scientific journals and organizations, and in the interest of conducting open science, the de-identified, aggregated data collected in this research project may be shared with other researchers, or on open science platforms such as Open Science Framework (OSF).

What happens to the information that you provide?

The overall findings will form part of a PhD thesis, and/or be published in scientific journals, presented at academic conferences, and/or grant applications, and/or be summarised and reported in media releases and/or social media posts by relevant researchers and organizations.

If you would like to know the results of this study, they will be available in approximately ten [eight] *Study 4 Time 2* weeks through Prof Ronald Fischer's research lab website (www.mindcultureevolution.com).

Thank you again for considering participation in this research.

I have read the above information and hereby give my consent to participate in this research. I understand that my responses will be kept confidential and that I can withdraw from the study at any point. [*I understand that it is my choice to provide my email address for the purpose of [participating in a follow-up survey, or] entering the prize draw, I understand that this identifying information may be used to collate the data from this research, at which point it will then be destroyed.]* *Study 4* I understand that all identifying information will either be destroyed or stored securely, as explained in the information provided above.

By participating I confirm that I am 18 years or older.

□ Yes, I agree to participate

□ No, I do not want to participate

Study 3 & 4 Recruitment Messaging

Online recruitment message (Study 4,Time 1):

Note: this message may have been abbreviated or adjusted by relevant stakeholders or organisations who chose to share this survey link to their social media audience

Kia ora koutou! Do you live in Wellington? Whether you've done some disaster preparation - or none at all - your input is needed! Through collaboration with other researchers at Victoria University of Wellington, your response will help us to better understand Wellingtonians and how to increase preparedness in our unique region. Participation will take approximately 15 minutes and, to thank you for your participation, you'll be able to enter to win one of fifteen $50 supermarket vouchers. If you are 18 years or older and currently live in the urban Wellington region, please follow the link below to learn more and get started:

Email recruitment message (Study 4 Time 2):

Note: this message was sent directly to participants from the Study 4 (Time 1) who provided consent to be contacted again for a follow-up survey (Time 2)

Kia ora koutou,

I am a PhD student from Victoria University of Wellington and I want to thank you for recently participating in our research into natural hazard preparedness. When you completed our last survey you indicated that you were willing to be contacted again for a follow-up survey. This survey is shorter in length and will take approximately 5-10 mins to complete.

This follow-up survey is crucial for our understanding of how and why people in Wellington prepare for natural hazards, and will allow for examination of what factors may actually *cause* preparedness. This is an important step for increasing preparedness in Wellington and helping our region to survive and thrive in response to natural hazard risk.

As a thank you for adding your valued perspective to our study, you will be given the opportunity to add an additional entry into the prize draw for one of fifteen $50 supermarket vouchers.

Please follow this link to the survey: xxxxx

Thank you so much. Please do not hesitate to email me with any questions.

Reminder email (sent twice, if needed: Study 4 Time 2):

Kia ora koutou,

I am a PhD student from Victoria University of Wellington and I contacted you recently to participate in a follow-up survey for our research project about natural hazard preparedness.

I wanted to remind you that this survey is short in length and will take approximately 5-10 mins to complete. As a thank you for adding your valued perspective to our study, you will be given the opportunity to add an additional entry into the prize draw for one of fifteen $50 supermarket vouchers.

Findings from this survey are crucial for our understanding of how and why people in Wellington prepare for natural hazards, and will allow for examination of what factors may actually *cause* preparedness. This is an important step for increasing preparedness in Wellington and helping our region to survive and thrive in response to natural hazard risk.

     Please follow this link to the survey: xxxxx

Thank you so much. Please do not hesitate to email me with any questions.

Study 3 & 4 Measures & Intervention

The key measures from Study 3 and 4 are presented below. The full surveys (exported from Qualtrics) are available to view on Open Science Framework:

- Study 3: https://osf.io/6skf9/
- Study 4 Time 1: https://osf.io/2wbpt/
- Study 4 Time 2: https://osf.io/wte5f/

Place attachment visualisation intervention:

We would now like you to take a break from thinking about disasters and preparedness.

Please carefully consider the **house** (including rented houses, apartments, dorm rooms, units, etc.,) and the **neighbourhood** that you currently live in. Which place do you have a more meaningful or positive connection with?

○ My house
○ My neighbourhood

Next, we would like you to please relax, close your eyes, imagine yourself in the place you selected, and visualise it in as much detail as possible for at least *the next minute*. What does this place look like? What do you see? Is anything happening there? If you are in this place currently, please close your eyes and visualise it as you would if you were not there.

When you are ready to begin, please click the 'arrow' button below.

What does this place look like? What do you see? Is anything happening there?

0	1	0	0

Please spend at least *the next minute* writing down as many of the things you saw during your visualisation as you can (bullet points are fine):

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0 1 0 0

We would like you to close your eyes once again, relax, and imagine yourself back in the same place. Please spend *another minute* thinking about your other senses. What are the smells of this place? What sounds do you hear? Can you feel anything touching your skin?

When you are ready to begin, please click the 'arrow' button below.

What are the smells of this place? What sounds do you hear? Can you feel anything touching your skin?

0 1 0 0

Please spend at least *the next minute* writing down as many of the sensory observations (smells, noises, feelings) you had during your visualisation as you can (bullet points are fine):

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0 1 0 0

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We would like you to close your eyes one final time, relax, and imagine yourself back in this place. Please spend at least *the next minute* considering how you feel in this place. What emotions come up when you are here? Does this place make you feel a particular way?

When you are ready to begin, please click the 'arrow' button below.

What emotions come up when you are here? Does this place make you feel a particular way?

`0 1 0 0`

One last time, please spend at least *the next minute* writing down as many of the feelings or sensations you noted during your visualisation as you can (bullet points are fine):

`0 1 0 0`

House attachment:

The questions that follow assess your feelings and thoughts about the **house** you currently live in (including rented houses, apartments, dorm rooms, units, etc.). Please think about and answer each question separately, and as accurately as possible, even if you have not lived in your house for a long time.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel that my house is a part of me	O	O	O	O	O
My house is very special to me	O	O	O	O	O
I identify strongly with my house	O	O	O	O	O
I am very attached to my house	O	O	O	O	O

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Living in my house says a lot about who I am	O	O	O	O	O
My house means a lot to me	O	O	O	O	O
My house is the best place for what I like to do	O	O	O	O	O
No other place can compare to my house	O	O	O	O	O

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I get more satisfaction out of living in my house than I would anywhere else	O	O	O	O	O
Doing what I do in my house is more important to me than doing it anywhere else	O	O	O	O	O
I would not substitute any other place for doing the types of things that I do in my house	O	O	O	O	O

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Neighbourhood attachment:

The questions that follow assess your feelings and thoughts about the **neighbourhood** that you currently live in. Please think about and answer each question separately, and as accurately as possible.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel my neighbourhood is a part of me	O	O	O	O	O
My neighbourhood is very special to me	O	O	O	O	O
I identify strongly with my neighbourhood	O	O	O	O	O
I am very attached to my neighbourhood	O	O	O	O	O

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Living in my neighbourhood says a lot about who I am	O	O	O	O	O
My neighbourhood means a lot to me	O	O	O	O	O
My neighbourhood is the best place for what I like to do	O	O	O	O	O
No other place can compare to my neighbourhood	O	O	O	O	O

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I get more satisfaction out of living in my neighbourhood than I would anywhere else	O	O	O	O	O
Doing what I do in my neighbourhood is more important to me than doing it anywhere else	O	O	O	O	O
I would not substitute any other area for doing the types of things that I do in my neighbourhood	O	O	O	O	O

Disaster preparedness behaviours:

Below is a list of actions that you may or may not have already taken for the purpose of becoming better prepared for a natural hazard event or disaster.

Please select which statement best describes your personal or household progress with the following actions. Remember, we are still interested in hearing from you even if you have not done any of these actions.

Store water	
Store non-perishable food	
Make an emergency kit	
Make an emergency plan (e.g., knowing where to meet family)	
Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	
Purchase items to use if power is lost such as a torch, radio, or gas cooker	▲▼
Purchase a water tank	▲▼
Cloud-store important documents and/or photos on an internet server	▲▼
Ensure my home and contents are insured for the right amount in the event of a disaster	▲▼
Seek out information about the different natural hazard risks posed to my home	▲▼
Have the strength of my building checked (or ask landlord to do the same)	▲▼
Fasten tall furniture to the wall	▲▼
Secure movable objects in my home (such as computers and TVs)	▲▼
Strengthen my house/its foundations (or ask landlord to do the same)	▲▼
Ensure that heavy objects are stored on the floor and at the bottom of cupboards	▲▼
Identify people in my neighbourhood who need checking up on in the event of a disaster	▲▼
Store enough emergency supplies to help others not in my household	▲▼
Volunteer my time to help prepare my community	▲▼
Participate in a lifesaving skills/emergency response course and feel confident in my ability to help others	▲▼
Talk to people I know about getting prepared	▲▼
Attend a community meeting where preparation is discussed	▲▼
Have contact details of my neighbours in case of emergency	▲▼
Identify my local Community Emergency Hub and understand how to use it to coordinate community response	▲▼

Dropdown options:
✓
Never heard of this
Heard of this but haven't thought about doing it
Undecided if I will do this
Decided I will not do this
Intend to do this
Partway through doing this
Have done this

Disaster preparedness intentions:

You previously indicated that you have not yet *completed* the following preparedness actions. Please review these and rate the likelihood that you will *complete* each of these actions **in the next two weeks**.

If actions likely take more than two weeks to complete (i.e., strengthening house foundations) please indicate the likelihood that you will begin this process in the next two weeks.

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Store water	○	○	○	○	○
Store non-perishable food	○	○	○	○	○
Make an emergency kit	○	○	○	○	○
Make an emergency plan (e.g., knowing where to meet family)	○	○	○	○	○
Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet	○	○	○	○	○
Purchase items to use if power is lost such as a torch, radio, or gas cooker	○	○	○	○	○
	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Purchase a water tank	○	○	○	○	○
Cloud-store important documents and/or photos on an internet server	○	○	○	○	○
Ensure my home and contents are insured for the right amount in the event of a disaster	○	○	○	○	○
Seek out information about the different natural hazard risks posed to my home	○	○	○	○	○

Preparedness goal-setting:

On the previous page, you indicated that there was some likelihood that you would complete the following preparedness action(s)in the next two weeks. We would now like you to set yourself an explicit goal to do one (or more) of these actions in this timeframe. Please select one (or more) of the following actions that you will specifically try to complete (or begin) in the **next two weeks**?

- ☐ Store water
- ☐ Store non-perishable food
- ☐ Make an emergency kit
- ☐ Make an emergency plan (e.g., knowing where to meet family)
- ☐ Store supplies (such as plastic bags and toilet paper) to use as an emergency toilet
- ☐ Purchase items to use if power is lost such as a torch, radio, or gas cooker
- ☐ Purchase a water tank
- ☐ Cloud-store important documents and/or photos on an internet server
- ☐ Ensure my home and contents are insured for the right amount in the event of a disaster
- ☐ Seek out information about the different natural hazard risks posed to my home
- ☐ Have the strength of my building checked (or ask landlord to do the same)
- ☐ Fasten tall furniture to the wall
- ☐ Secure movable objects in my home (such as computers and TVs)
- ☐ Strengthen my house/its foundations (or ask landlord to do the same)
- ☐ Ensure that heavy objects are stored on the floor and at the bottom of cupboards
- ☐ Identify people in my neighbourhood who need checking up on in the event of a disaster
- ☐ Store enough emergency supplies to help others not in my household
- ☐ Volunteer my time to help prepare my community
- ☐ Participate in a lifesaving skills/emergency response course and feel confident in my ability to help others
- ☐ Talk to people I know about getting prepared
- ☐ Attend a community meeting where preparation is discussed
- ☐ Have contact details of my neighbours in case of emergency
- ☐ Identify my local Community Emergency Hub and understand how to use it to coordinate community response
- ☐ Other preparedness goal, please specify: [_____]
- ☐ I do not wish to set myself a goal

Please indicate **when** and **where** you will complete your selected action(s) (e.g., this Saturday afternoon, buy water when I am doing my regular grocery shopping).

[   ]

Please also include **one action** you can take to ensure that you remember to complete these action(s) (e.g., write 'water' on my grocery list).

[   ]

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Study 3 & 4 Debrief

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

Application ID Number: 0000026881

Amanda Wallis　　　　　　Prof Ronald Fischer　　　　Dr Wokje Abrahamse
PhD Student　　　　　　　Primary Supervisor　　　　　Secondary Supervisor

Thank you for participating in this survey. Your responses have been recorded.

[The purpose of this research project is to extend knowledge about the role of place attachment (and other related factors) in predicting disaster preparation behaviours, intentions, and attitudes in Wellington, New Zealand. We expect that place attachment to one's local area has a positive effect on their disaster preparation behaviour, and that taking part in a simple place visualisation exercise can increase preparedness intentions and subsequent preparedness behaviour.

Some participants were asked to visualise a place they felt emotionally connected to, while others were asked to visualise a neutral place. Some participants did not visualise any place at all. We expect that the visualisation of a place to which people are emotionally connected will be most effective at increasing intentions to prepare.] ^Study 3^

[This study examines natural hazard preparation in Wellington, New Zealand. It explores different predictors of preparedness (e.g. place attachment and cultural values), as well as other related factors such as experience and perceived risk. A main goal of this survey is to re-test previously-found associations between these factors and preparedness.]^Study 4 Time 1^

[This survey intends to examine the effect of participation in the previous survey on self-reported preparation behaviour. The purpose of the overall research project is to extend knowledge about the role of place attachment (and other related factors) in predicting disaster preparation behaviours in Wellington, New Zealand. We expect that place attachment to one's local area has a positive effect on their disaster preparation behaviour, and that taking part in a simple place visualisation exercise can increase preparedness intentions and subsequent preparedness behaviour.

Some participants involved in the previous survey were asked to visualise a place they felt emotionally connected to, while others were asked to visualise a neutral place. A third group of participants were asked to visualise a place that they were attached to as well as to visualise any damage that could occur to that place in a future disaster. We expect that the attachment and damage visualisation will be most effective at increasing intentions to prepare, and most likely to result in self-reported behavioural follow-through (as assessed in this follow-up survey). All participants were also asked to set a goal for preparation in the

original survey as a simple, evidence-based means of encouraging action.]

Information collected from this survey will be used to inform future research exploring why people prepare for natural hazard events. It will also form the basis of future research projects exploring ways that we can increase preparedness using simple intervention strategies. We hope that these intervention strategies can be used by emergency management organizations to increase the preparedness of all New Zealanders, and therefore help them to reduce risk from natural hazard threats.

Findings from this survey will likely be shared in collaboration with other researchers as well as other relevant organizations (such as GNS Science and Wellington Regional Emergency Management Office). De-identified data may also be shared on open science platforms such as Open Science Framework (OSF). These findings will also be published in a PhD thesis and likely submitted for publication and presentation in scientific journals and conferences.

This research has been approved by the Victoria University of Wellington Human Ethics Committee [RMP0000026881]. If you have any concerns about the ethical conduct of the research you may contact the Victoria University HEC Convener.

Thank you again for participating in this research.