Urban environmental pathways to active ageing:
A participatory investigation amidst natural disasters

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Abstract

This thesis explores how the physical and social environmental conditions of urban areas potentially influence active ageing among independently living older adults in Christchurch, New Zealand. The research coincided with the 2010 and 2011 Canterbury earthquakes, which introduced deleterious environmental changes. Few studies have investigated antecedent and emerging environmental influences on diverse activities that contribute to a holistic conceptualisation of health in later life.

Population ageing and urbanisation are developing trends in New Zealand, and Christchurch is at the forefront of these changes due to historic patterns of fertility, mortality, and migration. Societal dividends can be realised from these transitions if the environmental conditions of urban areas support activity and independence in later life. Active ageing provides a framework for realising the opportunities of population ageing through the promotion of behaviours and the adaptation of environments in ways that encourage health and participation at all ages and abilities. Active ageing is operationalised in this research as physical, social, cultural, civic, spiritual, and economic pursuits.

Study objectives include the identification of urban areas likely to influence active ageing, the examination of potential activity correlates, and the exploration of emplaced experiences during a period of environmental disruption. Founded upon the complementary paradigms of pragmatism and participatory action research (PAR), this study utilises a mixed methods design across three phases to address interrelated objectives. Collaboratively developed methods include Geographic Information Systems (GIS) analyses, systematic observations of study areas, surveys, activity diaries, photovoice, and focus group discussions. Research partners include eight project advisers and 355 adults aged 65 years or older who reside in 12 urban areas.

Study participants were generally active and healthy with preferences for physical, social, and cultural engagements undertaken in proximate settings and networks. Across three research phases, the results support prominent roles for physical and social environments as
facilitators of and constraints to active ageing. Environmental influences are diverse and include elements of home, local environment, social network, and climate. Personal influences include a range of physiological, cognitive, and behavioural factors. The earthquakes of 2010 and 2011 created additional environmental and activity disruptions for many older adults and resulted in diverse expressions of vulnerability and resilience among the sample.

Concepts abstracted from the data inform the theory of navigated environmental performance. This model predicts that independently living older adults navigate personal circumstances and ubiquitous environmental barriers as resilient and autonomous agents to be active across urban areas. Opportunities for participation increase as settings become manifestly supportive by exhibiting combinations of malleability (adaptability of home), accessibility (availability and usability of local resources), amenity (attractiveness and age-appropriateness of proximate assets), social support (active and encouraging networks), and particularity (unique resources of areas). Older adults attempt to sustain participation even in settings that are unsympathetic to preference or ability, but risk inactivity and disablement arising from experiences of health and environmental change, social problems, or negative perceptions. This research prompted collaborative development of recommendations for urban environmental renewal and presentation to community stakeholders commensurate with a PAR process.
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1 Introduction and background

The right to a decent environment is an inalienable right that requires no empirical justification (Lawton, 1986, p. 160).

1.1 Chapter introduction and organisation

New Zealand is experiencing a rapid expansion of the 65 years and older age group as a consequence of long-term changes in fertility and mortality (Statistics New Zealand, 2009). A demographic dividend can potentially be realised from this transition as independent, healthy, and active older people contribute significantly to family and community life (World Economic Forum, 2012). Several potential challenges lie ahead, however, including rising costs of public healthcare provision for the very old and infirm; growing demands on the working-age population for care and tax revenue; and productivity losses associated with retirement, illness, or disability (Dunstan & Thompson, 2006; Stephenson & Scobie, 2002).

A potential mechanism for amplifying the benefits and ameliorating the challenges of an ageing population is to promote and support active ageing. Maintaining or increasing activity participation commensurate with ability and individual preference holds promise for reducing the duration and severity of morbidity in later life (Fries, 1996, 2003). Active ageing is associated with a holistic conception of health and includes the gamut of physical, social, cultural, civic, economic, and spiritual endeavours (Avlund, Lund, Holstein, & Due, 2004; Bassuk, Glass, & Berkman, 1999; Nelson et al., 2007; World Health Organisation, 2002a).

Influences on older-adult health and activity recognised by gerontologists include the physical and social conditions of urban environments. Researchers have identified that living in an environment with more physical and social problems is often associated with poorer health and functioning among older adults (Balfour & Kaplan, 2002; Breeze et al., 2005). Local and international findings suggest that environmental conditions potentially influence the health of older adults by facilitating or constraining participation in diverse activities, although how this process occurs is not well understood (Annear, Cushman, & Gidlow, 2009; Michael, Green, & Farquhar, 2006).
This chapter introduces and provides the rationale for a participatory investigation that explores how environmental conditions of urban areas potentially influence active ageing among independently living older adults. It considers population ageing in New Zealand and the characteristics of the older-adult group, conceptualisations of health and active ageing, the role of the urban environment, and the impacts of a series of earthquakes that intersected with the research in 2010 and 2011. Research objectives, hypotheses, and an overview of thesis structure are presented at the end of the chapter. This research is located firmly in the domain of environmental gerontology, which is interpreted as an emerging space at the intersection of sociology, psychology, and geography that explores the emplaced and subjective experiences of ageing (Kendig, 2003; Wahl & Weisman, 2003).

### 1.2 Population ageing in New Zealand

#### 1.2.1 Definition of population ageing

Population ageing refers to a transition from a younger to an older age structure, which occurs when older adults constitute a proportionally larger share of the total population (United Nations, 2002). This process is occurring throughout the world, but will initially be experienced in more developed countries as a result of historically higher levels of fertility and lower levels of mortality (United Nations, 2002). Empirical demarcations of aged societies range from 10 to 25% of the total population aged 65 years and older – benchmarks already exceeded in some parts of New Zealand (Gavrilov & Heuveline, 2003; Statistics New Zealand, 2009).

#### 1.2.2 Population projections

In New Zealand, the older-adult group is projected to grow from approximately 12% of the total population in 2010 to over 25% by 2061 (Statistics New Zealand, 2009). The South Island of New Zealand is projected to have significantly older population structures than the North Island due to historically higher populations of older adults, lower fertility levels, and greater outward migration of younger adults (Dunstan & Thompson, 2006). Christchurch, the location of this study, is the largest city in the South Island and in 2009 14% of residents were aged 65 years and over (Statistics New Zealand, 2010a). Of the three largest cities in New Zealand, Christchurch has the highest proportion of residents aged 65 years and
older (Auckland City = 9.6%; Wellington City = 8.4%) and is, therefore, at the forefront of urban population ageing in this country (Statistics New Zealand 2010). Population projections suggest that 20% of Christchurch's total population will be aged 65 years or older by 2026 (Statistics New Zealand, 2010a). During the same period, the older-adult populations of Wellington and Auckland will only increase to 13 percent (Statistics New Zealand, 2010). As a consequence of projected growth, Christchurch is likely to experience the opportunities and challenges associated with population ageing sooner than other urban areas in New Zealand.

1.2.3 Projection uncertainty

There is some uncertainty surrounding population projections, which are based on extrapolations from current trends in fertility and longevity. Projections may be invalidated by significant changes in the immigration (or emigration) of younger adults; demographic anomalies (such as the post-World War Two fertility increase); and the effects of future pandemics, wars, or natural disasters (Gee, 2002; Statistics New Zealand, 2009). In spite of uncertainty, there are several reasons why the current projections for an expansion of the 65 and older age group can be considered with confidence: (a) trends in fertility and longevity tend to change slowly over time, (b) the majority of those who will comprise the older-adult group over the projection period have already been born, and (c) historic population projections have tended to underestimate the rate of population ageing (Dunstan & Thompson, 2006; Gavrilov & Heuveline, 2003). New Zealand demographers have attempted to control for projection uncertainties by producing a range of population ageing scenarios (series) and all of these different projections indicate a shift towards a significantly older age structure (Statistics New Zealand 2004; Dunstan and Thompson 2006). The government statistician has asserted that, “regardless of which projection series is chosen, there will be significant changes in the age structure of the population – all series project more older people and further ageing of the population” (Statistics New Zealand, 2009, p. 6).

1.3 Older adults

1.3.1 Definition of old age and older adults

There is no universally agreed definition of an older adult as the meaning of this concept varies among countries, cultures, and historical contexts (Koopman-Boyden, 1993a;
Tinker, 2002). Conceptualisations of old age in the contemporary, international literature range from around 50 to 75 years and older, which reflects variations in social policy and emphasis on different stages of the ageing process (Achenbaum, 2009; Breeze et al., 2005; Chodzko-Zajko et al., 2009). In New Zealand, 65 years is the age at which residents and citizens become eligible for the largely universal, state-funded pension (New Zealand Superannuation) and is, therefore, a chronological and socially constructed marker of old age. In this research, older adults are defined as individuals aged 65 years and older who live independently\(^1\) in the community. This definition is consistent with government policy and focuses attention on those who are relatively high functioning (Rosenberg & Everitt, 2001; Victor, 2010). The use of a chronological definition avoids categorising older age as a purely biological or medical construct and recognises the diversity within the group (Westerhof & Tulle, 2007). It is acknowledged, however, that a chronological definition of ageing is an arbitrary measure and a socially constructed organisation of the life course that does not reflect the subjective experience of time (Baars, 1997).

1.3.2 Older-adult characteristics

The experience of later life is highly variable, and there are discrepancies in health status, independence, social engagement, and material circumstances (Johnson, 1995; World Health Organization, 2002). While the older-adult group is undoubtedly diverse, it also shares characteristics that provide justification for conceptualising those aged 65 years and older as a distinctive social group for the purposes of research. Domains in which older adults can be distinguished from those in younger age groups and which are relevant to the present research include living situation and health.

Older adults exhibit preferences for ageing in place (residing in a familiar environment even when faced with increasing frailty) and a large proportion own or rent accommodation within urban centres, reflecting a balance between desired independence and health and social service needs (Dunstan & Thompson, 2006; Schofield, Davey, Keeling, & Parsons, 2006; Van Der Pas, 2009). Evidence for older adults' preferences for ageing in place can be seen in patterns of home ownership and residential mobility. National studies have reported that between 70 to 82% of those aged 65 years and older have resided at their current address five

\(^{1}\) Independent living may be undertaken in the context of a partner, spouse, other family members, or social networks of varied composition.
years or longer, and 33% have lived at their current address for more than 20 years (Statistics New Zealand, 2007a; Van Der Pas, 2009). Related to preferences for ageing in place, is a tendency among older people to experience a constricting geographical and social world attributable to reductions in work and family responsibilities, the progression of illness or disability, the death or frailty of peers, or the loss of driver's license (Glass & Balfour, 2003; Wiles et al., 2009). According to Smith (2009), reductions in functional capacity, diminishing social networks, and preferences for ageing in place lead to an increased reliance on the local physical and social environment for the fulfilment of everyday needs.

Health is another defining feature of older adults. Over half of all people aged 65 years or older and two-thirds of those aged 75 years or older have a chronic medical condition or disability (Statistics New Zealand, 2004). Conditions that increase in prevalence with age include cardiovascular diseases, respiratory disorders, diabetes, obesity, certain cancers, degenerative musculoskeletal conditions, arthritis, sensory impairments, and cognitive disorders (Alley & Crimmins, 2010; Lakatta & Levy, 2003). Older adults' heightened risk of chronic illness and disability coupled with the projected absolute and relative increase of this population has the potential to significantly raise health and social costs in New Zealand. Health comprises a large proportion of government expenditure, and older adults consume disproportionate amounts of the country's healthcare resources (Fletcher & Lynn, 2002; Stephenson & Scobie, 2002). Analysis of trends in age-related diseases indicate that the New Zealand health sector can expect increased demand in the coming years due to a growing prevalence of lifestyle and age-related conditions (Cornwall & Davey, 2004; Creedy & Scobie, 2005).

Assumptions concerning a crisis in the provision of health and social services for the growing older-adult group are the subject of debate. Pressure on health and social resources is not merely a function of the expansion of this segment of the population, but is also related to such factors as the cost of health and disability services, demand for public resources and expectations for care, requirements for end-of-life hospital care, future tax law and social policy, labour market conditions, productivity growth, and the prevalence of disease and disability (Creedy & Scobie, 2005; Gee, 2002; Werblow, Felder, & Zweifel, 2007). The extent to which an ageing population will place a social and economic burden on developed societies remains unclear. Both challenges and benefits are likely to result from this demographic transition. New Zealanders old and young would be complicit, however, if preparations were
not made for an aged society at both the individual and community level (Cox & Hope, 2006). A strategy for responding to population ageing should involve increasing older adults' capacity for independence, participation, and activity in later life by changing negative lifestyle behaviours, strengthening social and care supports, and adapting environments (Schofield et al., 2006).
1.4 Active ageing: a framework for realising the benefits of an aged society

1.4.1 Conceptualisations of active ageing

At the core of this research is the concept of active ageing, which has gained prominence in the last decade as gerontologists and health researchers consider the implications of population ageing for individuals, communities, and governments. Active ageing gained wide usage during the United Nations International Year of the Older Person in 1999 and was adopted and promoted by the World Health Organisation as a replacement for the comparatively narrow concepts of productive and successful ageing (Walker, 2002). Active ageing refers to a process of optimising opportunities for health, participation, and security in order to enhance quality of life as people age, with the aim of extending healthy life expectancy and quality of life for older people, including those who are frail, disabled, and in need of care (World Health Organisation, 2002a). As expressed in behaviour, active ageing includes participation in physical, social, economic, cultural, spiritual, and civic affairs across the life course (World Health Organisation, 1986, 2002a).

1.4.2 Rationale for a focus on active ageing

Active ageing is closely related to the concepts of productive ageing, healthy ageing, positive ageing, and successful ageing, which are frequently cited in gerontological and policy discourses (Davey, 2002). All of these concepts promote an affirmative view of ageing and conceptualise later life as a time of opportunity, continuity, and contribution, which counter notions of decline and disengagement (Cumming & Henry, 1961). The concepts of productive, healthy, positive, and successful ageing tend to emphasise imposed social and political objectives, such as continued economic contributions or a reduced burden of illness, rather than the goals and preferences of older adults (Bowling & Dieppe, 2005; Llewellyn, Balandin, Dew, & McConnell, 2004; Peel, McLure, & Bartlett, 2005). Active ageing is the preferred concept due to its status as a descriptor of what it means to age well in contemporary society and the promotion of a range of activities that afford benefits for both the individual and society while being attuned to age-related changes and preferences.

Active ageing presents a framework for addressing the potential challenges of population ageing. At the root of this perspective is the assumption that by supporting activity
participation there is potential for improving health and reducing the duration and severity of morbidity in later life consistent with the compression of morbidity theory. The compression of morbidity thesis states that when longevity gains are surpassed by improvements in health, morbidity will be compressed into a short space of time prior to natural death (Fries, 1980, 2003). The alternatives to a compression of morbidity are a longer life with more time spent in ill health and disability (the expansion of morbidity) or relative gains in both health and longevity (dynamic equilibrium) (Cornwall & Davey, 2004; Ministry of Health, 2004). There is growing international evidence that a compression of morbidity may be achievable in more developed countries as a consequence of improved lifestyle behaviours and advancements in medical technology (Bronnum-Hansen, 2005). Confirmatory evidence from New Zealand is currently lacking, although there is an expectation that morbidity declines may be achievable in the coming decades (Graham, Blakely, Davis, Sporle, & Pearce, 2004; Ministry of Health, 2004). There is debate among researchers concerning the potential limits of the compression of morbidity and the possibility that a dynamic equilibrium may be a more realistic model (Manton, Stallard, & Tolley, 1991). Longitudinal health data have shown, however, that there is potential for positive lifestyle behaviours, such as regular physical activity, to facilitate a compression of morbidity, providing years of healthy and independent living (Fries, 1996; Hubert, Bloch, Oehlert, & Fries, 2002).

There is some discord among academics concerning the focus on activity in later life. Katz (2000) has argued that the relatively recent focus on being active in old age has ushered in a polarity in thinking which defines activity as a universal good and inactivity as a risk factor. The focus on activity in later life has also been criticised for giving pre-eminence to potentially unattainable and normative states of health and for paying comparatively less attention to the diverse experiences of ageing, including those of the inactive, unwell, or long-term disabled (Johnson, 1995; Koopman-Boyden & Waldegrave, 2009; Moody, 1988). Holstein and Minkler (2007) have argued that, “overzealous attention to health as a measure of success and achievement crowds out cultural space to grapple with critical existential questions and devalues those who flourish despite physical limitations” (p. 16). While highlighting the downside of activity rhetoric and promotion, these criticisms are largely addressed within the active ageing concept, which recognises that activity can be undertaken in a range of settings, in a variety of modes, at a level appropriate to functional and cognitive abilities, and consistent with an individual's motivations and preferences. An underlying premise of the active ageing concept, therefore, is of facilitating activity choices, rather than
prescribing standardised behaviours.

The beauty of this [active ageing] strategy is that it is good for everyone: from citizens of all ages as ageing individuals, in terms of maximising their potential and quality of life, through to society as a whole, by getting the best from human capital, extending community participation and solidarity, avoiding intergenerational conflicts and creating a fairer, more inclusive society (Walker, 2002, p. 137).

1.4.3 Domains of active ageing

There has been a lack of coherent definition of active ageing in both policy and research, which potentially undermines efforts to promote positive and inclusive experiences of later life (Bowling, 2008; Walker, 2006). To address this concern, this research focuses on six component behaviours of the active ageing concept introduced by World Health Organisation (2002a).

1.4.3.1 Physical activity

Physical activity is a broad behavioural domain that refers to bodily movement produced by the contraction of skeletal muscle that significantly increases energy expenditure (Chodzko-Zajko et al., 2009). Physical activity can be undertaken in a variety of contexts: as transportation, as part of paid employment, as regular household duties, or as exercise and recreation (U.S. Department of Health and Human Services, 1998). There is mounting evidence that, despite some risks for injury, regular physical activity can minimise the negative physiological effects of an otherwise sedentary lifestyle and increase healthy life expectancy by limiting the development and progression of chronic disease and disability (Chodzko-Zajko et al., 2009; Nelson et al., 2007). There is also emerging evidence that regular physical activity produces significant psychological and cognitive benefits for older people (Chodzko-Zajko et al., 2009). Evidence from large-scale New Zealand studies indicates that older adults generally have lower levels of total physical activity than other age groups, but show preferences for informal activities such as walking and gardening (Koopman-Boyden & Waldegrave, 2009; Sport and Recreation New Zealand, 2008).

1.4.3.2 Social activity
Social activity refers to the enactment and maintenance of network ties (the web of social relationships surrounding an individual) undertaken for the purpose of enjoying the company of others, receiving support, or sharing experiences and values (Berkman & Glass, 2000). There is emerging evidence that maintaining or increasing participation in positive social activities has direct benefits for physical and psychological health as well as indirect benefits via stress buffering or the confirmation of personal identity (Bassuk et al., 1999; Heaney & Israel, 2008; Unger, Johnson, & Marks, 1997). Social activities can also lead to negative experiences, however, including abuse, negative reinforcement, or unwanted obligations, which may threaten activity participation or health (Booth, 2000). When this domain has been assessed as part of general measures of well-being, it has been reported that social activities, particularly group outings and family interactions, are among older adults’ preferred pursuits (Koopman-Boyden & Waldegrave, 2009). Beyond the active ageing context, terms such as social network or social capital may also represent a meaningful engagement with family, peers, and community members. For the purposes of this research and the literature review, however, social activity is employed throughout the thesis for consistency and to link with the overarching active ageing concept. This is recognised as a potential limitation of this thesis.

### 1.4.3.3 Cultural activity

There are varying definitions of cultural activity, but in the context of this research the concept refers to ways of living and expressions of personal identity associated with learning or education, personal skills and interests, or ethnic or cultural identity (Abercrombie, Hill, & Turner, 2006). Comparatively little is known about how the cultural practices of older people contribute to health and this has been identified as an area ripe for research (Andrews, Cutchin, McCracken, Phillip, & Wiles, 2007). In a recent New Zealand study, older adults reported higher levels of library attendance and hobby participation than those in younger age groups, but lower levels of involvement in ethnic activities or organisations² (Koopman-Boyden & Waldegrave, 2009). Like the concept of social activity, cultural activity may be defined in diverse ways that have not been fully explored in the context of this thesis or associated literature review. This is acknowledged as a potential limitation of the thesis.

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² Potentially due to the relative ethnic homogeneity of older adults in New Zealand at the present time.
1.4.3.4 Civic activity

Civic activity is defined as participation in the life of the community and unpaid endeavours undertaken for the benefit of the friends or neighbours, the environment, or charitable organisations (Martinson & Minkler, 2006). Studies have reported improved physiological and psychological health outcomes for older adults who regularly participate in civic activities (Greenfield & Marks, 2004; Jirovec, 2005). National studies have reported that older adults tend to have higher rates of overall civic activity than younger adults and exhibit preferences for involvement in charitable community groups (Koopman-Boyden & Waldegrave, 2009; Statistics New Zealand, 2011a).

1.4.3.5 Economic activity

Economic activity refers to participation in paid activities for the purpose of earning money for self or family, which may be undertaken as full-time, part-time, self-employed, casual, or contract work. An increasing proportion of older adults (approximately 16% of the group) participate in paid employment, although the majority of retired adults still rely primarily on personal assets and the government pension (Statistics New Zealand, 2007a). Research on older-adult employment suggests that continuing to work beyond the official age of retirement is associated with subjective life satisfaction and well-being; however, demanding or full-time work can also reduce opportunities for the development of meaningful leisure and family experiences (Chang & Yen, 2011).

1.4.3.6 Spiritual activity

Spiritual activity refers to religious or contemplative activities that are concerned with the spirit, soul, or transcendence (Hill et al., 2000; Paragament, 1997). Emerging research in the field of health psychology has identified that religiosity or spirituality may be associated with improved health among older adults arising from positive psychological states and social interactions (Lawler-Row & Elliott, 2009). A New Zealand study has previously reported that spiritual activity, particularly belonging to a religious group, is an important correlate of older adults’ subjective well-being (Koopman-Boyden & Waldegrave, 2009). National census data indicates that older adults maintain greater religious and spiritual affiliations than younger age

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3 This is commensurate with volunteer and charitable activity.
groups, although this is set against a background a declining societal religiosity at all ages (Statistics New Zealand, 2006a).

1.5 Environmental influences on health and active ageing

1.5.1 Defining environments relevant to older adults

In general terms, environment\(^4\) refers to the totality of one's surroundings and the settings in which a particular activity is undertaken (Bell, Greene, Fisher, & Baum, 2001; Clark, 2003). A fuller definition that reflects the interaction between multiple environmental domains and the individual was articulated by Lawton (1993):

Environment, in objective terms, consists of a complex of opportunities and barriers from which a person seeks optimal stimulation. The whole of all that could be called objective environment is rarely relevant to the individual. The vagaries of happenstance and the rewards and punishments provided in particular environments constitute the relevant aspects of environment for the person. A major aspect of environment is composed of other people in physically or functionally close interaction with the person, the social norms of the environment, and the cultural values inherent in that environment (p. 31).

Aspects of the environment that are potentially relevant to individual health and activity include the physical environment, social environment, access to knowledge and information, public policy, and institutions (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1992). The most significant of these contexts that potentially affect the behaviour of older adults are arguably the physical and the social environments with which there is near perpetual interaction (Diez-Roux, 2001; Morris, Beck, Hanlon, & Robertson, 2006; Srinivasan, O’Fallon, & Deary, 2003). Older adults may rely heavily on their proximate socio-physical surroundings as a consequence of preferences for ageing in place and place attachment, reduced exposure to diverse settings, increased time spent at home or within their immediate environment, and diminishing social networks (Baltes & Baltes, 1990; Glass & Balfour, 2003; Smith, 2009).

The physical environment refers to all of the non-biological elements of one's surroundings, including both constructed and natural elements (Bell et al., 2001; Keating &

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\(^4\) In this research, the following terms are used synonymously and interchangeably with the concept of environment: setting, context, milieu, and surroundings.
Phillips, 2008). The constructed or built environment refers to the products of human designs, including homes, buildings, land-use patterns, transportation systems, urban design, landscaping, and other artificial features (Michael & Yen, 2009). In contrast, the natural environment refers to the antecedent conditions that exist independently of human intervention, including topography, climate, geographical location and scale, coastlines, estuaries, waterways, indigenous land cover, and other features (Johnson, Gregory, Pratt, & Watts, 2000). The social environment\(^5\) refers to the people and groups among whom one lives and regularly interacts (family, friends, and community members) and the nature of these relationships (Bell et al., 2001; Lawton, 1999; Peace, Holland, & Kellaher, 2006). The socio-physical environment accounts for much of the contextual interaction that an older person experiences during their daily life, so it is prudent to consider the potential influence of such realms on activity and health.

### 1.5.2 Interactions among environment, health, and activity

Physical and social environments potentially influence the health and activities of older adults in a variety of ways. The physical environment potentially influences health or behavioural outcomes by providing or denying access to resources, presenting physical obstacles to or incentives for participation, or exposing individuals to hazards (Annear et al., 2009). The social environment is thought to influence behaviour by shaping norms, enforcing patterns of social control, providing or not providing opportunities to participate in certain behaviours, reducing or producing stress, and placing constraints on individual choice (McNeill, Kreuter, & Subramanian, 2006). Both contexts are in constant interaction with older individuals and influences from each setting may be experienced concurrently.

There is some conjecture about the importance of environmental conditions on the health and activity participation of individuals (the context versus composition debate) (Sloggett & Joshi, 1994). Some researchers have argued that it may be more efficacious to focus on personal cognitions and circumstances as influences on health and activity participation as these tend to be well defined compared to the so-called black box of effects associated with potential environmental influences (Diez-Roux, 2001; Sloggett & Joshi, 1994). Others contend, however, that environmental influences may be underestimated due to

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\(^5\) In the context of this thesis, a distinction is made between social environment (the character and composition of a social network) and social activity (interactions with family, friends, and community).
a lack of explanatory data and theory (Kawachi & Berkman, 2003). Moreover, focussing on
the individual as the primary agent of health and behavioural outcomes supports a victim- or
community-blaming mentality, which ignores many of the potential structural barriers
(Kawachi & Berkman, 2003).

1.5.3 Ageing in the city

The majority of the world's population now live within cities, and there is persistent
movement of individuals towards urban areas with age (World Health Organisation, 2007).
The World Health Organisation (2007) has stated that, “population ageing and urbanisation
are two global trends that together comprise the main forces shaping the 21st century” (p. 6).
Urban environments are now the dominant context for ageing and present particular attributes
that can either foster or hinder active ageing and health. Such attributes include higher
densities of individuals living in proximity to one another, access to public transportation,
extremes of poverty and affluence, the melding of diverse social and cultural groups, diversity
of land uses, variable access to services and resources, myriad housing options (including age-
exclusive residential areas), and access to employment (Smith, 2009; World Health
Organisation, 2007). Describing the diverse benefits and barriers of city life for older people
Rodwin (2006) stated,

High levels of congestion, pollution, and crime in world cities, as well as social
polarization and the high cost of housing, may undermine quality of life for older
people. Yet these cities offer greater access to public transportation, pharmacies and
stores, world-class medical centres, museums, parks, concert halls, colleges and
universities, libraries and theatres (p. 6).

In response to a growing awareness of the influence of urban living on health and
activity, the World Health Organisation developed a global Age-Friendly Cities programme to
facilitate the development of environments supportive of active ageing (World Health

Age-friendly cities promote active ageing by optimising opportunities for health,
participation and security in order to enhance quality of life as people age…In
practical terms, an age-friendly city adapts to its structures and services to be
accessible to and inclusive of older people with varying needs and capacities (p. 1).
Relatively little remains known, however, about the experience of older adults living in diverse urban neighbourhoods and the impacts of such circumstances on active ageing in particular (Rubinstein & Parmelee, 1992; Smith, 2009). The challenge for researchers is to find effective ways of exploring the contextual backdrop to activity participation among older adults who reside in urban settings. Such research must contend with the dynamic character of environments where infrastructure, social networks, and even the earth beneath our feet are subject to dramatic change.

1.6 Earthquake disasters: unpredictable environmental influences

This research was influenced by a sequence of destructive earthquakes that occurred during 2010 and 2011 within the Canterbury region of New Zealand. Disasters, such as earthquakes, fall within the scope of environmental influences on health and activity participation, although their advent is unpredictable and their effects uncontrollable. Natural disasters are defined as events caused by forces of the earth that substantially disrupt the communities they strike (Bell et al., 2001). The landmass of New Zealand is particularly susceptible to large earthquakes due to its location at the boundary of the Pacific and Indo-Australian tectonic plates (Bryant, 2005). The effects of earthquakes on individuals and communities are diverse and may include loss of life, injury and illness, psychological problems, damage to infrastructure and buildings, loss of homes and possessions, disruption to utilities, and a breakdown of civic life (Bryant, 2005; Wisner, Blackie, Cannon, & Davis, 2004).

The earthquakes that intersected with the present research included a magnitude 7.1 tremor that struck on September 4, 2010, near the Canterbury town of Darfield; a magnitude 6.3 aftershock that struck on February 22, 2011, within Christchurch City; and a series of strong aftershocks of magnitude 6.0 and greater in June and December 2011. Due to the location of the preliminary Darfield earthquake 40 kilometres from Christchurch and the timing of the disaster in the early hours of a Saturday morning, the human impacts were initially minor. No deaths and only moderate injuries were reported. As a result of the earthquake, a local state of emergency was enacted, masonry buildings and fences were damaged, and there was moderate flooding and soil liquefaction in the east of the city (GNS Science, 2011a). A subsequent and powerful aftershock in February 2011 was considerably more damaging as it occurred directly beneath Christchurch on a Tuesday afternoon and
generated among the most violent ground acceleration ever recorded (GNS Science, 2011b). The effects of this earthquake were profound: 185 people were killed, hundreds more were seriously injured, brick and masonry buildings collapsed, multi-storey office complexes suffered structural failures, roads and bridges buckled, liquefaction and flooding consumed eastern suburbs, landslides and rockfalls occurred on hillside areas, drinking and waste water services were disabled, and power and telecommunications were cut (GNS Science, 2011b). As a consequence of the earthquake, a national state of emergency was enacted, cordons were set up throughout the city, an international rescue and relief operation was mounted, a nighttime curfew was imposed, and the army and police were deployed (GNS Science, 2011b). Long-term consequences of the earthquake remain unclear. Large areas of residential land to the east of Christchurch have been designated uninhabitable, thousands of people have left the city permanently⁶, and many businesses have closed or relocated (Hueber, 2011). Since the February 2011 earthquake, powerful aftershocks have continued to affect Christchurch, which has slowed recovery, challenged personal resilience, and created additional environmental disruption.

The main data collection phases and participatory action research (PAR) procedures of this thesis were unintentionally aligned with the earthquakes of 2010 and 2011. As this research explores environmental influences on active ageing, it was also necessary to consider the impacts of the earthquakes. The iterative and participatory design of the research allowed for the salient impacts of the earthquakes to be captured as part of existing and amended study procedures in the weeks following both the September 2010 and February 2011 earthquakes. In order to address the original research objectives as well as the unanticipated effects of the 2010 and 2011 earthquakes, environmental and earthquake influences on activity have been deliberately separated in this thesis (separate methods were also used to gather each type of data). It is acknowledged that this is a somewhat artificial distinction when all research activity occurred against a backdrop of a sequence of natural disasters. However, as the earthquakes began in the days before administration of a large-scale survey, it was necessary to endeavour to accommodate the original and emerging research imperatives independently.

⁶ Available employment, migration, electoral, health, and school enrolment data revealed that higher numbers of parents, children, and younger adults left the city permanently (Statistics New Zealand, 2011b). As of June 2011, 9,000 people (3,000 households) had left Christchurch (Statistics New Zealand, 2011b).
1.7 Research question, objectives, and hypotheses

The overarching research question developed in collaboration with older adults and on the basis of an examination of existing literature is as follows: *how, if at all, do the environmental conditions of urban areas influence active ageing among independently living older adults?* In order to address this question, a number of subordinate objectives and hypotheses were proposed across three research phases.

Research phase one: examining urban contexts

- **Objective one:** identify diverse geographic areas within urban Christchurch inhabited by larger older-adult populations, which potentially influence active ageing.

Research phase two: composition, context, and correlates

- **Objective two:** explore the composition, context, and potential environmental and personal correlates of active ageing among independently living older adults who reside in diverse urban areas in Christchurch by testing the following hypotheses:
  1. Older-adult activity is comprised predominantly of physical and social modes of participation undertaken in the context of home, local environment, and proximate networks.
  2. Environmental and personal variables are significantly associated with older adult activity.
     a) Older-adult activity varies by area of residence.
     b) Older-adult activity varies by socio-economic status of areas.
     c) There is a significant, positive association between health and activity participation.
  3. The Canterbury earthquakes of 2010 and 2011 had a significant, negative impact on local environmental conditions and older-adult activity participation (illustrating environmental impacts on activity participation).

Research phase three: exploring pathways to active ageing

- **Objective three:** explore the emplaced experiences of independently living older adults and discern the pathways to activity participation.
- **Objective four:** explore older adults’ experiences of the Canterbury earthquakes and
the subjective impacts on environmental conditions and activity participation.

1.8 Thesis structure and organisation

This thesis is organised into 11 chapters, which reflect the procedural aspects of a PAR process and the unanticipated earthquake disruptions, while retaining the structure necessary to address the thesis question and objectives. Following the introduction, chapters two, three, and four review the current literature relating to environmental influences on health and activity; the effects of disasters on older-adult populations; and theories of ageing, place, and behaviour. In chapters five and six, the epistemological and methodological foundations of the study are presented and the research design and methods are described. Chapters seven, eight, and nine constitute the results and address each of the research phases independently. Each results chapter includes discussion of relevant literature, consideration of limitations of the research methods, and reflection on PAR procedures (interactions with older-adult advisers and respondents). The final discussion, chapter ten, integrates the emergent findings and concepts into the theory of navigated environmental performance, makes recommendations for urban improvement and future research, reflects on the overall PAR process, addresses limitations of the research design, and highlights the implications and contributions of the research. In the final chapter, research findings are summarised and a conclusion offered.
2 Systematic review of influences on health and activity

2.1 Chapter introduction and organisation

This chapter explores the limits of understanding and the strength of evidence for potential environmental influences on health and activity participation among older adults. The systematic identification of relevant literature was conceived as a necessary step in the formation of an original research problem and design. At the outset of the chapter, the systematic review procedures and rationale are described, including article selection and assessment methods. Next, key findings are presented for environmental influences on health and activity participation, including supporting, contradictory, and mixed results. Finally, the knowledge gaps and limitations within the literature are identified.

2.2 Literature review overview and rationale

Investigations concerning potential environmental influences on health and activity participation have increased worldwide in the past two decades. Comparatively few studies, however, have examined environmental influences in relation to the older-adult group, which are often characterised by heterogeneity and variations in vulnerability and resilience (Jackson & Waters, 2005). Potential influences on health and activity participation are considered in concert within this review as there is an increasing global focus on active ageing and a growing recognition of the interconnections between health and activity at all ages (Fries, 2003; World Health Organisation, 2002b). There is a paucity of data concerning the environmental influences on activity in later life compared to studies addressing health-related outcomes. Literature reviews are often criticised for being too narrow and reductionist in their scope (Petticrew & Roberts, 2006), and this chapter considers wider health-related literature in addition to environmental influences on activity participation.

A systematic review is an examination of research evidence based on formulated questions that uses systematic methods to identify, select, and appraise primary research (NHS Centre for Reviews and Dissemination, 2001). Systematic reviews have several

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7 The contents of this chapter form the basis of a research paper that has been accepted for publication with the international journal Ageing and Society.
procedural steps, which include the formulation of focussed review questions, comprehensive
searches of primary research, application of appropriate inclusion and exclusion criteria,
quality assessment of included studies, and synthesis and interpretation of study results (Pai et
al., 2004). Systematic reviews are most commonly used to assess empirical evidence arising
from published research, and comparatively few have been undertaken to synthesise both
qualitative and quantitative data (Harden & Thomas, 2010; Jackson & Waters, 2005). A
systematic review provides an efficient and objective approach for identifying, assessing, and
synthesising the results of existing health and activity related studies and highlighting gaps
and limitations to guide the present research (Petticrew & Roberts, 2006).

2.3 Focussed review questions

A feature of systematic reviews is that they seek to answer focussed research
questions, which are formulated according to population and setting; conditions or
behaviours; an exposure, test, or treatment; and one or more specific outcomes (Cook,
Mulrow, & Haynes, 1997). Questions formulated for this review include the following:

- How, if at all, do conditions of the physical and social environment affect the health and
  activity participation of older adults?

- What are the knowledge gaps and limitations in the current body of literature, which could
  be addressed by the present research?

For the purposes of this review, older adults were defined as individuals aged 50 years or
older. A definition of older age of less than 65 years was used in this review as it was
necessary to account for the diversity of how this term is understood in other countries or
cultures. The settings of interest in this review included the physical and social environment.
The definition of health employed in this review follows inclusive World Health Organisation
definitions and incorporates both physical and mental well-being (World Health Organisation,
1948, 1986). The activities of interest in this review are those outlined by the World Health
Organisation (2002b) as part of the active ageing concept, including physical, social, cultural,
civic, spiritual, and economic activities.
2.4 Literature review methods

The review process follows the general framework established by the Cochrane Collaboration (Higgins & Green, 2011). A Cochrane-type review procedure was used in order to provide a systematic process for identifying studies of potential environmental influences on older adults' health and activity from within a diverse body of literature. Cochrane reviews generally investigate the effects of interventions for prevention, treatment, and rehabilitation in a healthcare setting (Ashworth, Chad, Harrison, Reeder, & Marshall, 2009; Foster, Hillsdon, & Thorogood, 2009). This review differs from a standard Cochrane review in several ways. Firstly, the review incorporates a mix of both qualitative and quantitative research, which has been identified as an undervalued aspect of modern reviews (Petticrew & Roberts, 2006). Secondly, the review does not specifically evaluate the effectiveness of an intervention or clinical trial, but explores the diverse evidence in fields related to ageing, environment, health, and activity participation. Finally, a narrative approach was used to report the findings of the review, rather than a statistical meta analysis (Petticrew & Roberts, 2006). It could be argued that a scoping review may have also been appropriate for the aims of the present research. However, scoping reviews are primarily employed as reconnaissance tools in new areas of enquiry, rather than as a way of consolidating high-quality research within a diverse field (Levac, Colquhoun, & O'Brien, 2010). Scoping reviews also tend to be variable in their methods and often lack a systematic approach to study identification and assessment (Davis, Drey, & Gould, 2009).

2.5 Search strategy

Databases accessed for the systematic review included ProQuest Health and Medical Complete, ISI Web of Knowledge, Ovid (including Medline, PsychINFO, NURSING, and EMBASE), Scopus, and EBSCO (including CINAHL). These databases were chosen to provide a balance between multi-disciplinary and specialist sources of information. Search terms were formulated using synonyms related to the original research problem and following assessment procedures used in existing literature reviews that have previously assessed interactions among health, activity, ageing, and environment (Bowling & Grundy, 1998; Humpel, Owen, & Leslie, 2002; Yen, Michael, & Perdue, 2009). Searches of the grey

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8 The process of synthesising primary studies and exploring heterogeneity descriptively.
literature\textsuperscript{9} were employed to identify relevant studies not located during the database searches. Academic colleagues were also consulted to identify items outside the bounds of the present review.

Table 1: Terms employed in the systematic literature search

<table>
<thead>
<tr>
<th>Population</th>
<th>Setting</th>
<th>Outcomes</th>
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</thead>
<tbody>
<tr>
<td>Older adult</td>
<td>Environment</td>
<td>Morbidity</td>
</tr>
<tr>
<td>Age</td>
<td>Context</td>
<td>Mortality</td>
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<tr>
<td>Elder</td>
<td>Place</td>
<td>Health</td>
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<tr>
<td>Senior</td>
<td>Ecology</td>
<td>Quality of life</td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>Well-being</td>
</tr>
</tbody>
</table>

\textbf{2.6 Inclusion and exclusion criteria}

The initial search of the five databases yielded a total of 1,428 articles. Searches of the grey literature identified a further 52 articles. Two sets of inclusion criteria were applied to the results. Primary inclusion and exclusion criteria included the stipulation that studies included in the review should be peer-reviewed journal articles from 1985 and onwards, published in English, and representing primary research. The review of articles included published research available until approximately July 2011 – the point at which the review was concluded. After reviewing title, keyword, and abstract information in relation to these criteria, the pool of articles was significantly reduced to 218. Secondary inclusion and exclusion criteria were then applied to make the final selection of articles for the review. Selection criteria included the stipulation that only studies meeting the following criteria would be reviewed: sampling of community dwelling older adults aged 50 years or older; assessments of health-related issues or component behaviours of the World Health Organisation's active ageing concept; studies that considered the environment or related concept as a potential influence on health or activity; and qualitative, quantitative, or mixed methods approaches. Once the secondary inclusion and exclusion criteria were applied, the pool of articles was further reduced to 97. Relevant articles located as a result of the search strategy were sent to two reviewers to determine whether selection had been consistent with the pre-defined criteria.

Once all relevant studies had been identified and the selection process peer reviewed,
remaining articles were assessed against a further set of criteria, which identified articles that were of sufficient quality to provide a sound basis for review. Studies that were identified as having a lower level of quality were omitted. Two sets of quality assessment criteria were utilised: one for quantitative studies and another for qualitative and mixed methods studies. Rating systems were adapted from existing procedures for both quantitative and qualitative studies (Catalani & Minkler, 2010; Devers, 1999; Jackson & Waters, 2005; Malterud, 2001; Stevenson, Pearce, Blakely, Ivory, & Witten, 2009; Victorian Health Promotion Foundation, 2005; Wulsin, Vaillant, & Wells, 1999; Yen et al., 2009). Six parameters were used to assess overall quality of quantitative and qualitative articles, and studies were assigned a score from 0 to 3 based on the level scientific rigour (table 2). A score of 3 was assigned for the highest levels of scientific rigour, such as use of randomised controlled trials or an appropriate theoretical framework justifying research design. A score of 0 was given when parameters were not reported or judged to be inappropriate for the research. Studies earning a total score of 9 or more were included in the research. The use of a check-list appraisal for qualitative data could be criticised as inappropriate or overly simplistic; however, it ensures transparency and that included studies have sufficient information to facilitate analysis in the context of this review. During the abstraction and quality evaluation period, 14 articles were identified as either having a lower level of quality or not meeting the inclusion criteria. The final systematic review, therefore, concerns 83 relevant and high-quality articles (figure 1).
### Table 2: Quantitative and qualitative assessment parameters

<table>
<thead>
<tr>
<th>Assessment score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative assessment parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research design</td>
<td>NR/IN*</td>
<td>Cross-sectional / quasi-experimental design</td>
<td>Longitudinal</td>
<td>Randomised controlled trial</td>
</tr>
<tr>
<td>Reliability and validity of measures</td>
<td>NR/IN</td>
<td>Reliability and validity of some measures ascertained</td>
<td>NA</td>
<td>Pilot testing / prior verification of all measures</td>
</tr>
<tr>
<td>Sample size and representativeness</td>
<td>NR/IN</td>
<td>Small sample size</td>
<td>Sample size &gt;500 (power requirements not reported)</td>
<td>Representative sample (power requirements reported)</td>
</tr>
<tr>
<td>Response rate</td>
<td>NR/IN</td>
<td>&lt; 60%</td>
<td>NA</td>
<td>≥ 80%</td>
</tr>
<tr>
<td>Appropriateness of statistical analysis</td>
<td>NR/IN</td>
<td>Generally appropriate, but some inconsistencies</td>
<td>NA</td>
<td>All hypotheses and objectives adequately addressed</td>
</tr>
<tr>
<td>Control of potential confounding variables</td>
<td>NR/IN</td>
<td>NA</td>
<td>NA</td>
<td>Potential confounding variables included in the analysis</td>
</tr>
</tbody>
</table>

| **Qualitative assessment parameters** |   |   |   |   |
| Research design | NR/IN | NA | NA | Appropriate to the aims of the study |
| Sampling and recruitment strategy | NR/IN | NA | NA | Appropriate to the aims of the study |
| Theoretical framework use | NR/IN | NA | NA | Theoretical framework for methods or design present |
| Evidence of reflexivity | NR/IN | NA | NA | Background, preconceptions or meta-positions are addressed |
| Rigour of data analysis | NR/IN | NA | NA | Well-documented and systematic process |
| Validation of findings | NR/IN | NA | NA | Triangulation and verification of results |

* NR: Not reported, IN: Judged to be inappropriate in the context of the study.
Figure 1: Article selection process
2.7 Review findings

2.7.1 Existing literature reviews

Nine literature review articles were located during a preliminary database search, which explored the evidence for interrelationships among ageing, environment, health, and activity participation. Among the identified reviews, four publications considered the evidence from studies of older people (Andrews et al., 2007; Bowling & Grundy, 1998; Wahl & Weissman, 2003; Yen et al., 2009). A further five reviews were located which examined the relationship among environmental conditions, health, and activity participation among adult samples (Humpel et al., 2002; Owen, Humpel, Leslie, Bauman, & Sallis, 2004; Pickett & Pearl, 2001; Stevenson et al., 2009; Yen & Syme, 1999). All of the review articles reported modest or strong support for independent environmental influences on health and activity participation among general and older-adult populations. Existing reviews were limited, however, to studies of physical activity and relatively little consideration was given to other domains. Moreover, the potential effects of the physical environment dominated reviewed studies, and there was little examination of social milieux. The identified reviews were often not systematic and addressed quantitative research findings.

2.7.2 Research characteristics

2.7.2.1 Research participants

Of the 83 studies examined in this research, 10 were conducted solely with older women and the remaining 73 studies were undertaken with a mixed sample. All of the studies assessed in this review employed a chronological marker of older age: 32 studies used a minimum age limit of 65 years or older, 31 studies used an age of inclusion of 60 years or younger, and 20 studies included adults aged 70 years or older. Over 70% of all studies utilised a chronological age between 60 and 70 years as the starting point for participation.
2.7.2.2 Research locations

Research from North America and Western Europe dominated the review results. Out of 83 studies, 49 were undertaken in North America and 20 were undertaken in Europe. Limited numbers of research articles from other areas were identified, including eight studies undertaken in Australasia, four in Asia, and two in South America. No studies were identified from either Africa or the Middle East.

2.7.2.3 Research design and methods

Quantitative approaches dominated the reviewed research. Of the 83 studies analysed, 72 were quantitative and only 11 were qualitative or mixed methods approaches. The prevailing research design among the assessed quantitative studies was cross-sectional \( (n = 48) \), with smaller numbers of longitudinal or cohort studies \( (n = 21) \) and several randomised controlled trials \( (n = 3) \). The prevalence of cross-sectional research appeared to be associated with the large number of exploratory objectives and hypotheses, which is consistent with the relative youth of the field of environmental gerontology. Strategies for sampling study participants in the assessed literature included simple random sampling, systematic sampling, convenience and purposive sampling approaches. Probability sampling techniques were the most common, which is congruent with an empirical design focus. Surveys and interviews dominated the research. Interview surveys were employed as a primary method in 37 studies and questionnaires were employed in 36 studies. Where qualitative research methods were employed, either independently or in combination with other methods, in-depth interviewing was used most frequently \( (n = 7) \) followed by focus group discussions \( (n = 5) \) and field observations \( (n = 3) \). A small number of studies utilised novel research methods such as participant role playing and photovoice procedures (Connell & Wolf, 1997; Gallagher et al., 2010).

2.7.2.4 Measurement of environmental variables

Environmental variables that were commonly assessed as potential influences on health and activity participation included measures of land-use characteristics, area

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10 Canada and the United States.
11 Comparatively limited results from Asia, Africa, South America, and the Middle East may be related to the exclusion of non-English language journal articles from the review process.
deprivation or poverty, neighbourhood degradation, accessibility of services and facilities, accessibility of public green space, social environment and networks, perceived crime and anti-social behaviour, pedestrian friendliness, traffic conditions, aesthetics and architecture, trip hazards in the home and neighbourhood, home and environmental adaptations, climate and topography, and the presence of animals. The conceptualisation of environment as a unit for analysis in the assessed literature included government-defined administrative areas; home or residential care settings; land-use typologies; subjective definitions of neighbourhood proposed by local residents; distinctions based on distance, time, or population density; and researcher definitions.

2.7.2.5 Outcome measures and covariates

The main outcome measures identified in the assessed literature included mortality and longevity (n = 5), mental health (n = 13), morbidity and functional ability (n = 32) and activity participation (n = 33). Potential confounding variables and covariates were also assessed in conjunction with environmental influences on health or activity participation. The covariates presented on Table 3 have all been identified from within the reviewed literature. Common covariates refer to often-reported variables that are assessed across multiple studies.

Table 3: Outcome measures and covariates among assessed research studies

<table>
<thead>
<tr>
<th>Mental health outcomes</th>
<th>Physical health outcomes</th>
<th>Activity participation</th>
<th>Common covariates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressive symptoms</td>
<td>Mortality</td>
<td>Physical activity</td>
<td>Age</td>
</tr>
<tr>
<td>Cognitive functioning</td>
<td>Mobility</td>
<td>Social interaction</td>
<td>Gender</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>Functional ability</td>
<td>Travel behaviour</td>
<td>Genetic factors</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Risk of institutionalisation</td>
<td>Restorative activity</td>
<td>Household income</td>
</tr>
<tr>
<td>Anger</td>
<td>Self-reported falls</td>
<td>Activities of daily living</td>
<td>Smoking status</td>
</tr>
<tr>
<td></td>
<td>Self-reported health</td>
<td>Spiritual activity</td>
<td>Level of education</td>
</tr>
<tr>
<td></td>
<td>Quality of life</td>
<td></td>
<td>Ethnicity</td>
</tr>
<tr>
<td></td>
<td>Incidence of disease</td>
<td></td>
<td>Residential tenure</td>
</tr>
<tr>
<td></td>
<td>Incidence of disability</td>
<td></td>
<td>Country of birth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marital status</td>
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<td></td>
<td></td>
<td></td>
<td>Home ownership</td>
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<td></td>
<td></td>
<td></td>
<td>Body mass index</td>
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<td></td>
<td></td>
<td></td>
<td>Alcohol use</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Household size</td>
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<td></td>
<td></td>
<td></td>
<td>Current drivers license</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Employment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Living situation</td>
</tr>
</tbody>
</table>

12 Census tracts or postal codes.
2.7.3 Main review findings

Of the 83 studies assessed in this review, a majority \((n = 46)\) reported significant, independent relationships between environmental conditions and older adults' health and activity participation. Seven studies identified either no relationship or a relationship contrary to the majority of research findings between environmental conditions and older-adult health and activity participation. Eight studies identified both significant and non-significant associations among environmental conditions and activity participation and health. Finally, 22 studies identified a combination of personal and environmental influences on older-adult health and activity participation.

2.7.3.1 Environmental influences on physical health

The systematic review identified a large number of studies which reported significant and independent relationships between physical environmental conditions (both natural and constructed) and the health of older adults, including health-related quality of life, disability, chronic disease, incidence of falls, and mortality (Balfour & Kaplan, 2002; Bowling, Barber, Morris, & Ebrahim, 2006; Breeze et al., 2005; Connell & Wolf, 1997; Diez Roux, Borrell, Haan, Jackson, & Schultz, 2004; Kobetz, Daniel, & Earp, 2003; Merkin et al., 2007; Takano, Nakamura, & Watanabe, 2002; Zeng, Gu, Purser, Hoenig, & Christakis, 2010). Characteristics of the physical environment associated with poor health among older populations and reported in the literature included excessive noise, inadequate lighting, heavy traffic, temporary hazards, poor walking surface conditions, air pollution, the presence of rubbish, barriers in and around the home, extreme temperatures, and excessive environmental demands (Balfour & Kaplan, 2002; Connell & Wolf, 1997; Parra et al., 2010; Zeng et al., 2010). Physical environmental features associated with improved health among older adults included proximity to and density of public open space and recreational facilities, peacefulness, cleanliness, safety of public areas and street crossings, frequent rubbish collection, access to health services, transport availability, closeness to shops and places for walking, living in a retirement village, living in a hillside area, living in an area with high rainfall, and living in a rural environment (Bowling et al., 2006; Day, 2008; Grant, 2007; Lee, 1993; Parra et al., 2010; Takano et al., 2002; Zeng et al., 2010). These data suggest that environmental conditions of residential areas may either promote or impair physical health among older people.
In addition to studies of the associations between proximate physical environmental conditions and the health of older people, researchers have also considered the role played by the social environment, including proximate social networks, social capital (norms of reciprocity and trust), and incidental social interactions. Researchers have reported independent associations among elements of the social environment and disability, functional decline, morbidity, and mortality (Avlund et al., 2004; Beckett, Goldman, Weinstein, Lin, & Chuang, 2002; Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Unger et al., 1997). Aspects of the social environment that have been found to be associated with improved health and reduced rates of mortality include a large social network, high levels of social participation, presence of living children, ethnic homogeneity of an area, high levels of perceived neighbourliness, community literacy, higher socio-economic status of populations in particular areas, high levels of workforce participation, spending time in the company of friends, and living in a community of older adults (Avlund et al., 2004; Beckett et al., 2002; Bowling et al., 2006; Day, 2008; Eschbach et al., 2004; Grant, 2007; Kobetz et al., 2003; Maier & Klumb, 2005; Patel, Eschbach, Rudkin, Peek, & Markides, 2003; Walsh & O’Shea, 2008; Zeng et al., 2010). Features of social environments, however, can also place demands on older people and may lead to reduced health and functioning in some cases. Social variables that have been identified as having a deleterious influence on health and mortality include financial problems within the family, excessive demands placed on an individual by family and friends, having a spouse or partner in poor health, lower socio-economic status of individuals within particular areas, perceptions of crime, and the presence of graffiti (Beckett et al., 2002; Bowling et al., 2006; Parra et al., 2010; Patel et al., 2003). Across all studies assessed in this review, it was noted that being part of a strong and supportive social network was positively associated with health and longevity among older adults, although the composition of a supportive network varied.

2.7.3.2 Environmental influences on mental health and cognition

In addition to the impacts of environmental conditions on the physical health of older adults, research has also been undertaken in relation to mental health and cognitive ability. Mental health and cognition components that have been assessed in the literature include depression, anxiety, anger, psychological distress, and cognitive functioning (mental processing and memory) (Berke, Gottlieb, Moudon, & Larson, 2007; Brown et al., 2009; Dean, Kolody, Wood, & Matt, 1992; Jansen & von Sadovszky, 2004; Schieman & Meersman,
Aspects of the physical environment that have been identified as positively associated with desirable mental health outcomes include neighbourhood walkability\textsuperscript{13}, architectural features that promote visibility (such as housing oriented to provide oversight of public areas), and long-term residence in a stable urban environment (Berke et al., 2007; Brown et al., 2009; Wiles et al., 2009). Elements of the physical environment associated with deleterious mental health outcomes include the presence of heavy traffic, excessive noise, dilapidated housing, the presence of rubbish, and a rapid pace of urban change (Schieman & Meersman, 2004; Wiles et al., 2009).

The social environment has also been identified as both a facilitator of and constraint to older adults' mental health. Aspects of the social environment that have been identified as a positive influence in the literature include access to networks of support and social participation (Schieman & Meersman, 2004; Smits et al., 1995; Walsh & O’Shea, 2008; Zunzunegui, Alvarado, Del Ser, & Otero, 2003). Characteristics of the social environment that have been identified as a potentially deleterious influence on older-adult mental health include neighbourhood vandalism, perceptions of crime, people loitering on the street, evidence of alcohol and drug abuse, living alone, and a lack of social network contact (Dean et al., 1992; Schieman & Meersman, 2004; Zunzunegui et al., 2003). In a notable link between mental health and activity participation, researchers reported that exercising or being physically active in the presence of others appears to enhance performance and confer a boost to physical and mental health in randomised controlled trials (Helbostad, Sletvold, & Moe-Nilssen, 2004; McAuley et al., 2000).

With increasing international evidence for a relationship between environmental conditions and the physical and mental health of older adults, some researchers have turned their attention to mechanisms underlying this interaction. It has been theorised that environment influences health via the pathway of activity participation. Research into the possible relationship between physical activity and environmental conditions has received the most attention, which is possibly due to the well-established health benefits associated with regular participation (Chodzko-Zajko et al., 2009). As will be shown, however, there is also emerging evidence that participation in other domains of activity may be influenced by environmental conditions.

\textsuperscript{13} Local features that facilitate walking.
2.7.3.3 Environmental influences on physical activity

Physical activity has received attention as a potential influence on the health of adults of all ages, which may be affected by environmental conditions. Potential facilitators of physical activity identified in the literature include the presence of attractive local conditions (urban design, heritage buildings, well-maintained properties and public spaces), safe and smooth paths for walking, protection from traffic, reliable transportation options, accessibility of the home environment, facilities within walking distance, age of urban areas, clean air, and a moderate climate (Annear et al., 2009; Berke, Koepsell, Moudon, Hoskins, & Larson, 2007; Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Gallagher et al., 2010; Haak, Fange, Horstmann, & Iwarsson, 2008; King et al., 2005; Niva & Skar, 2006; Salvador, Florindo, Reis, & Costa, 2009). Physical environmental attributes that have been identified as barriers to activity participation include inappropriate facilities and infrastructure, evidence of neighbourhood decline, unattractive environmental conditions, lack of street lighting, bad weather, poor-quality footpaths, and heavy traffic (Annear et al., 2009; Gallagher et al., 2010). In a qualitative study concerning environmental influences on active ageing, Michael and associates (2006) reported that physical environmental conditions were a salient influence on older-adult activity. Following focus group discussions with older adults from diverse neighbourhoods, researchers found that access to shops and services, safe pedestrian conditions, access to public transportation, and neighbourhood attractiveness facilitated activity, while exposure to heavy traffic volumes acted as a constraint (Michael et al., 2006). Michael and colleagues also reported that older adults expressed a high degree of agency in their selection of residential area and made choices to move or remain in their current location in relation to the level of environmental support for daily activities.

Characteristics of the social environment have also been identified as potential influences on physical activity among older adults. Potential social environmental facilitators reported in the literature include living in more affluent areas, opportunities to express cultural traditions, safety from crime, perceptions of trustworthy and responsible residents, peacefulness, access to local networks of social support, the presence of active people, and family or peer support for physical activity (Annear et al., 2009; Booth et al., 2000; Gallagher et al., 2010; Salvador et al., 2009). Social environmental barriers reported in the literature include living in a high poverty area, perceptions of crime and antisocial behaviour, and the

14 Conceived narrowly as the integration of physical activities into daily routines.
presence of unrestrained dogs (Annear et al., 2009; Gallagher et al., 2010). In particular, living in a more deprived urban area is often considered a barrier to activities in later life as a consequence of associated deleterious physical and social conditions that are often observed in such areas. Some researchers have argued, however, that while such environments may constrain involvement in preferred activities they may also increase participation in necessary or utilitarian endeavours, such as active travel and physical work (King et al., 2005).

2.7.3.4 Environmental influences on other domains of activity

Comparatively few studies have examined the relationship between environmental conditions and a broader concept of active ageing, including social, cultural, civic, spiritual, and economic elements, which potentially contribute to health in later life (World Health Organisation, 2002a). Even when active ageing is referred to in the literature, it is often considered primarily in relation to physical activity (Michael et al., 2006). This may be due to the largely undisputed links between physical activity and health across all age cohorts – a rationale for physical activity research and funding priorities. Publication bias may also offer an alternate rationale for the dominance of physical activity studies.

A small number of studies were located in this review, which explored the influence of environment on general, restorative, spiritual, and social activities (Barnett et al., 2007; Haak et al., 2008; Jansen & von Sadovszky, 2004; Marcellini, Giuli, Gagliardi, & Papa, 2007; Raina, Rogers, & Holm, 2007; Walker & Hiller, 2007). Several researchers considered the environmental influences on general activity participation (including leisure and everyday activities) among older adults. Reported environmental facilitators of general activity included living in an urban area, proximity to services, positive perceptions of the local environment, feelings of attachment to home and neighbourhood, trusting and reciprocal relationships with neighbours, security in home and neighbourhood, and proximity to social networks (Marcellini et al., 2007; Walker & Hiller, 2007). Barriers to general activity in later life included fear of violence within the local environment, social disconnection, unfamiliar environments, living in rural areas, air pollution, and traffic noise (Barnett et al., 2007; Marcellini et al., 2007; Walker & Hiller, 2007). In a qualitative study involving 30 older adults from a mid-western city in the United States, Jansen and von Sadovszky (2004)

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15 Publication bias describes the tendency for journals to publish strong, positive results instead of negative or weak findings (Petticrew & Roberts, 2006; The Cochrane Collaboration, 2011).
16 This was not analogous with the active ageing concept.
reported that both physical and social environmental conditions were associated with participation in a spectrum of restorative activities (pursuits that promote recovery from mental fatigue). Following interviews with older adults, environmental characteristics associated with restorative experiences were identified and included spending time in natural settings and social network interaction (Jansen & von Sadovszky, 2004). Evidence from a longitudinal study undertaken with 511 adults aged 65 years and older in the United States identified that regular participation in spiritual activities was an effective mechanism for offsetting the deleterious environmental impacts on personal health associated with residence in more deprived communities (Krause, 1998). Finally, a Swedish study of home and neighbourhood influences on activity participation among 314 adults aged over 80 years reported that social activity was positively associated with good local transportation and negatively correlated with a lack of cultural opportunities (Haak et al., 2008). While there is emerging evidence for associations between environmental conditions and a broad spectrum of activities, non-significant or seemingly contradictory findings were also identified.

2.7.4    Non-significant and contradictory findings

Seven articles were located which identified either a non-significant relationship or alternative evidence concerning the relationship between environmental conditions and the health and activity participation of older adults. While these studies represent a minority within the context of the review, it is important to consider the potential implications of these and how they differ from other findings.

2.7.4.1    Non-significant and contradictory findings: health

Only two studies were located which identified non-significant or contradictory findings for an interaction between environment and health in later life. In 1996, researchers from the United States assessed the relationship between social network characteristics and the onset of activities of daily living disability among 1,189 men and women aged 70 years or older (Seeman, Bruce, & McAvay, 1996). Using a longitudinal design and interview surveys, the authors reported no protective effects associated with network or structural support characteristics over a two-year period and that higher levels of social network support was a significant predictor of increased risk of disability (Seeman et al., 1996). The authors suggested that more research was required to verify these unexpected findings. In 2007, North
American researchers explored whether depressive symptoms varied across urban neighbourhoods among 3,442 adults aged 65 years and older (Aneshensel et al., 2007). Significant variation in depressive symptoms across census tracts was identified, but this variation was accounted for by the characteristics of residents rather than environmental conditions (Aneshensel et al., 2007). Researchers argued that the findings suggested that neighbourhood differences in health among older adults are compositional (pertaining to the characteristics of individuals) rather than contextual. Personal correlates of depression identified in the study included lower levels of education, religious faith, and marital status.

### 2.7.4.2 Non-significant and contradictory findings: activity participation

Several studies were identified, which found no relationship or an unanticipated relationship between environmental influences and activity participation. In 2009, an Australian survey explored the facilitators and barriers to physical activity among 333 adults aged 60 years or older from culturally diverse and lower socio-economic areas (Bird et al., 2009). A range of compositional influences on physical activity were identified, and barriers included poor health, cultural backgrounds, lack of energy or motivation, fear of injury, and perceptions of danger. In contrast to other studies, supportive pedestrian conditions were found to be inversely associated with physical activity (Bird et al., 2009). Similar findings were reported in a Canadian study, which explored personal and environmental correlates of daily activities and social roles among 200 adults aged 65 years and older who had chronic health problems (Anaby et al., 2009). The authors found that mobility, balance confidence, and gender were the prevailing determinants of activity participation in this study (Anaby et al., 2009). While highlighting the importance of personal factors as influences on activity participation, the study authors commented that further investigation into potential contextual barriers would be warranted and surmised that environment may be more important for older adults who are in better health (Anaby et al., 2009).

Unexpected findings concerning the influence of environmental factors on activity participation were also reported in several qualitative studies. Norwegian researchers explored how environmental conditions potentially influenced participation among 14 adults over 65 years of age who had undergone community based rehabilitation following accident or illness (Vik, Lilja, & Nygard, 2007). The researchers identified social environmental barriers to activity participation, including family pressures to focus on activities of daily living and
negative attitudes of decision makers and the media (Vik, Lilja, et al., 2007). Similar findings were reported in a longitudinal study from North America concerning the relationship between received social support and late life transitions among 2,303 adults aged 60 years or older (Wilmoth, 2000). Study authors reported that support from family members was positively associated with transitions to institutional care, while support from friends was associated with transitions within the community. These findings suggest that some forms of network interaction encourage maintenance of independence and health, while others act as a negative influence (Wilmoth, 2000). In 2008, Nagel, Carlson, Bosworth, and Michael examined the relationship between objectively measured aspects of the local environment and walking activity among 546 adults aged 65 years and older who resided in 56 neighbourhoods in Portland, United States. Using interview surveys, the researchers found no significant relationship between walking behaviour and the built environment. When the population of participants who walked regularly was considered in isolation, however, there was a significant association among walking time, traffic volume, and number of commercial establishments. The authors concluded that, “for older adults who are not already active, approaches to reduce inactivity should focus on physical or psychological concerns” (Nagel, Carlson, Bosworth, & Michael, 2008, p. 7). These results suggest that those who are already active may be encouraged to continue or increase their participation in favourable environmental circumstances, while there may be little contextual influence for those who are inactive.

Personal factors appear to influence the health and activity participation of older adults and are arguably more significant than environment in some circumstances. These findings present a challenge to gerontologists as they suggest that environmental conditions may act to constrain health and activity participation rather than to promote it in some instances. While these studies represent only a small portion of the assessed articles, they emphasise that environment does not always present a consistent or overarching influence.

### 2.7.5 Significant and non-significant findings for environmental influences

During the review process, eight studies were identified that reported both significant and non-significant environmental influences on health and activity participation. Many of the studies involved older participants who were disabled or recovering from an injury or operation (Vik, Nygard, & Lilja, 2007). Researchers often reported that their results appeared
to contradict established findings, which indicated a greater role for environmental variables in the relationship among ageing, health, and activity participation (Mota, Lacerda, Santos, Ribeiro, & Carvalho, 2007). Studies that have reported both significant and non-significant results in the same study are summarised below in table 4.
<table>
<thead>
<tr>
<th>Author</th>
<th>Main outcome measure</th>
<th>Environmental influence</th>
<th>No relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cagney, Browning &amp; Wen (2005)</td>
<td>Self-rated health</td>
<td>Neighbourhood affluence</td>
<td>Collective efficacy</td>
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<td></td>
<td></td>
<td>Residential stability</td>
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<td></td>
<td></td>
<td>Familial support</td>
<td>Public transportation services</td>
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<td></td>
<td></td>
<td>Service provider support</td>
<td>Accessibility of facilities</td>
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<tr>
<td></td>
<td></td>
<td>Health and rehabilitation services</td>
<td>Services for recreational, religious or cultural organisations</td>
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<td></td>
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<td>Accessibility of taxis and businesses</td>
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<td>Roads</td>
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<td>Natural features</td>
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<td></td>
<td></td>
<td>Technical aids</td>
<td></td>
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<td></td>
<td></td>
<td>Availability of environmental modifications</td>
<td></td>
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<td></td>
<td></td>
<td>Accessibility of home environment</td>
<td></td>
</tr>
<tr>
<td>Gauvin et al. (2008)</td>
<td>Physical activity and walking</td>
<td>Density of walking destinations</td>
<td>Age-friendliness of areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Street connectivity</td>
<td>Social environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infrastructure for walking and cycling</td>
<td>Aesthetics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social environment</td>
<td>Recreation facilities</td>
</tr>
<tr>
<td>Kubzansky et al. (2005)</td>
<td>Mental health problems</td>
<td>Neighbourhood poverty</td>
<td>Access to local services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concentration of older adults</td>
<td></td>
</tr>
<tr>
<td>Davis, Moritz, Neuhaus, Barclay &amp; Gee (1997)</td>
<td>Survival / mortality</td>
<td>Living with a spouse or partner for women</td>
<td>Living with a spouse or partner for men</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Residential stability (inverse relationship)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density of older adults (inverse relationship)</td>
<td></td>
</tr>
</tbody>
</table>

Studies that have highlighted both significant and non-significant associations between environmental conditions and the health and activity participation of older people reveal the complexity of environmental influences. Environmental conditions clearly do not affect older adults in a uniform manner and may vary in relation to the outcome under investigation, research setting and population, or personal attributes and circumstances.
2.7.6 *Interactions between environmental and personal factors*

Among the 83 reviewed studies, 22 reported that older adults' health and activity participation was significantly influenced by a combination of personal and environmental characteristics. Reliable evidence for a mix of personal and environmental factors comes from twin studies, which are able to distinguish between genetic, personal, and environmental influences on activities over time\(^\text{17}\). In a large-scale Danish study, researchers found that a complex mix of shared genetics, non-shared environmental conditions, and lifestyle choices influenced cognitive and physical functioning among 1,053 pairs of older twins (Johnson, Deary, McGue, & Christensen, 2009). Similar results were also reported in a Swedish study, which explored the sources of genetic and environmental variation in physical health and functioning among 758 pairs of older twins (Harris, Pedersen, McClearn, Plomin, & Nesselroade, 1992). Harris et al. reported that the health of individual twins became more varied with increasing age and surmised that non-shared environments in adulthood become a greater influence on health over time. In the table below, potential environmental and personal influences on health and activity participation are identified from the assessed literature.

\(^{17}\) It is acknowledged that there is a large body of research concerning the health and ageing of adult twins and it was not the intention of the present research to scope this diverse field.
<table>
<thead>
<tr>
<th>Study authors</th>
<th>Main outcome measure</th>
<th>Environmental influences</th>
<th>Personal influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernandez-Ballesteros (2001)</td>
<td>Health-related quality of life</td>
<td>Socio-recreational aids</td>
<td>Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community accessibility</td>
<td>Educational level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expectation of functioning</td>
<td>Personal income</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tolerance for deviance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social climate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Policy choice</td>
<td></td>
</tr>
<tr>
<td>Seeman et al. (1995)</td>
<td>Functional performance</td>
<td>Supportive social network</td>
<td>Exercise history</td>
</tr>
<tr>
<td>Johnson, Deary, McGue &amp; Christensen (2009)</td>
<td>Cognitive and physical functioning</td>
<td>Non shared environmental conditions (education, rearing, religious faith)</td>
<td>Shared genetic attributes (twin study)</td>
</tr>
<tr>
<td>Harris, Pedersen, McClearn, Plomin &amp; Nesselroade (1992)</td>
<td>Physical health and functioning</td>
<td>Non shared environmental conditions in adulthood</td>
<td>Shared genetic attributes (twin study)</td>
</tr>
<tr>
<td>Wight et al. (2006)</td>
<td>Cognitive ability</td>
<td>Area-level educational characteristics</td>
<td>Individual educational attainment.</td>
</tr>
<tr>
<td>Dwyer, Barton &amp; Vogel (1994)</td>
<td>Risk of institutionalisation</td>
<td>Rural or urban setting</td>
<td>Race</td>
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<tr>
<td>Holtzman et al. (2001)</td>
<td>Cognitive functioning</td>
<td>Social network characteristics</td>
<td>Age</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emotional support</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban living</td>
<td>Ethnicity</td>
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<tr>
<td></td>
<td></td>
<td>Perceived neighbourhood safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Received social support</td>
<td>Self-efficacy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social contacts</td>
<td>Ability to perform household tasks</td>
</tr>
<tr>
<td>Gitlin, Mann, Tomit &amp; Marcus (2001)</td>
<td>Functional ability</td>
<td>Environmental design characteristics</td>
<td>Age</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Topography</td>
<td>Gender</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scenery</td>
<td>Disability and pain</td>
</tr>
<tr>
<td>King et al. (2000)</td>
<td>Physical activity</td>
<td>Topography</td>
<td>Ethnicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scenery</td>
<td>Age</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presence of other active people</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Energy levels</td>
</tr>
<tr>
<td>Study authors</td>
<td>Main outcome measure</td>
<td>Environmental influences</td>
<td>Personal influences</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
</tbody>
</table>
Area-level socio-economic status  
Density of older adult population  
Concentration of ethnic groups  
Facilities available for walking                                                                                                                            | Self efficacy  
Education level |
| Kemperman & Timmermans (2009)                     | Walking and cycling           | Level of urbanisation  
Public space availability                                                                                                                                     | Age  
Education level  
Personal income |
| Lim & Taylor (2005)                               | Physical activity             | Rural residence                                              | Gender  
Age  
Mobility  
Physical functioning  
Level of psychological distress  
Fruit and vegetable intake  
Language  
Presence of diabetes |
| Richard, Gauvin, Gosselin & Laforest (2008)       | Social participation (activity) | Perceived accessibility to resources for older adults                                                                                                             | Age  
Walking behaviour  
Levels of energy  
General health |
| Wilcox, Castro, King, Housemann & Brownson (2000) | Leisure time physical activity | Scenery  
Social support levels  
Presence of other active people                                                                                                                                    | Ethnicity  
Age  
Education level |
Scenery  
Presence of other active people  
Safety of environment for activity  
Prevalence of footpaths and street lights                                                                                                                    | Level of fatigue  
Level of interest  
Time available  
Health |
| Levasseur, Desrosiers & St-Cyr Tribble (2008)     | Activity participation        | Barriers in the built environment                                                                                                                                       | Quality of life  
Participation satisfaction |
| Lian, Gan, Pin, Wee & Ye (1999)                   | Leisure time physical activity | Family support  
Presence of active family members                                                                                                                                  | Smoking status  
Time available  
Health  
Awareness of exercise benefits  
Dietary habits |
| Hough, Cai & Handy (2008)                         | Mobility patterns             | Social club membership  
Familial networks  
Rural or urban setting                                                                                                                                         | Self efficacy  
Level of dependence  
Physical and cognitive problems |
There is a growing body of research attesting to a combination of personal and environmental influences on the health and activity participation of older adults. The role played by the environment, therefore, is likely to be a complex one. Certain environmental conditions may be associated with particular health states or modes of activity, but not others. For example, it has previously been reported that higher urban density is associated with increased walking, but decreased cycling among older adults (Kemperman & Timmermans, 2009). In other studies, activity participation has been shown to have a close association with conditions in the physical environment, but not the social environment (Levasseur et al., 2008). In the figure below, the diverse influences on health and activity participation identified from the literature review are summarised by context and potential influence.
Figure 2: Overview of potential influences on activity participation

**Social environment**
- Social network relationships
- Peer pressure / social norms
- Collective efficacy
- Neighbourhood poverty or affluence

**Physical environment**
- Density / accessibility of neighbourhood resources
- Environmental aesthetics / attractiveness
- Street connectivity and transport services
- Local walking conditions and infrastructure
- Age-friendliness of local area

**Other environmental**
- Political systems and social norms
- Religious and cultural institutions

**Late life health and activity**
- Contested influences
- Potentially significant influences
- Potential covariates or confounders

**Potential interactions**

**Social environment**
- Perceptions of neighbourhood safety
- Social network size
- Population density
- Perceived neighbourhoodness
- Neighbourhood stability / pace of change
- Social capital of local area
- Health and financial status of family
- Residing in a retirement village or aged community
- Living situation (alone or with others)
- Ethnic homogeneity / cultural opportunities
- Presence of active peers in local environment
- Community literacy and workforce participation
- Peacefulness and quietness

**Physical environment**
- Local climate and topography
- Level of pollution and environmental degradation
- Level of noise and street lighting
- Accessibility of greenspace and natural areas
- Urban or rural land use
- Accessibility of the home environment
- Local traffic conditions
- Quality of local facilities
- Hazards in the local environment
- Age of urban areas
2.8 Discussion

A large number of studies identified that environmental conditions play an important role in facilitating or constraining health and activity participation among older adults. Environmental influences appear to vary widely in their effects depending on the health outcome or activity assessed, characteristics of the sample group, and the setting under investigation. Several studies also suggested that certain environmental conditions have no relationship or a counter-intuitive relationship to health and activity participation. The contradictions and inconsistencies that exist between studies may reflect the youth of environmental gerontology and an absence of definitive evidence, the overuse of limited survey tools, or the lack of diverse theorising about potential mix of influences likely to affect health and activity in later life. Personal influences on health and activity were also identified, which indicates that there are likely to be multiple and interacting levels of influence at play. Several limitations and gaps were identified during the review and data abstraction process, which provide rationale for the design of the present research.

2.8.1 Gaps and limitations

Research concerning the interactions between ageing and environment is required in such regions as Asia, Africa, the Middle East, and Australasia, where comparatively few studies have been undertaken in the field of environmental gerontology. In particular, further research from the English-speaking countries of Australia and New Zealand is warranted as these areas represent approximately 30 million people, fast-growing older-adult group, and diverse environments. The current paucity of articles from the regions mentioned above is not necessarily a limitation. It may simply reflect differing research priorities, a lower volume of research outputs, or a publication bias. The results of this review should be viewed with some care as they are generally reflective of conditions in Western Europe and North America.

More qualitative and mixed methods research is required to explore the complex pathways through which environmental conditions may influence the health and activity participation of older adults. There is an overwhelming focus in the current literature on identifying potential correlates of health and activity participation among older adults; however, such approaches do little to advance our understanding of the pathways leading from environment to action. For example, identified relationships between environmental
accessibility and physical activity seldom explain how this factor influences activity and the consequences and experiences of residing in more or less accessible settings. Moreover, considering the myriad potential environmental influences on health and activity participation, it makes little sense to attempt to conceptualise environmental influence on the basis of a relatively small number of survey items. Qualitative and mixed methods studies are necessary for the development of new ecological models and theories concerning ageing and environment. Throughout the assessed literature, there were few examples of novel or alternative research approaches that could shed new light on the interactions among ageing, environment, activity participation, and health. Survey and interview methods dominated the research, and there is scope for the use of other approaches that may lead to unanticipated and beneficial research outcomes.

There was also a noticeable absence of older-adult participation in research processes, which is commensurate with a focus on quantitative, researcher-driven survey methods. In particular, older adults had no involvement in setting the research agenda, defining key concepts and identifying potential confounding variables, selecting and pilot testing methods, or in the analysis and interpretation of study results. As most gerontological researchers sit outside their study cohort, a closer collaboration with participants would help to achieve better representation of the diverse perspectives and experiences of later life.

Research is required that explores environmental influences on activity participation as a contributor to the health of older adults. Relatively little work has been undertaken that considers the environmental influences on activities undertaken in later life, which have a potentially cumulative influence on health. Moreover, components of activity participation other than physical activity need to be considered in the research literature. In particular, research is required that focuses on social, cultural, civic, spiritual, and economic activities, which potentially influence a holistic conception of health. Notably, none of the studies assessed in this review examined the active ageing concept in its totality.

Investigations into environmental influences on health and activity participation often rely on arbitrary definitions of areas based on Census-related variables or postal codes. While such approaches are useful for delineating the boundaries between areas for the purposes of analysis, they provide little descriptive information about the areas that could help to build an in-depth profile of locations that potentially influence health or activity. Studies intending to
explore the influence of particular environments on health and activity participation should develop a more holistic conceptualisation of areas under investigation, which takes into account such factors as existing population composition, quality and character of the transportation network, availability of community services, and access to places for leisure and recreation. Such an approach could be facilitated by including participant definitions of areas, using systematic observations, or accessing objective geographic and demographic data.

Models of older-adult health and activity participation need to consider both environmental conditions and personal factors as potential influences. It appears beyond conjecture that health and activity participation are the result of the complex interaction between intrinsic and extrinsic factors. It is important, therefore, that ecological models of health and ageing come to the fore to recognise the important interplay between personal and environmental factors that either constrain or facilitate health or activity in later life. It should be noted that much of the work on ecological models is currently undertaken with general adult populations. Work is also required to develop new theories that address the interplay between ageing and environment based on the growing body of international research.

2.8.2 Limitations of the systematic review

While measures were undertaken in the present review to ensure that results were obtained and analysed systematically and without bias, there were several limitations. There is a shortage of accepted frameworks for undertaking a systematic review incorporating quantitative, qualitative, and mixed methods studies. The present review is based primarily on the Cochrane review process, which is usually undertaken to assess quantitative research evidence. As a consequence, the review represents a pragmatic approach, which comprised different sets of criteria for assessing quantitative and qualitative evidence. It is possible that some readers will disagree with the approach taken believing, perhaps, that findings from quantitative and qualitative studies are not directly comparable. It was necessary, however, to include both forms of evidence in the present review to provide a full account of the existing knowledge relating to the interactions among environment, ageing, health, and activity participation. The different criteria used to assess both the qualitative and quantitative studies addressed obvious philosophical and methodological discrepancies between these approaches.
An additional limitation relates to the use of keyword, subject heading, and abstract searches, which were a feature of this review. This technique is commonly used in literature searches, but is generally unable to adequately identify complex concepts or ideas. For example, such searches may miss studies that employ novel or unorthodox research approaches or employ more creative or literary naming conventions. It is also possible that the search parameters and keywords used did not scope the totality of the field, particularly when addressing areas such as social and cultural activity. Social and cultural activity may be reflected in such concepts as network participation, community engagement, or social capital. The potential failure to locate such articles is a limitation of this thesis. As a consequence, no guarantee can be given that the present review represents the totality of relevant articles produced since 1985. It is also possible that some relevant studies were overlooked in this review as a consequence of the databases selected. Databases such as PubMed were not consulted during the search procedures as limited selections were made of appropriate sources to expedite the review process. Databases were specifically chosen to provide a balance between a diversity of health-related and psycho-social studies and an efficient search procedure. Despite these limitations, a significant body of literature was identified and assessed (including over 1,400 primary research articles in the preliminary searches), which represents a significant diversity of research addressing potential environmental influences on active ageing over the last 25 years.

2.9 Chapter summary

There is substantial evidence in the assessed literature that both environmental and personal attributes contribute significantly to older-adult health and activity participation. Most studies reported that environmental conditions (including built, natural, and social contexts) were important influences. While a small number of articles suggested there was no discernible relationship between environment and health or activity participation, these studies represented only a minority of cases and were often undertaken with lower-functioning older adults. Such results, however, highlight the need to carefully consider the role of the environment among an ocean of potential influences. It is likely that the strength, direction, and experience of environmental influences vary significantly across individuals, communities, and health-related outcomes in later life. Further work is required within the field of environmental gerontology to understand the nature of the relationships among environment, ageing, health and activity participation. Future research could include a greater
focus on qualitative or mixed methods approaches, increased collaboration with older-adult stakeholders, more attention on diverse activity domains, and the development of new ecological theories to explicate the personal and environmental influences on health and activity participation.
3 Review of disaster research

3.1 Chapter introduction and organisation

In response to the earthquakes that affected Christchurch during 2010 and 2011, a literature review was undertaken to explore the evidence concerning the impacts of natural disasters on older adults. Disaster research has typically been conducted in relation to the impacts of floods, storms, heat waves, tsunamis, and earthquakes. Earthquake studies have usually been conducted in areas of high seismicity, including Japan, Taiwan, Turkey, Armenia, Italy, Peru, and the United States. Comparatively little research concerning the health and social impacts of earthquakes has been undertaken in New Zealand. This is possibly because New Zealand has not experienced a disruptive earthquake in an urban area during its recent history. The last earthquake that caused widespread destruction and loss of life occurred in the Hawkes Bay region of New Zealand in 1931 (GNS Science, 2011c; King, 2003). The infrequency and unpredictability of natural disasters, particularly earthquakes, makes the investigation of such phenomena extremely difficult and has forced some researchers to examine the effects on survivors months or years after initial exposure (Lazaratou et al., 2008).

This chapter outlines the evidence for the effects of natural disasters on the health and activity participation of older adults. In the first section, the search strategy is described and the prevailing exposures and outcomes reported in the literature are addressed. Next, disaster-related theory is considered as it relates to older adults. Following this, the effects of natural disasters on the health and activity participation of older adults are outlined. Finally, gaps and limitations in the current body of research are presented and the review findings are summarised.
3.2 Search strategy

A non-systematic search of commonly used social scientific and health-related databases was undertaken prior to the development earthquake questions in the second research phase. Searched databases included Scopus, ProQuest Health and Medical Complete, EBSCO, Ovid (including Medline, PsychINFO, NURSING, and EMBASE), ISI Web of Knowledge, and Google Scholar. The following terms were used in the search: older adult, elderly, natural disaster, and earthquake. In addition to the database searches, research colleagues also contributed relevant articles. The purpose of the review was to identify primary research from 1985 and onwards that investigated the effects of natural disasters, particularly earthquakes, on older-adult health and activity participation. This date was chosen to reflect the youth of the field of environmental gerontology and the relative dearth of articles on the interaction between environment, ageing, and activity that were published before 1985. It is accepted, however, that such a distinction is somewhat arbitrary, though necessary for bounding the review. In congruence with the main literature review, disaster influences on health and activity participation were considered together due to the potential interactions between these two concepts. Following the search procedures, 28 articles were identified and selected for inclusion in the review.

3.3 Exposures and outcomes

Reported effects of natural disasters on older adults include physical injury, mental health impacts, and disruptions to activity participation and quality of life. Several of the reviewed studies assessed multiple outcomes, which reflects the serendipitous nature of disaster research, the pervasive impact of natural disasters on multiple facets of human life, and interconnections between physical and mental health impacts and disruptions to activities and quality of life. In the context of this review, seven studies examined the effects of the natural disasters on the physical health of older adults, 21 studies explored mental health outcomes, and eight studies examined the impacts of natural disasters on activity participation and quality of life. The majority of reviewed articles assessed the impacts of earthquakes on older survivors \((n = 22)\), and the remaining studies \((n = 6)\) explored the effects of floods and storms (table 6).

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18 The present review was not systematic in either the selection of articles or assessment of research quality. A non-systematic review was undertaken in response to the relative paucity of disaster-related gerontological research.
Table 6: Overview of the disaster literature

<table>
<thead>
<tr>
<th>Study authors</th>
<th>Earthquake</th>
<th>Other disasters</th>
<th>Physical health</th>
<th>Mental health</th>
<th>Activity / QoL</th>
<th>Qual / Mixed</th>
<th>Quant</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aoyama et al. (1998)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Japan</td>
<td></td>
</tr>
<tr>
<td>Ardalan et al. (2010)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Iran</td>
<td></td>
</tr>
<tr>
<td>Ardalan et al. (2011)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Iran</td>
<td></td>
</tr>
<tr>
<td>Carr et al. (1995)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Carswell (2011)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
<tr>
<td>Chen et al. (2007)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Taiwan</td>
<td></td>
</tr>
<tr>
<td>Cherry, Silva, &amp; Galea, (2009)</td>
<td>Yes (storm)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry et al. (2010)</td>
<td>Yes (storm)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td></td>
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<tr>
<td>Goenjian et al. (1994)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Armenia</td>
<td></td>
</tr>
<tr>
<td>Jia et al. (2010)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>China</td>
<td></td>
</tr>
<tr>
<td>Kaniasty &amp; Norris (1993)</td>
<td>Yes (flood)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>United States</td>
<td></td>
</tr>
<tr>
<td>Kario &amp; Ohashi (1997)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Kario &amp; Ohashi (1998)</td>
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<td>Kato, Asukai, Miyake, Minakawa, &amp; Nishiyama (1996)</td>
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<tr>
<td>Knight, Gatz, Heller, &amp; Bengtson (2000)</td>
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<td>Yes</td>
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<tr>
<td>Lin et al. (2002)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Taiwan</td>
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</tr>
<tr>
<td>Phifer (1990)</td>
<td>Yes (flood)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>United States</td>
<td></td>
<td></td>
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<tr>
<td>Salcioglu, Basoglu, &amp; Livanou (2003)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Turkey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seplaki, Goldman, Weinstein, &amp; Lin (2006)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Taiwan</td>
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<td>Shenk, Mahon, Kalaw, Ramos, &amp; Tufan (2010)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Peru</td>
<td></td>
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3.4 Disaster theory

Several theoretical perspectives have emerged from research observations to explain and predict the effects of natural disasters on older adults. Perspectives relevant to older adults include the inoculation hypothesis, maturation theory, and the burden hypothesis. The inoculation hypothesis (Norris & Murrell, 1988) contends that prior experience of natural disasters or traumatic events over the life course may have a protective function for older adults whereby individuals become more resilient to the negative psychological impacts (including anxiety and strong emotional reactions) of subsequent events. Maturation theory (Knight, Gatz, Heller, & Bengtson, 2000) is similar to the concept of inoculation, but is not predicated on previous traumatic experience. This hypothesis argues that older adults have a lower emotional reactivity both before and after a disaster as a consequence of emotional growth and the development of effective coping styles throughout the life course (Knight et al., 2000). The maturation hypothesis also suggests that pre-disaster psychological state has a strong association with post-disaster coping (Cherry et al., 2010). The Burden hypothesis (Thompson, Norris, & Hanacek, 1993) suggests that middle-aged adults, in contrast to younger or older adults, are likely to be negatively affected by a disaster due to economic and social responsibilities for generating income and protecting more vulnerable family members. Older adults are thought to have reduced financial and social responsibilities and are, therefore, less likely to be materially affected by a major disaster (Thompson et al., 1993). Theories considering the impacts of disasters on older adults often contend that this group is more psychologically prepared, resilient, or adaptable than younger populations. It is important to note, however, that during a disaster older adults may be more prone to physical injury or death, less likely to receive warnings and participate in evacuation, and more disturbed by altered routines and lifestyles (Ardalan et al., 2011; Friedsam, 1962; Phifer, 1990). Furthermore, it has been argued that when older adults sustain an injury or financial loss during a disaster, it is likely that it will be more difficult for them to recover their health and assets than those in younger age cohorts (Friedsam, 1962; Phifer, 1990). It appears, therefore, that among the older-adult group there are likely to be examples of both significant resilience and vulnerability in the aftermath of a natural disaster.
3.5 Physical health

Relationships have been identified between natural disasters, including earthquakes, and deleterious physical health outcomes among older adults. During a disaster, there is an increased possibility of injury and death at all ages, although this risk is greater for older adults who are frail, disabled, or unwell (Ardalan et al., 2011; Cloyd & Dyer, 2004; Tanida, 1996). A range of other physical conditions and symptoms have been observed in older populations in the months and years following a natural disaster, including reductions in reported general health and increased incidence of chronic disease.

In the aftermath of the Kobe earthquake in 1995, Kario and Ohashi (1997, 1998) examined the number of stroke and coronary heart disease deaths in the three-month, post-earthquake period. Using mortality statistics, the authors identified a significant increase in cardiovascular deaths in those aged 70 years and above compared to figures from the preceding year (Kario & Ohashi, 1997, 1998). In a similar study undertaken in Kobe, Aoyama et al. (1998) investigated the recorded incidence of peptic ulcers among large samples of adults in the months before and after the disaster. The study authors reported that there was a two-fold increase in the incidence of ulcers in the months following the earthquake and older adults were found to be disproportionately affected. The researchers surmised that stress induced by the disaster led to an increase in reported disease (Aoyama et al., 1998).

Qualitative evidence from a 2007 study of 24 survivors of a Peruvian earthquake aged older than 60 years identified finer-grained health impacts associated with the disaster (Shenk, Mahon, Kalaw, Ramos, & Tufan, 2010). Among diverse responses, participants reported a range of physical symptoms including increases in bodily pains, coughing, sore throat, and increased difficulty hearing and seeing (Shenk et al., 2010). Following the 2003 Bam earthquake, Iranian researchers explored the health-related impacts on 210 adults aged 65 years and older five years after disaster exposure using a validated World Health Organisation instrument (Ardalan et al., 2011). The study authors reported that exposure to the earthquake was linked with reduced general health, injury during the disaster, exacerbation of chronic illness, and reduced access to and utilisation of health services (Ardalan et al., 2011).

In addition to studies of earthquake impacts, two articles were identified that considered the health impacts of floods and hurricanes on older adults. In both cases, the results were consistent with the earthquake findings. In the aftermath of a series of large
floods that affected the southern United States during the 1980s, researchers explored the physical impacts on 200 older adults aged 55 years or older who were interviewed before and after the disasters (Phifer, 1990). After follow-up with respondents 18 months after the floods, researchers found a significant decrease in reported physical health among older adults. Notably, older adults with worse pre-disaster symptoms exhibited the greatest reduction in physical well being (Phifer, 1990). Following hurricanes Rita and Katrina in the United States, researchers examined health outcomes among adult survivors as part of a longitudinal survey (Cherry, Silva, & Galea, 2009). Across middle-aged, old, and very-old populations, researchers found consistent increases in negative health changes following the disasters (Cherry et al., 2009).

It can be difficult to determine whether declines in health following a disaster are directly attributable to the event itself or whether they are part of the natural progression of underlying disease or disability at older ages. Even when health data are captured prior to a disaster, the lack of suitable controls can make it difficult to establish causality. In spite of some uncertainty, evidence suggests that disturbances to physical health should be expected among older adults following a natural disaster. It is possible that onset or worsening of physical conditions among older adults after a disaster is associated with the mental health impacts and disruptions to activities, which are commonly reported among survivors. For example, increases in stress and anxiety during and after natural disasters are often hypothesised as triggers for cardiovascular events, although increased exertion and infections (particularly during winter months) are also possible precursors (Kario & Ohashi, 1997, 1998). It is equally plausible that in the aftermath of a disaster older adults are more sensitive to their state of health and may seek medical treatment for pre-existing or mild symptoms, resulting in an increased rate of investigation and diagnosis.

### 3.6 Mental health

A comparatively large number of studies have explored the association between natural disasters and the incidence of mental health problems among older survivors. In particular, researchers have assessed the disaster-related impacts on depression, anxiety, and emotional distress; post-traumatic stress disorder; psychiatric morbidity, psychological coping, adjustment, and cognitive functioning.
3.6.1 Depression, anxiety, and emotional distress

Several researchers have examined the influence of natural disasters on the development or progression of depression, anxiety, and emotional distress in older adults. A survey undertaken with 586 adult survivors of a large earthquake in Turkey identified that older age was a significant risk factor for increased levels of post-disaster depression (Salcioglu, Basoglu, & Livanou, 2003). Other risk factors included experiencing the loss of loved ones, being unmarried, past psychiatric illness, previous trauma, and female gender (Salcioglu et al., 2003). Evidence was also gathered from two longitudinal investigations, which assessed the pre- and post-earthquake mental health status of older adults following a Taiwanese earthquake (Seplaki, Goldman, Weinstein, & Lin, 2006; Watanabe, Okumura, Chiu, & Wakai, 2004). Mixed findings were reported after a follow-up survey with 1,160 adults aged 50 years and older was undertaken to assess the mental health consequences of earthquake exposure (Seplaki et al., 2006). While many of the older survivors displayed an increase in depressive symptoms, significantly higher rates of depression were identified among individuals with low socio-economic status, socially isolated adults, women, middle-aged adults, and those who had experienced property damage (Seplaki et al., 2006). In a second longitudinal study involving post-earthquake interviews with 104 adults aged 55 years and older, researchers reported that depressive symptoms were associated with levels of social support 6 to 12 months after the disaster (Watanabe et al., 2004). Specifically, individuals receiving higher levels of social support, particularly from family members, were less likely to be depressed than those who received little or no support (Watanabe et al., 2004). In one of the few qualitative studies to examine the effects of an earthquake on the mental health of older adults, Ardalan et al. (2010) used focus group discussions and semi-structured interviews to explore the experiences of 56 older survivors of an Iranian earthquake. Respondent data indicated high levels of emotional insecurity and distress following the earthquakes. Mental health disturbances were also found to be associated with loss of homes and possessions, the death of friends and family, dislocation, fear of victimisation, and witnessing the destruction of historic buildings (Ardalan et al., 2010).

In addition to the earthquake effects on the mental health of older adults, data were also obtained for a number of flood disasters. Following a series of floods in the southern United States during the 1980s, two groups of researchers examined the impacts on the mental health of older survivors (Kaniasty & Norris, 1993; Phifer, 1990). In both cases, researchers
were undertaking longitudinal health surveys involving large samples of older adults prior to the flooding. After follow-up interviews with 200 older adults, Phifer (1990) identified that exposure to the flooding was associated with both increased levels of anxiety and depression up to 18 months after the event. Phifer also found that psychological distress was more pronounced in middle-aged adults than among older adults. In the second study involving the completion of post-flood interviews with 222 older adults, researchers reported that negative flood experiences (personal losses and reductions in social support and interaction, for example) were positively associated with increases in depressive symptoms (Kaniasty & Norris, 1993).

These data suggest that older adults are vulnerable to an increased incidence of depression, anxiety, and emotional distress in the aftermath of a disaster, but that such outcomes are likely to be associated with traumas suffered during the event. Moreover, there is some evidence that older adults suffer depression, anxiety, and emotional distress to a lesser extent than middle-aged adults in the aftermath of a disaster (Phifer, 1990). Other factors unrelated to age also appear to contribute to the risk of depression, anxiety, and emotional distress (Ardalan et al., 2010; Salcioglu et al., 2003).

### 3.6.2 Post-traumatic stress

Several authors have investigated clinically defined post-traumatic stress disorder (PTSD) symptoms among older adults following a disaster. There is some discord among research studies, however, concerning the extent to which older adults may be disproportionately affected by PTSD. Comparative studies of the incidence of diagnosed PTSD among younger and older adults have been undertaken up to 18 months after large earthquakes in Armenia and China (Goenjian et al., 1994; Jia et al., 2010). Armenian researchers utilised validated PTSD survey interviews with 179 purposively selected adults to assess the mental health impacts associated with a 1988 earthquake (Goenjian et al., 1994). The researchers found that increased earthquake exposure was associated with higher levels of post-traumatic stress at all ages, but that older adults were more susceptible than younger adults to adverse arousal symptoms (Goenjian et al., 1994). In a similar study, Chinese researchers used a validated interview with 327 adult survivors of the 2008 Sichuan earthquake to explore post-disaster mental health challenges (Jia et al., 2010). The results of the study indicated that older adults were more likely than younger adults to display...
symptoms of PTSD; however, incidence was also common among those who had been in imminent danger; lost family members; or suffered injury to self, friends, or family members (Jia et al., 2010).

Divergent findings were identified in a Japanese study of the experiences of survivors of the 1995 Kobe earthquake (Kato, Asukai, Miyake, Minakawa, & Nishiyama, 1996). In the weeks after the earthquake, researchers compared PTSD symptoms among 75 older adults and 67 younger adults using validated interviews. In the first three weeks after the earthquake, study participants of all ages reported depression, hypersensitivity, irritability, and problems sleeping. Eight weeks after the earthquake, however, there was a discrepancy between the responses of younger and older adults. Younger adults showed little or no change in their degree of PTSD, while older adults showed a significant reduction in most recorded symptoms. The authors hypothesized that older adults' better psychological adjustment following the earthquake may have been associated with lower stress levels, larger social support networks, and previous experiences of disasters (Kato et al., 1996).

Data from two studies revealed that in some cases older adults may be more susceptible to PTSD than other age cohorts after a disaster. In another study, however, older adults displayed reduced symptoms of PTSD relative to younger adults. This discrepancy possibly exists as there are other identified correlates of PTSD besides age. Individuals who suffered personal losses, injury, or the death of a loved one were more likely to display PTSD symptoms. It is also possible that previous life experience, reduced stress, and effective coping skills helped some older adults to maintain or recover their psychological integrity.

3.6.3 Psychological morbidity

Several researchers have undertaken generalised assessments of psychological morbidity, which consider the impacts of natural disasters on a range of mental health outcomes. Following a large earthquake in Turkey in 1999, a sample of 25 older adults who were living near the epicentre and 22 older adults from another town were recruited for a study investigating the psychological consequences of proximity to an earthquake (Yazgan, Dedeoglu, & Yazgan, 2006). After the completion of an interview survey and clinical diagnostic tests for psychological morbidity, it was found that older adults closest to the earthquake epicentre had significantly higher levels of psychological trauma, trauma-related
grief, PTSD symptoms, and depression than same-aged peers who lived far from the epicentre (Yazgan et al., 2006). Evidence from two Taiwanese studies also suggests that older adults may be susceptible to psychological problems in the aftermath of a disaster. Following the 1999 Chi-chi earthquake in Taiwan, 6,400 adults who lost their homes completed a survey to assess their levels of post-traumatic stress and psychiatric morbidity (Chen et al., 2007). Older age was found to be positively associated with higher levels of psychiatric morbidity among those who had lost their homes, although no increase in PTSD symptoms was reported. Incidence of psychiatric morbidity was also found to be associated with female gender, having a lower level of education, living in temporary housing, and loss of a home during earthquake (Chen et al., 2007). As part of a community mental health programme in Taiwan, researchers assessed the psychiatric morbidity of 663 adult survivors following the Chi-chi earthquake using a validated screening battery (Yang et al., 2003). A number of variables were found to be associated with diagnosed post-traumatic stress and psychiatric morbidity, including female gender, older age, financial loss, nervousness, and obsessive traits (Yang et al., 2003).

One of the most troubling psychological morbidities that may arise in the aftermath of a disaster is suicidal ideation and behaviour. In the years following the 2004 Chuetsu earthquake in Japan, researchers examined the incidence of major mental illness and suicidal behaviour among 496 purposively selected older survivors using a validated interview survey (Suzuki et al., 2011). The study authors found low levels of clinical mental health problems and low rates of suicidal behaviour among older survivors three years after the earthquake, but comparatively high levels of sub-clinical mental health symptoms (Suzuki et al., 2011). Suzuki et al. surmised that emotional maturity and inoculation derived from wartime experiences and previous earthquakes may have insulated older adults against negative psychological outcomes compared to other age groups.

Assessments of psychological morbidity among older adults following a disaster show that age is indeed associated with adverse mental health outcomes. Older age, however, appears to be only one of a number of potential correlates of psychiatric morbidity. Factors such as proximity to a disaster, level of disruption experienced, gender, and pre-existing mental health are likely to be influential. The research also suggests that older adults may be less prone to significant clinical conditions than younger age cohorts, but susceptible to sub-clinical mental health disorders that can be difficult to diagnose.
3.6.4 Coping, adjustment, and cognitive functioning

In contrast to studies addressing the psychological vulnerability of older adults, several researchers have explored coping, adjustment, and cognitive functioning in the aftermath of natural disasters. Following a moderate earthquake in Newcastle, Australia, two studies reported that older adults experienced significant problems coping with the aftermath of the disaster and adapting their behaviour and routines to changed circumstances (Carr et al., 1995; Ticehurst, Webster, Carr, & Lewin, 1996). Six months after the Newcastle earthquake, researchers examined psychological outcomes and coping among 3,007 younger and older adults using a questionnaire. The researchers identified that poor psychological outcomes were associated with older age, using avoidance as a coping mechanism, female gender, and lower levels of social support (Carr et al., 1995; Ticehurst et al., 1996). The researchers also found that exposure to the worst effects of the earthquake were associated with increased disruption to mental health and activities of daily living among older survivors (Carr et al., 1995; Ticehurst et al., 1996). In support of the Australian evidence, Japanese researchers also identified problems with psychological coping in the aftermath of a large earthquake. Five months after the Niigata-Chuetsu earthquake, 2,083 adults completed a survey incorporating validated measures of coping (Toyabe et al., 2006). The study authors found that older adults who were affected psychologically by the earthquake had a much slower recovery than younger adults with regards to meeting their daily living requirements (Toyabe et al., 2006).

Contrasting evidence was reported in North America in relation to the effects of earthquake and flood disasters. Following the 1994 Northridge earthquake in the United States, researchers examined whether older adults displayed better psychological adjustment to the natural disaster than other age groups to test the emotional maturation and inoculation theories (Knight et al., 2000). Participants included 166 adults aged from 30 to 102 years who answered telephone interviews concerning their psychological condition one year after the earthquake. Older-adults reported lower levels of psychological distress following the earthquake than younger adults, but this was also associated with better pre-disaster psychological functioning (Knight et al., 2000). Modest support was found for the inoculation thesis, and older adults who had previously experienced earthquakes generally displayed lower levels of depression, which suggested that enduring previous hardship helped older adults to cope emotionally in the disaster (Knight et al., 2000). Following hurricanes Rita and Katrina in the United States, researchers explored the pre- and post-disaster cognitive
functioning among 66 middle-aged (45-64 years), older (65-89 years), and very-old (90 years or older) adults using a validated interview (Cherry et al., 2010). The results revealed that storm-related disruption to working memory declined with age and the oldest sample group reported significantly lower declines in working memory than the youngest sample group (Cherry et al., 2010). Post-disaster declines in working memory among the younger age cohorts was found to be associated not only with age, but also with decrements in social engagement and storm-related disruptions (Cherry et al., 2010). The study authors concluded that the data supported the burden hypothesis and older adults may be more resilient than younger groups with regard to the onset of mental health problems following a disaster.

These results suggest that some older adults cope better than others in the aftermath of an earthquake. Older adults who do not cope well or adjust to post-disaster circumstances include those who have avoided confronting the realities of their situation and seeking help for emerging psychological problems. Moreover, female gender, social isolation, and negative experiences during the disaster appeared to hinder psychological recovery. Older adults who do not cope or adjust in the aftermath of the disaster may be more susceptible to psychological discord and suffer an impaired recovery as a consequence. Alternatively, those who cope well may have experienced previous disasters during their lifetime and be better prepared to recover from future events than less-experienced or younger adults.

3.7 Activity participation and quality of life

Few researchers have explored the impacts of natural disasters on the everyday lives, routines, and activities of older adults. While these impacts may seem less significant than the physical and mental health problems that are often manifest among some older adults in the aftermath of disasters, changes to activities and routines can have long-term consequences for quality of life and health. For example, prolonged reductions in physical activity associated with a loss of venues or social networks following a disaster could lead to an increase in anxiety or a heightened risk for disease associated with chronic inactivity. In the context of this review, six studies were located that examined the impacts of natural disasters on the quality of life and activities of older adults.

Following a large Iranian earthquake in 2003, a survey of 210 randomly selected adult survivors aged 65 years and older revealed that older adults suffered reduced quality of life
five years after the earthquake (Ardalan et al., 2011). Groups that were identified as particularly vulnerable included older women, the very old, those who were living alone, those who suffered severe injury at the time of the earthquake, those who had poor-quality living conditions, individuals living in urban areas, those in temporary accommodation in the aftermath of the quake, and individuals who required assistance with activities of daily living (Ardalan et al., 2011). The authors also found that while many older adults suffered a reduced quality of life after the earthquake, there was a noticeable improvement in social relationships in affected areas (Ardalan et al., 2011).

In Taiwan, a quality of life study was underway in the months prior to the Chi-Chi earthquake of 1999 (Lin et al., 2002). In the 12 months following the disaster, researchers assessed quality of life impacts during interviews with 268 older survivors. Older adults reported reduced quality of life following the earthquake, which was predominantly associated with impaired physical and mental health and pervasive environmental constraints. Notably, however, older adults whose homes had been destroyed in the earthquake reported higher quality of life in the social domain and improved relationships, while older adults whose residences remained intact reported poorer social interactions (Lin et al., 2002). While disasters may reduce quality of life in certain domains, they may also prompt improvements in social relations as families and communities pull together to overcome a crisis.

In the years following a series of flood disasters in the mid-western United States, researchers undertook a longitudinal study into the impacts of these events on older adults' social support circumstances (Tyler, 2006). A sample of 517 adults aged 55 years and older who had a high level of exposure to the flooding were interviewed before and after severe flooding in 1993 (Tyler, 2006). In congruence with the Taiwanese findings reported above, the results identified that higher levels of flood exposure were associated with both the receipt and provision of social support among older adults. Additionally, when older adults received social support in the immediate aftermath of the flooding, they were more likely to provide support to others in need. A further finding of note was that older women received significantly higher levels of real and perceived social support than older men in the aftermath of the floods, suggesting the importance of gender in post-disaster social activity (Tyler, 2006).
A recent study of the experiences of survivors of a large Peruvian earthquake provided detailed information concerning the impact of disasters on the everyday lives and activities of older adults (Shenk et al., 2010). Researchers used semi-structured interviews with a convenience sample of 24 older survivors to explore the experiences and health outcomes following the 2007 earthquake. Participants described massive disruptions to their daily routines following the earthquake. Perturbations to quality of life were, in many cases, associated with material and personal losses suffered, such as the collapse of the family home or the loss of a business, which left older people without a sense of purpose and identity and without the resources necessary to recover successfully from the disaster. For many respondents, the earthquake was also associated with increased participation in certain activities. Older men were more frequently involved in home repair and socialising with their peers after the earthquake, while older women were more active in the provision of care for family members displaced by the disaster and church activities (Shenk et al., 2010).

As previously stated, New Zealand disaster research addressing the experiences and needs of older survivors is uncommon. Two recent studies have been undertaken, however, to address the impacts of a major flood and the Canterbury earthquakes. In the first study, researchers investigated older adults' experiences of a flood in the North Island (Tuohy & Stephens, 2012). Qualitative data ascertained from narrative interviews with nine flood survivors aged 65 years and older revealed that they suffered significant disruption and discontinuity to their lives and routines during and after the flooding, but were able to draw on life experiences and pre-existing psychological resources to help them cope. The authors found that older adults framed their experience of the flooding in terms of an ongoing construction of personal identity and that the disaster contributed to personal narratives concerning resilience and independence developed across the life course (Tuohy & Stephens, 2012). These findings support the inoculation hypothesis and suggest that older adults displayed significant resilience after a natural disaster.

Following the 2010 and 2011 Canterbury earthquakes, eleven aged care facilities (including rest homes and retirement villages) were evacuated and over 600 residential beds were lost (Carswell, 2011). Within this context, a report was commissioned by local health agencies to record the experiences of 105 aged-care sector stakeholders from 70 organisations. Reported challenges faced by older residents included coping with the shock and trauma of the earthquakes (and the associated negative psychological consequences –
particularly increased anxiety and grief among residents), increased observed frailty among previously independent individuals, physical injury (fractures, dislocations, cuts, and bruising associated with falls or falling objects), damage to facilities and loss of treasured possessions, management of evacuees and the evacuation process, flooding and liquefaction, disruptions to normal routines, and difficulties with activities of daily living associated with water restrictions and contamination, sewage system and power outages, and transitions to new accommodation (Carswell, 2011). These data suggest that the earthquakes had a diverse and overwhelmingly negative impact on those who were living in care in Christchurch, particularly when evacuation was required. It is necessary to recognise, however, that those living in care settings were also likely to be older and frailer than those living independently in the community.

Research addressing the impacts of natural disasters on the quality of life and activities of older adults is limited. General findings concerning the impacts of natural disasters on quality of life suggest that older adults who experience a significant earthquake or flood suffer disruptions in the ensuing months and years, which may have negative consequences for their physical and mental health. Reductions in general quality of life have been associated with disruptions to activities of daily living and economic activities. Disaster experiences can also result in increased participation in social networks and involvement in recovery activities. Disruptions to activities and routines is not only associated with older age, but also appears to be influenced by such factors as level of disaster exposure or material disruption, injury suffered, gender, degree of urbanisation, living conditions, and required support. As such, care must be taken not to conceptualise disaster vulnerability as solely a problem of ageing.

3.8 Gaps and limitations

The low number of articles identified for this review reflects the paucity of published literature addressing the effects of natural disasters. The lack of published studies restricted the possibility of undertaking a systematic review. The present research is well placed to contribute to the body of evidence addressing gerontological impacts of natural disasters by considering the diverse experiences of older survivors within the context of a study of active ageing in urban areas.
Due to the unpredictability of natural disasters, it is often not possible to obtain health or activity data from older adults before or immediately after such events. Moreover, limitations imposed by university ethics procedures, emergency regulations and enforcement, and injury to or displacement of local residents can make research extremely difficult in the weeks following a disaster. In some cases, such as for this thesis, researchers have been in the serendipitous position of having a disaster strike in the middle of an ongoing study. Such research is rare, but provides an opportunity to capture the conditions of older adults prior to and in the aftermath of a disaster. Many of the studies in this review were undertaken 12 months or more after a natural disaster and relied on recall or observations of delayed or ongoing effects. Such studies are likely to miss the acute challenges faced by older adults in the immediate aftermath of a disaster. A distinguishing feature of the present research is that it captured data about older adults' disaster experiences in the weeks immediately after both the September 2010 and February 2011 earthquakes.

There is a notable lack of disaster research involving older adults in the context of New Zealand. This is unusual considering New Zealand's location at the boundary of the Indo-Australian and Pacific tectonic plates. Moreover, New Zealand is often exposed to flooding, volcanic activity, and severe storms, which cause injury, death, and property damage. The relatively small size of New Zealand's population, low population density, and infrequency of large earthquakes may offer explanation for the lack of New Zealand research. There is an opportunity, therefore, for the present research to make a contribution to understanding how major disasters affect older adults living in contemporary New Zealand.

There is a paucity of international literature concerning the impacts of earthquakes on the activities and lifestyles of older adults. Pressing concerns for the physical and mental welfare of vulnerable groups and disaster victims in the aftermath of an earthquake may prompt academics to pursue investigations that address the immediately discernible and health-related impacts of a crisis. There may also be a publication bias, which promotes clinical research outputs if they are perceived to be more salient to recovery process or disaster preparation. It can be argued, however, that disruption to activity participation or quality of life in general can have longer-term and deleterious impacts on the health of older adults. The present research investigates the activity related disruptions associated with the experience of a sequence of earthquakes to address this gap.
Few of the assessed studies utilised qualitative research methods to examine the experience of older adults during and after a disaster. In the minority of cases where qualitative methods were used, rich detail about the vulnerability and resilience of the group emerged (Shenk et al., 2010; Tuohy & Stephens, 2012). The present research employed quantitative measures of disaster-related disruption to environments and activity participation as well as open-format questioning and photographic procedures to assess the diverse experiences of older adults in the weeks following the earthquake disasters.

In the past half century, there has been limited theoretical work undertaken by researchers to conceptualise how older adults are affected by and respond to a disaster. While some of the reviewed studies have tested the hypotheses of the inoculation, burden, and maturation theories, few researchers have sought to develop these perspectives further or offer new theoretical insights to predict or explain the disaster experience in later life. Considering the general paucity of disaster research associated with older adults, this area is ripe for theoretical development. The present research addresses the gap by formulating a theory of active ageing that considers the interaction between major environmental change and activity participation.

### 3.9 Chapter summary

Few studies have been undertaken that consider the influences of earthquakes and other disasters on the health and activities of older adults internationally and in New Zealand. For this reason, a non-systematic review of the literature was undertaken. Several theoretical perspectives were identified, which suggest that older adults have potentially higher levels of resilience than other age groups following a natural disaster. The reported effects of earthquakes on older adults are equivocal, however, and the data suggest that diverse physical, psychological, and activity related outcomes are to be expected. The literature also indicates that age is not the only predictor of resilience or vulnerability following a disaster and a variety of personal and circumstantial characteristics also play a role in determining how individuals are affected. This review has demonstrated that there is ample scope for a mixed method investigation of the diverse effects of the 2010 and 2011 Canterbury earthquakes on older adults who reside in urban areas.
4 Review of theoretical literature

4.1 Chapter introduction and organisation

This chapter identifies theories of ageing, place, and health behaviour, which predict and explain health and activity participation in later life. Such a review is necessary to assess the extent to which interactions among ageing, environment, health, and activity have been considered from a theoretical perspective across disciplines and to identify gaps or limitations that could be addressed by the present research. An assessment of existing theory also provides additional explanation for the research findings and contributes to the final development and critique of a model of navigated environmental performance. Theory is defined as a set of connected statements or propositions about the relationship between two or more concepts, which collectively account for a phenomenon (or a set of phenomena) and are presented in an abstract or generalised form that is applicable to a variety of circumstances (Glanz, Rimer, & Viswanath, 2008; Jaccard & Jacoby, 2010).

This chapter is divided into three sections, which address theoretical traditions that have hypothesised the interrelationships among ageing, environment, health, and activity. The three sections consider existing personal and ecological models arising from theories of human ageing, the subjective experiences of place, and health behaviour. In the final section of this chapter, the limitations and gaps within the current body of theory are considered as a prelude to the research design and methods.

4.2 Theories of ageing

The theories of ageing include biological, psychosocial, and ecological perspectives, which have emerged from the disciplines of geriatrics and gerontology. These theories address the influences on human ageing and age-related changes to body, mind, and behaviour.

19 The concepts of theory and model are used interchangeably in this thesis.
20 Urban planning theory, which potentially addresses interactions between the built environment and population health and behaviour, has not been included as it is seldom canvassed in gerontological studies, does not specifically address the health or activity of older adults, and is arguably a divergent field (Allmendinger, 2009). Similarly, this thesis does not delve extensively into the field of urban sociology or cultural geography, which are broad areas of endeavour in their own right. These areas are scoped to some degree by theories of place, although only perspectives that explicitly address the relationship between individual, environment, and behaviour have been included in this chapter.
4.2.1 Biological theories of ageing

Biological theories of ageing are concerned with explaining the mechanisms underlying the progressive decline in physical function that begins in adulthood and ends in death (Austad, 2009). Such mechanisms represent largely unchangeable and pre-programmed facets of the ageing process. These theories are useful as they allow for a distinction to be made between those aspects of the ageing process that are potentially subject to intervention and those that are inherent to the individual and cannot be readily changed. Biological theories of ageing are relevant to the present research because they reflect fundamental barriers to active ageing and recognise that, in the end, all biological activity must cease and that transitions from an active old age to decline and death are inevitable, though widely varying. Commonly cited biological theories of ageing are summarised in the following table.

<table>
<thead>
<tr>
<th>Biomedical perspectives</th>
<th>Central tenets</th>
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</thead>
<tbody>
<tr>
<td>Evolutionary senescence</td>
<td>The power of natural selection to favour or disfavour gene traits depends on the age at which those traits begin to affect reproductive fitness (Medawar, 1952). Traits affecting survival and reproduction in early life are strongly affected by natural selection. Beyond reproductive age, natural selection may effectively be blind to the fate of genes even if they promote ageing and decline (Williams, 1957). Thus, natural selection may work to optimise reproduction at the expense of the soma (Kirkwood, 2002).</td>
</tr>
<tr>
<td>Antagonistic pleiotropy</td>
<td>Ageing is an evolutionary development that optimises fitness and serves a beneficial function for the human population by ridding society of the old and infirm who may compete for resources with younger individuals (Gonidakis &amp; Longo, 2009). In this respect, a biological clock could be argued to drive human development and ageing.</td>
</tr>
<tr>
<td>Disposable soma</td>
<td>The use of energy to support cellular and molecular processes produces injurious chemical by-products, which accumulate and result in tissue and organ damage and, ultimately, ageing and death (Harman, 1956; Sohal, 1986).</td>
</tr>
<tr>
<td>Adaptive / programmed senescence</td>
<td>Random genetic mutation across the life course determines health and life span (Martin, 2009).</td>
</tr>
<tr>
<td>Altruistic suicide</td>
<td>Normal ageing is pathologically related to immunological processes such that immune system traits are correlated with mortality in later life (Walford, 1969). In support of the antagonistic pleiotropy thesis, immune functions that were beneficial in early life may become detrimental to health in later life (Effros, 2009).</td>
</tr>
<tr>
<td>Rate of living</td>
<td>There is a natural limit to cellular division beyond which biological systems begin to breakdown and age (Hayflick &amp; Moorhead, 1961).</td>
</tr>
<tr>
<td>Oxidative stress</td>
<td>All complex organisms have an increasing risk of biological failure over time (Gravilov &amp; Gravilova, 2006).</td>
</tr>
</tbody>
</table>

Biological theories suggest that the ageing process is associated with innate genetic factors, random changes to the soma, and the wear and tear of daily living, which lead to reduced physical and mental functioning over time and inevitable death. Despite continuous theoretical development in the biomedical sciences, academics have noted that “there is no unified theory on the horizon for the biology of ageing” (Bengston, Gans, Putney, &
Silverstein, 2009, p. 11). For example, there remains a lack of confirmatory evidence for immunological and evolutionary theories (Austad, 2009; Westendorp & Kirkwood, 2007), and biological exceptions exist to rate of living and replicative senescence perspectives (Speakman, 2005; Vasunilashorn & Crimmins, 2009). While it is understood that there is a biological basis for ageing, the precise mechanisms by which this process occurs remain disputed. Additionally, there is tremendous diversity in later life with regard to physiological and cognitive functioning, and older people are capable of adaptation to changing circumstances (Zodgekar, 2005). There is also emerging evidence that lifestyle behaviours and environmental conditions potentially influence healthy life expectancy in concert with genetic dispositions (Harris et al., 1992; Johnson et al., 2009). In the context of the present research, biological perspectives of ageing provide an important counterbalance to arguments for the influence of environmental characteristics on the health and activity of older adults.

4.2.2  Psychosocial theories of ageing

While biological ageing is inevitable, cognitive and social processes appear to be highly flexible, with many older adults capable of adapting to new circumstances, learning new and complex skills, improving intelligence, and engaging in meaningful ways with society (Koopman-Boyden, 1993a). The psychosocial theories of ageing have historically provided explanation for the activity participation of older people. Relevant theoretical perspectives include disengagement theory, activity theory, continuity theory, selective optimisation with compensation, socio-emotional selectivity theory, gerotranscendence, and age-stratification theory.

Among the earliest of the psychosocial theories of ageing was disengagement theory (Cumming & Henry, 1961), which asserted that in later life it is appropriate for individuals to begin to retire from economic, intellectual, and social roles to accommodate younger groups and to conserve energy. Cumming and Henry (1961) argued that “ageing is an inevitable mutual withdrawal or disengagement, resulting in decreased interaction between the ageing person and others in the social systems they belong to” (p. 14). The disengagement theory has been discounted, however, as it positioned the ageing process and the social roles of the individual as innate, unidirectional, and universal when, in reality, later life is characterised by significant heterogeneity of both capacity and engagement (Achenbaum, 2009). The disengagement thesis was directly challenged by the activity theory of ageing (Burgess, 1960;
Havinghurst & Albrecht, 1953), which purported that it is desirable for older adults to maintain participation in meaningful pursuits to facilitate continued psychological and social well-being and adjustment to ageing. Activity theory has influenced the concepts of successful, productive, and positive ageing, which are often incorporated into government policy as a preventive measure to address perceived health and economic issues associated with old-age dependency (Ministry of Social Policy, 2001; Rowe & Kahn, 1997). This perspective has been criticised, however, for creating a polarising dichotomy, which positions older bodies as a risk factor and stigmatises those who are unable or unwilling to be active (Katz, 2000). Critics of both the disengagement and activity theories argue that they are extremes on a continuum of later-life experience, which tend to ignore structural factors, including health status, economic inequalities, and ethnicity, that may influence older adults' capacity for participation (Achenbaum, 2009).

Attempts to reformulate ageing theory to emphasise both the positive experiences and inherent diversity of later life led to the development of continuity theory, the theory of selective optimisation with compensation, and socio-emotional selectivity theory. Continuity theory (Atchley, 1989) asserts that adults gradually develop stable patterns of activity across the life course and attempt to preserve and maintain these rather than disengage from them as they adapt to old age. Refinement of the continuity model resulted in the theory of selective optimisation with compensation (Baltes & Carstensen, 1996), which asserts that by focussing energy and resources on selected and preferred activities to the exclusion of others, older adults can compensate for reduced abilities and optimise feelings of continuity and competence in later life. The model of selective optimisation with compensation recognises the fluidity of later life and accounts for the dynamics between an increase in the number of specific losses and challenges in biological, social, and psychological spheres and opportunities for growth in old age (Baltes & Carstensen, 1996).

Closely related to the concept of selective optimisation with compensation is socio-emotional selectivity theory. This perspective asserts that as older adults become increasingly aware of the temporal limits on their life span, they shift attention away from knowledge- and information-gathering goals and onto activities and interactions that are emotionally fulfilling (Carstensen, Fung, & Charles, 2003). In particular, this theory explains diminishing social network interactions as a refocussing on intimate relationships (particularly with close family) that provide positive emotional experiences (Carstensen, Isaacowitz, & Charles, 1999). In
congruence with notions of changing priorities in later life, the gerotranscendence theory suggests that older adults shift their focus from material and pragmatic ways of interpreting and acting towards the world around them to more transcendent and cosmic concerns, such as the exploration of inner worlds (Tornstam, 2005). Gerotranscendence also suggests that older adults focus attention on fewer, but more meaningful, social relationships and spending more time in solitude and introspection (Krause, 2009).

An additional perspective of relevance, age-stratification theory, moves beyond the individual experience of ageing to consider generational influences. This perspective considers the movement of successive birth cohorts through time and relates the characteristics of each cohort to the historical circumstances that affect individual attitudes and behaviours (Koopman-Boyden, 1993b). As cohorts age within a social and cultural context, they are thought to develop a particular subculture of shared values, attitudes, and behaviours, which creates a unique expression of ageing (Riley, 1971). From this perspective, every generation of older adults may be presumed to exhibit socio-cultural differences from preceding and subsequent generations.

The psychosocial theories of ageing provide a useful adjunct to biological perspectives by highlighting the important social and psychological influences on behaviours and experiences in later life. These perspectives have been criticised, however, for largely ignoring structural and environmental influences, which continually interact with the ageing individual (Cowgill & Holmes, 1972; Gans, Putney, Bengston, & Silverstein, 2009). In response to these limitations, ecological perspectives have been developed to describe the multiple layers of influence on the expressions and experiences of ageing.

4.2.3 Ecological theories of ageing

There are a relatively few theories of ageing that address multiple levels of influence on behaviours and experiences in later life (Verbrugge & Jette, 1994); however, evidence from the last decade suggests increased use of such models is a response to growing awareness of the complexity of the ageing experience (Alley, Putney, Rice, & Bengtson, 2010). The ecological theories of ageing contend that old age is a period of adult development that is profoundly influenced by physical and social environmental factors (Wahl, 2001). Lawton and Nahemow (2006), have defined the ecology of ageing as “a system of continual
adaptation in which both the organism and the environment change over time in a non-random manner” (p. 621). This definition implies a level of symbiosis between an individual and their surroundings underpinned by perpetual change. In this thesis, the concept of ecological theory is used to encompass a range of perspectives that suggest external influences on health and behaviour, which may include aspects of physical environment, social setting, and policy or institutional factors. This approach also scopes a variety of perspectives that have not traditionally been considered as ecological. Ecological perspectives that are relevant to the present study and which address the ageing process directly include structured dependency, the life-course perspective, the disablement model, the convoy model of social relations, and Lawton's competence-press model.

The theory of structured dependency (Townsend, 1981) asserts that the behaviours and experiences of older adults are determined to a large extent by the location of individuals within particular social classes, gender roles, and ethnic groups. Behaviours and experiences are also influenced by how social and economic policies, such as welfare provision, potentially facilitate or constrain opportunities for these groups. In particular, it has been argued that social institutions and economic policies create differential dependency among groups of older adults and reduce agency and independence in some cases (Townsend, 1981). This perspective has been criticised, however, for downplaying older adults' capacity for self determination, which has been identified as an important element of maintaining an active and engaged later life (Walker, 2009).

Life-course theories of ageing position later life as one stage in the developmental process, which is predicated on early life conditions, behaviours, and experiences within particular structural, social, and cultural milieux (Findlay & McLaughlin, 2005; Osler, 2006). The life-course perspective asserts that innate conditions (genetic or developmental factors), personal behaviours, and external circumstances experienced across the life span have pronounced and cumulative effects on health in later life (World Health Organization, 1999). When functional capacity in later life becomes reduced or environmental challenges become insurmountable, an individual passes through a disability threshold: a point at which they can no longer maintain independence in their current setting (World Health Organisation, 2002a). Conversely, when environmental conditions support health and independence, fewer individuals are likely to experience disability (World Health Organisation, 2002a). The effects of a supportive environment on functional ability are compounding. When an individual is
healthy and residing within a supportive environment, they are likely to be more active, which in turn supports their health and conditioning to their environment.

Figure 3: A life-course perspective on health (World Health Organisation, 2002a)

The disablement process (Verbrugge & Jette, 1994) describes health changes in elderly populations, which occur as individuals develop a greater burden of disease with age and the healthcare focus shifts from preventing and curing disease to managing chronic illness, reducing disability, and sustaining quality of life (Alley & Crimmins, 2010). Disability is broadly defined by Verbrugge and Jette (1994) as difficulty performing activities in any domain of life. Disability is viewed not as a personal characteristic, but rather as the gap between personal capabilities and physical and social environmental demands (Alley & Crimmins, 2010). Linking to the life-course perspective above, it has been argued that improvements in the environment can lower the disability threshold thereby supporting older adults to stay independent for longer, even in the midst of declining function (World Health Organization, 2008).

The convoy model of social relations shifts the emphasis away from the physical environment and suggests that individuals require close social relations and the associated positive and negative feedback to facilitate personal development and exploration across their life (Antonucci, Birditt, & Akiyama, 2009). The composition of an individual's convoy (or network) is associated with both personal (age, gender, ethnicity, and personality) and
situational (social roles, expectations, norms, and demands) factors that influence support relations (Antonucci et al., 2009). The model identifies three types of social support as relevant to older adults: aid (tangible assistance), affect (emotional support), and affirmation (shared values and aspirations) (Kahn & Antonucci, 1980). The model also asserts that older adults vary in the amount and type of social support they require at different stages of life.

The final theory of ageing that addresses multiple levels of influence on health and activity participation is Lawton's competence-press model, which is arguably the most widely cited ecological theory of ageing (Lawton & Nahemow, 1973). Building on the work of Kurt Lewin, Lawton argued that the behaviour ($B$) of older adults is a function of personal factors ($P$), environmental factors ($E$), and their interaction: $B = f(P, E, P \times E)$ (Lawton & Nahemow, 1973). Main concepts of the model include personal competence and environmental press. Competence refers to characteristics of an individual and includes health and functional ability, cognitive capacity, ego strength, personal traits, and resources (Lawton, 1982). The concept of environmental press describes the real or perceived demands of the physical and social environment (Lawton, 1982; Lawton & Nahemow, 1973). The concept of person-environment fit describes the relative congruence between environmental demands and the basic needs and competencies of an individual (Kahana, Lovegreen, Kahana, & Kahana, 2003). If environmental press is within the individual's competence, then positive feelings about the environment arise facilitating the comfortable execution of activities or providing opportunities for meeting performance potential (Bell et al., 2001). If, however, the environmental press is weaker or stronger than the individual's competence, negative feelings and maladaptive behaviour may result (Bell et al., 2001). Two further theoretical perspectives that have emerged from Lawton's model include the environmental docility and proactivity hypotheses. The environmental docility hypothesis asserts that low levels of personal competence and a narrow adaptive range make an individual more susceptible to being controlled or constrained by the environmental conditions they experience (Lawton, 1990; Nahemow, 2000). Alternatively, the environmental proactivity hypothesis contends that individuals with higher levels of competence are more likely to utilise environmental resources for their benefit and adapt their environment, which emphasises their agency within the model (Lawton, 1999). The work of Lawton and Nahemow is of tremendous importance in the field of environmental gerontology because it recognises the dynamism in the individual-environment relationship. In particular, it reveals that successful execution of behaviours are finely balanced at the intersection of environmental support, challenge, and
personal competence. It also shows that changes in either the individual or environment (or both) can be responsible for increases or decreases in a particular behaviour. For example, a fall and resultant disability may reduce personal competence and make an environment more unmanageable – limiting certain behaviours for an older person and increasing levels of dependence. Alternatively, movement to a neighbourhood with safer pedestrian conditions may encourage more walking and lead to gains in health and community engagement.
The work of Lawton and Nahemow has influenced gerontologists and geographers for decades, and a particularly prominent work that reflects this understanding has been undertaken by Graham Rowles. In *Prisoners of Space*, Rowles (1978) hypothesised that older people experience a geographical constriction in the realms of action accompanied by an expansion of geographical fantasy. Rowles also argued that there is a continual reframing of the relationship and feelings between older adult and their intimate environments that results in a selective intensification of involvement with different physical locations. These propositions contribute the hypothesis of changing emphasis, which describes the altering geographic modalities of action, orientation, feeling, and fantasy. Rowles describes a geographical lifespace (a largely cognitive and subjective space), rather than a physical setting, but still emphasises the importance of environmental fit and adjustment of older people as a dynamic tension between personal capability and environmental opportunity. In essence, Rowles identifies an age-related spatial withdrawal (akin to the concept of disengagement) in the context of declining physical and mental ability with a changing relationship between the older person and their environment to emphasise meaning and
preferred experiences (similar to notion of selective optimisation with compensation).

A criticism of the ecological theories of ageing is that they often downplay the agency and adaptability of older adults and tend to emphasise their passivity and vulnerability in the face of environmental challenges (Wahl, 2001). These concerns are beginning to be addressed by such perspectives as the environmental proactivity hypothesis, however, which emphasises the role of personal agency in individual-environment interactions. Others have suggested that ecological theories tend to be difficult to operationalise because of their broad scope and a lack of refinement of core concepts (Glass & Balfour, 2003). These concerns suggest that further theoretical developments within the field of gerontology are necessary. It has also been argued that ecological theories of ageing fail to consider the influence of affective bonds between people and place on behaviour and health (Rubinstein & Parmelee, 1992). Such perspectives are generally considered in theories of place, which are addressed in the next section.

4.3 Theories of place

Theories of place address person-environment interactions at a subjective and emotional level (Johnson et al., 2000). These perspectives are not specific to older adults, but they offer explanation for how time spent in particular environments stimulates affective ties that potentially influence health and behaviour. Theories of place incorporate perspectives from the fields of human geography and environmental psychology, including place attachment theory, attention restoration theory, therapeutic landscapes, and theories of environmental stress or overload.

Place attachment theory describes a symbiotic relationship whereby an individual imbues a place with meaning and significance, and, in turn, the place provides a familiar setting for activities of daily life, psychological and emotional fulfilment, and contributions to the formation and maintenance of personal identity (Rubinstein & Parmelee, 1992). Feelings of place attachment are often directed at home or neighbourhood where an individual has spent significant time (Peace, Wahl, Mollenkopf, & Oswald, 2007). An intimate knowledge and understanding of the physical and social fabric of a particular locality (the insideness of place) can assist older adults to remain independent even in the face of increasing frailty, facilitating ageing in place and permitting the continuation of relationships and activities.
Review of theoretical literature

Place attachment can also be a negative experience, however. A person may have a connection to an environment in which they are no longer safe if their level of competence does not comply with the imposed demands (Fried, 2000; Rowles & Ravdal, 2002). Negative components of a place, such as high crime or poverty, may also discourage attachment and promote a sense of placelessness or detachment, although it has been asserted that positive attachments can be maintained even in difficult circumstances via memory and life history (Rowles, 1978; Smith, 2009).

Attention restoration theory contends that spending time in particular environments help individuals to recover from directed attention fatigue (feelings to tiredness or stress associated with prolonged concentration) (Kaplan & Kaplan, 1989). Restorative environments are defined as physical locations that provide opportunities for relaxation and the recovery of mental energy (King, Stokols, Talen, Brassington, & Killingsworth, 2002). Wilderness areas and museums are examples of environments that have the capacity to promote recovery from directed attention fatigue and stress (Kaplan, 1995; Ulrich et al., 1991). Such settings promote recovery by providing experiences of being away from everyday surroundings, affording novel or engaging experiences that are compatible with personal preferences and inclinations, and facilitating the experience of fascination (involuntary attention) and reflection (Kaplan & Kaplan, 1989; Kaplan, 1995; King et al., 2002). Closely related to attention restoration theory is the concept of therapeutic landscapes. Spending time in certain physical environments (particularly natural settings) has been theorised to promote the health of individuals by shaping beliefs and invoking situated experiences of well-being (Gesler, 1992; Milligan, Gatrell, & Bingley, 2004). Therapeutic landscapes describe both the health-promoting characteristics of natural settings (such as the fresh air afforded by parks and beaches) and locations specifically designed to facilitate health or recovery (such as hospitals or aged-care facilities) (Carman & Fox, 2009; Gesler, 1992).

Theories of environmental overload or stress suggest that exposure to deleterious urban characteristics (such as crowding, noise, violence and crime, pollution, poverty, traffic, information overload, or disasters) may trigger specific stress reactions, including fatigue, reduced motivation, and feelings of loss of control (Bell et al., 2001; Glass & Singer, 1972; King et al., 2002). The existence of multiple and diverse environmental stressors within urban environments can be expected to further impair activities and well-being (King et al., 2002). Older adults are thought to be more vulnerable to negative environmental stressors due to
their increased reliance on and greater time spent within the local environment (Phillips, Siu, Yeh, & Cheng, 2005). In the face of significant urban stressors, individuals are forced to employ coping strategies to deal with the negative environmental influences (Bell et al., 2001). Successful coping leads to adaptation, psychological well-being, and adherence to behaviours, while unsuccessful coping leads to long-term costs for the individual in terms of poor health outcomes, exhaustion, and reduced participation (Bell et al., 2001; Glanz & Shwartz, 2008; Parcione, 2001). Methods of coping with environmental problems in urban areas may include screening out negative information, erecting barriers to unwanted environmental inputs, employing adaptive strategies, making lifestyle changes, or focussing on areas of life that provide fulfilment and support (Parcione, 2001; Phillips et al., 2005).

Within the context of theories of overload and stress, the transactional model asserts that stressful experiences are generated during person-environment interactions. The impact of an external stressor is mediated by an individual's appraisal of the stressor and the psychological, social, and cultural resources at their disposal (Lazarus & Cohen, 1977).

Like the ecological theories of ageing, place-related perspectives highlight the importance of person-environment transactions as an influence on health and behaviour. In particular, these theories emphasise the connection between environmental conditions and emotional and psychological health, which can underpin how an older adult behaves within urban settings. However, there are limitations associated with theories of place. By focussing on the affective and psychological impacts, theories of place suggest that adapting to negative environments is a matter of personal resilience and coping. However, the ability to respond effectively to deleterious circumstances is not always within the capability of older adults. In the aftermath of an urban disaster, successful coping or adaptation may not be feasible if disruption is too severe (Stokols, 1996).

4.4 Theories of health behaviour

The active ageing concept employed in this research describes a set of behaviours associated with a holistic definition of health (World Health Organisation, 1948, 1986). It is necessary, therefore, to consider a branch of theory associated with environmental influences on health behaviour. Health behaviour refers to personal attributes such as beliefs, expectations, motives, values, and perceptions; personality characteristics, including affective and emotional states and traits; and overt behaviour patterns, actions, and habits that relate to
health maintenance, restoration, or improvement (Gochman, 1997). Theories of health behaviour relevant to this research include the health belief model, protection motivation theory, the theory of reasoned action and the theory of planned behaviour, the transtheoretical model and states of change, social cognitive theory, and the social ecological model.

### 4.4.1 Personal theories of health behaviour

Several theories of health behaviour have been developed to explain the personal influences on health behaviours among adult populations. Prevailing elements of personal theories include the following: (a) the individual determines engagement or non-engagement in health-related activities; (b) influences on health behaviour are largely cognitive, concerning perception, intention, beliefs, and self-efficacy; (c) desires to avoid negative health outcomes or attain positive outcomes are important drivers of behaviour; and (d) individuals commonly employ a subjective appraisal of the costs and benefits of health-related behaviours before taking action (Brewer & Rimer, 2008; Floyd, Prentice-Dunn, & Rogers, 2000). Theories of health behaviour that address the influence of personal factors are summarised in the table below.

<table>
<thead>
<tr>
<th>Personal theories</th>
<th>Central tents</th>
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<tbody>
<tr>
<td>The health belief model (Rosenstock, 1974)</td>
<td>Health behaviours are directed by individual perceptions of current health (perceptions of severity of or susceptibility to disease) and regard for the efficacy and barriers associated with undertaking preventative behaviours (Champion &amp; Skinner, 2008).</td>
</tr>
<tr>
<td>Protection motivation theory (Rogers, 1975)</td>
<td>Individuals act to protect their health when they fear an imminent threat and believe that a particular coping response will support their health and will be sustainable (Floyd et al., 2000; Milne, Sheeran, &amp; Orbell, 2000).</td>
</tr>
<tr>
<td>Theory of reasoned action / Theory of planned behaviour (Fishbein &amp; Ajzen, 1975)</td>
<td>Rationally motivated, behavioural intention is the prevailing driver of health-related behaviours (Montano &amp; Kasprzyk, 2008). Intentions are influenced by attitudes towards the behaviour, subjective norms (expectations for appropriate behaviour from significant others and motivation to comply), and level of perceived control (perceived ease or difficulty performing the activity) (Munro, Lewin, Swart, &amp; Volmink, 2007).</td>
</tr>
<tr>
<td>Transtheoretical / States of change model</td>
<td>Individuals move through a series of stages before embarking on a new course of action or changing their behaviour. Important stages include pre-contemplation, contemplation, preparation, action, and maintenance (relapse prevention) (Prochaska, Redding, &amp; Evers, 2008). This theory argues that people will only undertake health-related behaviour if they are at an appropriate level of readiness (Brewer &amp; Rimer, 2008).</td>
</tr>
</tbody>
</table>

Whilst useful for explaining or predicting individual influences on health-related behaviours, personal theories have several limitations. First, they fail to consider the influence of environmental factors thereby holding the individual entirely responsible for their health and behavioural outcomes (McLeroy et al., 1988). Second, they often neglect to scope the
breadth of cognitive influences (particularly subjective and emotional factors) on health and behaviour (McLeroy et al., 1988; Munro et al., 2007). Finally, definitions of and relationships between personal variables are often limited, which can make it difficult to test hypotheses arising from these perspectives (Munro et al., 2007).

### 4.4.2 Ecological theories of health behaviour

Ecological theories contend that there are multiple and interacting levels of influence on health and behaviour, including personal, social and physical environmental, institutional, and public policy factors (McLeroy et al., 1988; Sallis, Owen, & Fisher, 2008). Environmental attributes are considered to be potentially more important than personal factors because they influence the lifestyles, behaviour choices, and health of large numbers of people and are potentially more amenable to change than personal attributes, cognitions, and relationships (McLeroy et al., 1988; Sallis, Bauman, & Pratt, 1998). Ecological theories of health and behaviour relevant to this research include social cognitive theory and social ecological theory.

Social cognitive theory (Bandura, 1986) emphasises reciprocal determinism between individuals and their environments, whereby behaviour is viewed as the product of a dynamic interplay among personal, social, and environmental factors (Bandura, 1999; McAlister, Perry, & Parcel, 2008). This perspective also highlights the importance of agency and suggests that individuals are both the producers and products of their socio-physical environments (Bandura, 1999, 2001). While environmental influences are recognised in social cognitive theory, the most important components of the model are generally regarded as self-efficacy (beliefs about personal ability to perform behaviours) and outcome expectations (beliefs about the value and consequences of behavioural choices) (Munro et al., 2007). These concepts are often tested independently in studies of health behaviour – such is their perceived significance (Redding, Rossi, Rossi, Velicer, & Prochaska, 2000). Other important components of social cognitive theory that potentially influence behaviour include collective efficacy, social modelling, self-regulation, and behavioural incentives (McAlister et al., 2008).

The social ecological model asserts that human health and behaviour are influenced by multiple factors, including personal attributes, psychological dispositions, and physical, socio-cultural, and societal factors (McLeroy et al., 1988; Stokols, 1992). Different environments
potentially affect individuals in diverse ways due to the dynamic interplay between external and internal conditions (Stokols, 1996). Much like social-cognitive theory, person-environment interactions are also characterised by cycles of mutual interaction wherein physical and social settings influence the health and behaviour of individuals who in turn attempt to alter their context through individual or collective activity (Stokols, 1996). Social ecological theory emphasises the interdependence of physical and social environmental conditions and the interconnections between multiple settings and life domains (home, work, family, local environment and others). Determinants of health and health-related behaviours are conceptualised as the degree of fit between an individual's biological, behavioural, and socio-cultural needs and the environmental resources available (Stokols, 1996). Unlike social-cognitive theory, however, the social ecological model does not elevate particular traits or contexts above others (Stokols, 2001).

Although ecological theories provide a comprehensive explanation of the potential interactions among ageing, health, activity, and environment, they are also subject to criticism. Ecological models are far-reaching, but they often lack the specificity required to guide conceptualisation of testable hypotheses or the development of cost-effective interventions for specific populations (McLeroy et al., 1988; Sallis et al., 2008). Moreover, ecological approaches can lead to coercive and paternalistic approaches to health promotion, which reduce individual freedoms and privacy (McLeroy et al., 1988).

4.5 Gaps and limitations

While the early years of environmental gerontology were strongly theoretical, there has been a noticeable dearth in theory development since the 1980s and reviews of the field have identified the need for increased hypothesis testing and new model development (Andrews et al., 2007; Kendig, 2003; Scheidt & Windley, 2006; Wahl & Weissman, 2003). Birren (1999, p. 459) observed that the field of gerontology is “data rich, but theory poor”, while Kendig (2003, p. 612) underscored “the astonishing paucity of research on the macro environments of neighbourhoods, regions, and urban-rural divides that are so significant to structuring experiences of ageing”. As a consequence of limited gerontological theory development, perspectives from other disciplines, particularly geography and health, are often co-opted for studies of ageing (Wahl & Weissman, 2003).
Ecological theories, which highlight the influence of socio-physical environments as well as personal attributes, have been identified as an important area of future theoretical development for gerontologists (Andrews et al., 2007). While there are several theories that address individual or environmental influences on the health and activities of older adults, relatively few consider multiple levels of influence on behaviour or attempt conceptual integration across disciplines (Andrews et al., 2007; Kendig, 2003; Munro et al., 2007). Moreover, few theories consider the pathways through which environments potentially influence the health and behaviour of older adults or potential interactions with psychological and biological processes (Gans et al., 2009; Glass & Balfour, 2003). In many ecological perspectives, individuals are simplistically presented as nested within increasingly wider environments of influence without consideration of the associated processes or interactions (Gans et al., 2009). New theories of environment and ageing also need to consider the diversity associated with everyday experiences of ageing and the agency of individuals within particular contexts, which is often overlooked in ecological approaches (Kendig, 2003). Current ecological theories also tend to view the environment as stable and unchanging when, in fact, it is dynamic and subject to both incremental and acute change (natural disasters provide an example of how an environment can change rapidly) (Stokols, 1996).

The present research addresses the existing gaps and limitations within the current body of theory through the development of the theory of navigated environmental performance. This theory draws upon existing ideas from the fields of gerontology, human geography, environmental psychology, and health, and abstracts original concepts from a mixed methods and participatory study.

### 4.6 Chapter summary

There are numerous theoretical perspectives, which provide direct or indirect explanations for the health and activity participation of older adults. The most relevant perspectives can be delimited as theories of ageing, place, and health behaviour. Within this interdisciplinary context, a limited number of ecological theories hold particular promise for their capacity to consider a range of interacting influences on health and behaviour from biological and psychological characteristics to macro-environmental processes. The present research seeks to build on existing limitations and gaps by developing an interdisciplinary theory of active ageing.
5 Paradigm and methodology

5.1 Chapter introduction and organisation

To understand the assumptions about the nature of reality (ontology), the constitution of knowledge (epistemology), relationships between the researcher and study participants, the role of values, and the rationale for method selection (methodology), it is necessary to consider the diverse paradigms that contributed to the development of this research. The four contributing paradigms include pragmatism, participatory action research (PAR), post-positivism, and constructivism, which each address different aspects of the research problem. An overview of each paradigm is provided, which includes basic tenets, relevance and rationale for use, limitations and weaknesses, and application in the present research. Pragmatism and PAR constitute the overarching epistemological and methodological frameworks for the research, while procedural components of post-positivism and constructivism were adopted for their ability to address specific research objectives. This pluralistic approach rests specifically on the foundation of the pragmatic paradigm, which seeks to address the research problem directly and accommodates a range of philosophical and methodological positions within the context of a subjective and indeterminate reality (Johnson & Onwuegbuzie, 2004).

5.2 Paradigmatic conventions

The concept of paradigm was conceived by Kuhn (1970) and, though defined in different ways, generally describes an overarching conceptual construct, world view, or belief system with which researchers make sense of the world (Crotty, 1998; Morgan, 2007). Paradigms are typically composed of a set of shared principles of a particular community of specialists, which guide research design and set parameters for study procedures (Creswell & Clark, 2011; Crotty, 1998; Kuhn, 1970). Academic inquiry seldom utilises a single paradigm, and the history of social scientific progress has been punctuated with paradigm shifts (Kuhn, 1970). Addressing the inherent flexibility and plurality of paradigms Creswell and Clark (2011) stated,
Our view is that world views relate to types of designs, that world views can change during a study, that world views may be tied to different phases in the project, and that researchers need to honour and write about their world views in use (p. 46).

The complexity of environmental influences on active ageing arguably requires flexibility and pluralism in research design and methods selection. Accordingly, elements from four paradigms address different aspects of the research problem as well as gaps and limitations in the gerontological literature. Other paradigms could also be considered as influences on this research, including post-modernism and symbolic interactionism, which take positions on the nature of knowledge, reality, and power that are generally commensurate with the aims of this research (Crotty, 1998; Johnson et al., 2000). These paradigms did not directly inform decisions concerning research design or method selection and are, therefore, not elaborated upon any further in this thesis. Critical gerontology is expressed, though not explicitly stated, in the use of a PAR philosophy and methods, the recognition of the role of meanings and values, and in challenges to traditional ways of researching and understanding the experiences of ageing (Holstein & Minkler, 2007; Jamieson & Victor, 1997). The pluralistic approach used in this research is generally accepted within critical gerontology and is permissible within the overarching pragmatic paradigm, which challenges assumptions about the incompatibility of disparate world views (Morgan, 2007). Positivist readers may disagree with the assertion that the majority of social research reflects a multiplicity of paradigms throughout the research process. Some may believe that paradigms cannot and should not be mixed as this may undermine the epistemological and ontological foundations of research. In defence of this thesis, however, it is important to recognise the realities of research and the fundamental limits of objectivity. For example, even in a carefully controlled, post-positivist study utilising validated surveys there is often a high degree of subjectivity associated with the choice of literature to inform hypotheses, the selection of survey items, or the design of the data analysis procedures. It may be most appropriate, therefore, to identify all of the epistemological assumptions (inherent in different paradigms) that influence various phases of research. In this way, researchers can honestly address the interplay between subjectivity and objectivity that is arguably associated with all social research.
5.3 The pragmatic paradigm and mixed methods

5.3.1 The pragmatic paradigm

The pragmatic paradigm shares philosophical foundations with PAR and is often used as a theoretical justification for collaborative modes of investigation and mixed methods research (Bryant & Charmaz, 2008; Reason & Bradbury, 2006). There is a close interconnection among pragmatism, PAR, and emergent design and analysis, which revolves around an iterative and cyclical process of problem solving in collaboration with those affected by the research resulting in transformation, emancipation, or improved understanding (Johnson & Onwuegbuzie, 2004; Strubing, 2008). The pragmatic paradigm was conceived by the American researchers in the 19th century as a response to a perceived uncritical acceptance of the ability of existing scientific designs to adequately interpret the social world and a prevailing dogmatism and duality within academic disciplines (Johnson et al., 2000). Key among these figures was John Dewey who articulated arguments regarding the problems of theoretical dualisms, the socially constructed nature of knowledge, and the importance of action and meaning in relations between people and environments (Cutchin, 2005). For this reason, Dewey's pragmatism is often applied to the topic of ageing and place (Cutchin, 2005). The pragmatic paradigm is known for the axiom that what counts for knowledge is determined by its usefulness and it is frequently cited as the theoretical rationale for mixed methods, where modes of enquiry are selected for their perceived ability to increase understanding of the research problem (Johnson et al., 2000; Morgan, 2007; Tashakkori & Teddlie, 2003).

Within this paradigm, concepts of truth and reality are viewed as changeable, relative, indeterminate, and subordinate to the process of taking action to address a practical research question (Guba & Lincoln, 2005; Tashakkori & Teddlie, 2003). Pragmatism does not deny an absolute truth or reality, but posits that ways of knowing are imperfect and researchers should seek to increase understanding through the refinement and integration of intellectual processes. The pragmatic paradigm also contends that the world cannot be explained or understood through the lens of a single world view and justifies the use of multiple paradigms or theoretical frameworks within the context of a mixed methods study by removing the

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21 The pragmatic paradigm and pragmatism are used interchangeably in this thesis.
22 Prominent advocates include John Dewey, William James, George Herbert Mead, and Charles Sanders Pierce.
forced choice dichotomy between post-positivism and constructivism (Creswell & Clark, 2011; Guba & Lincoln, 2005).

The pragmatic paradigm contributes to this thesis in several ways: (a) it provides the theoretical justification for a mixed methods and multi-phase approach; (b) it prioritises the research question and objectives as organisational components of the study; (c) it permits the analysis and integration of objective and subjective knowledge within the same study; (d) research outcomes are conceived as the result of a consensus and are co-created by participants; and (e) it accepts the fundamental limitations of all modes of research and abandons claims to absolute truth and causality (Creswell & Clark, 2011; Guba & Lincoln, 2005). The pragmatic approach is also characterised by a version of abductive reasoning (plausible and often multiple interpretations that best describe the data) that invokes both induction (extrapolation from individual cases to general concepts) and deduction (hypothesis testing and identification of general concepts and patterns that explain specific cases and instances of phenomena) (Bryant & Charmaz, 2008; Morgan, 2007).

Several criticisms of the pragmatic world-view have been articulated. The most damaging charge is the incompatibility thesis, which suggests that pragmatism oversimplifies the philosophical discord between paradigms and promotes an invalid integration of incompatible research methods and findings (Guba, 1990; Howe, 1988). Pragmatists have been accused of having an unreasonable attitude of accommodation (Mumford, 1950) and of being overly eager for action and effectiveness while taking an uncritical view of underlying intellectual values (Walzer, 1989). Moreover, by downplaying notions of absolute truth and reality pragmatism has been accused of sidestepping central ethical and philosophical issues arising from post-positivist and constructivist perspectives (Guba, 1990). Guba (1990) underscored his concerns about pragmatism when he stated,

Accommodation between paradigms is impossible. The rules for action, for process, for discourse, for what is considered knowledge and truth, are so vastly different that, although procedurally we may appear to be undertaking the same research, in fact, we are led to vastly different, disparate, and totally antithetical ends (p. 81).

Arguments against pragmatism are often answered by the assertion that the melding of diverse philosophies and methodologies opens research to new and unexpected insights, which may advance understanding of a complex problem and which are arguably less likely
to be obtained through the application of a single paradigm (Austin, 1990; Johnson & Onwuegbuzie, 2004; Morgan, 2007). Furthermore, the successful use of mixed methods research in recent decades across a variety of disciplines has rendered the so-called incompatibility thesis largely moot (Teddlie & Tashakkori, 2003). The history of paradigm shifts within the social sciences also serves to reinforce the notion that there is no single and correct way to approach a research question, and some of the purported incompatibility between different perspectives may be due to a historical lack of communication during intellectual transitions (Kuhn, 1970). Moreover, all researchers hold particular values, knowledge, and scientific heritage, which inevitably colours their practice and findings (Johnson & Onwuegbuzie, 2004; Star, 2008).

5.3.2 Mixed methods as methodology

Consistent with the pragmatic paradigm, research methods (instruments and procedures) were selected and mixed in a manner that provided the best opportunity for addressing the research question (Johnson & Onwuegbuzie, 2004). Mixed methods was one of two overarching methodologies for the present research and refers to “research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative methods in a single study” (Tashakkori & Creswell, 2007, p. 4). According to Victor, Westerhof, and Bond (2007), pragmatic and mixed methods research is supportive of applied social and behavioural studies and well suited to gerontological investigations of the emplaced experiences of ageing. Proponents of ecological models of ageing have also asserted that as behaviour arises in response to objective environment, individual circumstances, and the subjective and transactional relationship between person and surroundings, it is necessary to use multiple means of analysis and interpretation (Weisman, Chaudhury, & Diaz-Moore, 2000).

The systematic literature review identified few gerontological studies that utilised mixed methods in investigations of interactions among ageing, environment, activity, and health (Andrews et al., 2007; Wahl & Weissman, 2003). Where such approaches were undertaken, researchers reported improved data collection and enhanced understanding of complex ecological problems (Annear et al., 2009; Gallagher et al., 2010). The application of a mixed methods approach, incorporating both quantitative and qualitative procedures, addresses gaps in the gerontological literature, which is dominated by quantitative survey
methods and informed primarily by the post-positivist world view.

The present research collected and analysed both quantitative and qualitative data and employed successive research phases to build up to final results and theory (Creswell & Clark, 2011; Victor et al., 2007). The multi-phase design incorporated both sequential and concurrent data collection over several months to address multiple research objectives relating to an overarching problem (Creswell & Clark, 2011). The use of a mixed methods approach provided a means of verifying and elaborating research findings across a number of phases, which increased the validity and generalisability of the results, reduced bias and errors inherent in any single method, and provided insight into different aspects of a multifaceted research problem (Creswell & Clark, 2011; Johnson & Onwuegbuzie, 2004). The multi-phase, mixed methods approach also complemented the PAR process through the utilisation of methods that afforded participants a measure of control over the generation and interpretation of their data.

5.4 Participatory action research (PAR)

5.4.1 The PAR paradigm

PAR refers at once to a paradigm, a methodology, and a set of methods, which are part of the broader action research construct. As a paradigm, action research is concerned with understanding the political construction of reality; a focus on democracy and humanism at all levels of society; an appreciation for emplaced, embodied, and co-created human experience; and the empowerment of underprivileged or marginalised groups and an orientation towards problem solving and social action (Bargal, 2006; Coghlan & Brannick, 2009; Reason & Bradbury, 2006). Action research was conceived by Kurt Lewin in the mid 20th century as research leading to social change via a process of planning, action, and fact finding in cooperation with others (Lewin, 1946). A widely used definition of action research has been provided by Reason and Bradbury (2006):
Action research is a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory world view…Action research seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of concern to people and more generally the flourishing of individual persons and their communities (p. 1).

The distinctiveness of PAR in relation to action research lies in the prioritisation of a collaborative process in which researchers and participants work together in the context of an identified problem to bring about positive change, education, or improved understanding within a mutually acceptable framework (Lingard, Albert, & Levinson, 2008). Such research usually operates outside the bounds of political or organisational structures, but often seeks change within these contexts as well as at community level (Coghlan & Brannick, 2009). PAR reflects questioning about the nature of knowledge and the extent to which it represents the interests of the powerful and educated and serves to reinforce their positions in society (Baum, MacDougall, & Smith, 2006; Foucault & Gordon, 1980). As Farganis (1975) has previously stated, “all scientific knowledge about social reality carries with it, either implicitly or explicitly, certain ideological, political, and evaluative convictions” (p. 483). Law (2004) has argued that researchers should acknowledge their unavoidable interference in the world and attempt to maximise their engagement at the community level to affect improvements in social conditions.

Paulo Freire popularised early ideas about participatory research through his work on praxis and consciousness raising. Freire used a collaborative approach to empower uneducated communities to collaborate as equals with their educators and to analyse the structural reasons for their illiteracy and oppression (Baum et al., 2006; Freire, 1972). Freire (1972) pioneered the early understanding of the concept of praxis: collective reflection and action upon the world with the aim of transforming it to redress structural inequities. From Freire’s perspective, the key to PAR is a critical self insertion into the reality of one’s own situation, which leads to the formation of critical consciousness and collective action (Crotty, 1998; Freire, 1972). Freire (1972) argued that the process of action and reflection cannot effectively occur in isolation and must be undertaken in fellowship, and community members must be valued for their inherent knowledge and capacity to affect change. When community members are involved as collaborators throughout a research process, they establish themselves as more powerful agents with an ability to influence the practices of institutions, the production of knowledge, and the political construction of reality.
The PAR paradigm contributes to the present research in several ways: (a) the meaningful involvement of older adults as collaborators at each stage of the research; (b) a focus on addressing issues of relevance for community members negotiated in advance of study commencement; (c) collaborative development of actionable recommendations for change, a locally relevant model of active ageing, and dissemination of study findings to decision makers; and (d) the understanding that subjective reality is both socially and politically constructed and, therefore, negotiable and transformable.

A potential problem arising from PAR reflects what Gaventa and Cornwall (2006, p. 77) have labelled the “illusion of inclusion”, whereby research is positioned as a moral authority on an issue and as the voice of the people when, in reality, it reflects the underlying designs and assertions of researchers. Such outcomes occur when participant input echoes the perspectives of dominant groups for fear of oppression or chastisement, when the researcher seeks a mandate for a predetermined approach that reinforces existing power relations, and when a drive for general consensus masks fine-grained differences among participants (Gaventa & Cornwall, 2006). The issue of meaningful participation was addressed in this research through the recruitment of older-adult project advisers who were knowledgeable of research processes, consultation regimens, and existing age-related issues in Christchurch (the reference group). These individuals ensured that an equitable relationship between researcher and study participants was achieved (and open to continuous review) and that participatory research aims were met during the project. PAR provided a theoretical basis for the meaningful involvement of community members in the research process, ensured that the study addressed an issue of local significance, and provided a pathway for connecting community concerns to existing power structures within the city (Blair & Minkler, 2009; Minkler, 2005; Witten, Parkes, & Ramasubramanian, 2000).

5.4.2 PAR as methodology

As a methodology, PAR refers to a systematic investigation with the collaboration of those affected by the issue being studied for the purposes of education, taking action, or bringing about social change (Blair & Minkler, 2009; Minkler, 2000). Older adults were involved as co-researchers in all phases of the research process, from initial design and development through to analysis and dissemination of results (Cornwall & Jewkes, 1995; Kemmis & McTaggart, 2006). PAR was selected as a methodology for several reasons. First,
research investigators were not members of the older-adult group and, therefore, could not fully understand the embodied and emplaced experience of this age group. It has previously been argued that younger gerontologists rarely get inside the experiences of ageing because of their lack of empathy and understanding (Achenbaum, 1997). Collaboration with older adults during all research phases was the only way to ensure that the perspectives of this group were accurately represented. Second, research concerning the interactions among environment, ageing, and activity is fraught with complexity (Casswell, 2000), and the involvement of community members provided validation of the research process and outcomes via the collaborative design and member checking of results and conclusions. Third, recruiting and retaining older research subjects can be difficult, and participant withdrawal, loss of interest in the research process, breakdowns in trust, or loss of health or mobility are common threats (Carter, Elward, Malmgren, Martin, & Larson, 1991; Moreno-John et al., 2004). PAR provided a mechanism for maintaining engagement by involving older adults in a meaningful way from the outset of the research and addressing an issue of concern to the community. Previous PAR studies conducted with older adults and minority groups have typically reported improved recruitment and retention (Carasquillo & Chadiha, 2007; Norris et al., 2007). Finally, the use of a PAR methodology addressed the dearth of older-adult collaboration in applied gerontological research that was evident in the reviewed literature.

PAR has been employed in health-related, environmental, and gerontological research with marginalised or minority groups to identify and address issues affecting these communities, although it is acknowledged as a presently underutilised approach in critical gerontology (Holstein & Minkler, 2007; Ray, 2007). PAR has been used in the United States to explore the chronic pain experiences of older adults and as a mechanism for involving minority community groups in evaluating their neighbourhoods and advocating for healthy urban development (Baker & Wang, 2006; Minkler, 2000; Wang, Morrel-Samuels, Hutchison, Bell, & Pestronk, 2004). PAR has received comparatively little use outside the northern hemisphere, and Witten, Parkes, and Ramasubramanian (2000) have argued that New Zealand has a unique and favourable social, cultural, and legislative environment for participatory research in the realms of health and the environment.

Although numerous PAR principles have been developed for successful collaborations with older adults, each partnership generates its own values (Israel, Eng, Shulz, & Parker, 2005). PAR principles that were employed to guide the research procedures include the
following: (a) building on existing community capacities and networks within Christchurch; (b) collaborating with older adults as equals in the research process; (c) embracing the reciprocal exchange of knowledge and skills among research partners; (d) focussing on the local relevance of public health problems and on ecological perspectives that attend to the multiple determinants of health; and (e) disseminating the results to all partners and focussing on the community outcomes (Israel et al., 2005). In the present research, PAR procedures are mainly reflected in iterative cycles of planning, action, and reflection (and replanning) undertaken across three research phases with the population under investigation (community dwelling older adults) and in the final dissemination of recommendations at a community symposium. It was beyond the scope of this research to undertake an intervention or to affect significant social change in relation to the limited time and resources available. This does not negate the action research design or imperative of the study and is consistent with existing approaches to PAR (Catalani & Minkler, 2010; Israel et al., 2005; Wang et al., 1998). PAR procedures and outcomes were agreed with research partners and are described in more detail in Chapter 6.

5.5 Contributions from post-positivism

Post-positivism is a top-down (researcher-imposed) approach that is typically associated with quantitative research methods. Research based upon this perspective is usually concerned with hypotheses testing, removing bias from research procedures, maintaining a dispassionate and distanced relationship with participants, and the application of the scientific method (Crotty, 1998; Mertens, 2003). Post-positivism differs from the more dogmatic world-view of positivism, which takes the deterministic viewpoint that objective truths about phenomena exist and can only be understood through empirical measurement and a standardised application of the scientific method (Bryman, 2008; Trochim & Donnelly, 2007). Post-positivism deviates from positivism in its acceptance of the fallibility of empirical measurement, the revision of theory commensurate with improved understanding, the use of multiple forms of measurement, the rejection of the incompatibility thesis, an acceptance that research is inherently value-laden and subject to bias, and the notion that reality is socially constructed (Bryman, 2008; Kuhn, 1970; Popper, 1959; Trochim & Donnelly, 2007).

Post-positivism contributed to the present research in several ways: (a) the formulation of general hypotheses concerning the potential interactions between environmental conditions
and activity participation among older adults; (b) the development of standardised definitions and concepts in the early phases of the research; (c) the use of a quantitative research methods; (d) the selection of control groups, comparisons between respondent and non-respondent populations, data checking, and procedures to reduce research bias; and (e) the reliance on previous literature and theory to inform the development of the research (Creswell & Clark, 2011).

Post-positivism is subject to a number of criticisms, including charges that it distances researchers from subjects and contexts, methods emphasise the passivity of less powerful subjects, and the inherent complexity of human experience is undermined by a tendency to disregard meaning, interaction, and processes of change (Gaventa & Cornwall, 2006; R. Johnson & Onwuegbuzie, 2004). These weaknesses were addressed through the addition of constructivist and participatory research elements, which provided verification and elaboration of the quantitative findings, highlighted meaningful aspects of the relationship between older adults and their environments, and fostered a democratic relationship between research parties. In the context of this research, post-positivist elements provided an efficient means for exploring potential study areas, canvassing the perspectives of a large and diverse population of older adults, and undertaking a preliminary assessment of possible influences on active ageing.

5.6 Contributions from constructivism

Constructivism is a bottom-up (participant-generated) perspective, which relies on subjective, qualitative data to advance understanding of a research question and as the building blocks of theory (Creswell & Clark, 2011). Constructivism asserts that knowledge and conceptions of reality are subjective, multiple, and brought forth through interactions between individuals and the external, indeterminate world (Creswell & Clark, 2011; Crotty, 1998; Grbich, 2007; Riegler, 2005). In congruence with the pragmatic and PAR world views, the constructivist perspective emphasises the significance of interactions between the researcher and participants in the creation of knowledge (Mertens, 2003).

The constructivist perspective made several contributions to the present research: (a) the use of qualitative research methods, which prioritised the meanings and experiences of older adults; (b) the emergent approach to theory generation, which utilised participant data to
build definitions, themes, and concepts concerning the interactions among ageing, environment, and activity participation; and (c) the understanding that subjective experiences, perceptions, and meanings generated within particular contexts are likely to influence the manner in which older adults act within those circumstances (Creswell & Clark, 2011; Crotty, 1998). The utilisation of constructivist elements within the study also addressed gaps in the existing gerontological literature. In particular, the lack of qualitative research associated with investigations of potential relationships between environmental conditions and active ageing.

Constructivism is also the subject of criticism, however, and concerns include difficulties generalising findings to settings and populations beyond the original study and the potential for researcher bias in the analysis of results associated with inductive and abductive processes (Grbich, 2007; Johnson & Onwuegbuzie, 2004). Potential researcher bias was addressed through verification and elaboration of emergent findings with quantitative results and focus group discussions. Generalisability of the research findings was facilitated via a collaborative theory development process, which distilled abstract concepts and meanings directly from the data. The constructivist perspective provided a conduit for the diverse voices, experiences, and categories of meaning among research participants; facilitated in-depth and contextualised understanding of the pathways from environment to activity; and was sensitive and flexible to changing urban circumstances following a series of earthquake disasters that occurred during the study (Johnson & Onwuegbuzie, 2004).

5.7 Chapter summary

This research drew upon four paradigms (pragmatism, PAR, post-positivism, and constructivism) and two associated methodologies (mixed methods and PAR procedures) to advance a programme of research exploring environmental influences on active ageing in urban Christchurch. Combining multiple research systems was a practical response to the inherent complexity of the problem at hand and a means to creatively address identified knowledge gaps within the gerontological literature associated with an over-reliance on positivist research designs, a lack of qualitative and mixed methods approaches, and the absence of older-adult collaboration. There are limitations and weaknesses inherent in this approach, but these have been largely addressed through the verification and elaboration of research findings via multiple methods of investigation; collaboration with research participants to critique the process, results, and conclusions; and acknowledging the
ubiquitous limits of human understanding that cut across paradigms.
6 Research design and procedures

6.1 Chapter introduction and organisation

This chapter describes the research design and methods associated with a pragmatic and participatory investigation of the potential environmental influences on active ageing in urban areas. Initially, the PAR and mixed methods procedures are introduced (figure 5). This is followed by an overview of the ethical approval and consenting process. Next, the research field of Christchurch is described and the processes associated with area selection are outlined. The particular methods of investigation are then introduced. Following this, an overview is provided of the selection and recruitment of research participants and collaborators. Pilot testing procedures are described in the penultimate section. Finally, the quantitative and qualitative data analysis processes are elaborated and the manner by which the theory of navigated environmental performance was refined from the data is explained.
Figure 5: The participatory action research (PAR) process
6.2 Initiating PAR procedures

The PAR process followed three iterative research phases, which each involved a sequence of planning, action, and reflection in collaboration with older adults (Lewin, 1946). Prior to the initiation of the three main research phases, the PAR process began with a preliminary reconnaissance to develop a working relationship with community members and to conceptualise the research problem (Heron & Reason, 2006). The reconnaissance was among the most significant stages of the research as it provided a mechanism for what Lofland and Lofland (1995, p. 31) describe as “getting in and gaining acceptance”. After initial reconnaissance, the PAR process entered the core stages of planning, action, and reflection, which were enacted across three phases to address different research objectives. Planning was the first step in each phase and involved discussions with older-adult collaborators to identify and refine the research objectives at each phase of the project and determine procedures (Coghlan & Brannick, 2009; Heron & Reason, 2006). The action stage involved the implementation of the collaborative plan and the collection of data to address the research objectives (Coghlan & Brannick, 2009). The final stage of each action phase involved reflection on the meaning and significance of the research findings, evaluation of the effectiveness of the approach, identification of potential limitations and weaknesses, and consideration of how the findings contributed to the development of subsequent research phases (Coghlan & Brannick, 2009). The second and third phases were interrupted by the 2010 and 2011 Canterbury earthquakes and both contain additional cycles of planning and action as a result.

6.3 PAR as method

As a research method, PAR refers to the practical aspects of collaboration with participants and to the instruments that afford respondents control over the collection, analysis, and utilisation of data (Bargal, 2008; Brydon-Miller, 1997). Concerning the collaborative aspects of the research, two groups of older adults participated as co-researchers during the study: (a) a group of eight individuals from a local older persons' advocacy organisation, and (b) a participant group of 30 volunteers from within the research sample. The reference group was involved in the research process from its inception in 2010 and collaborated in the formation of the research problem; development of research questions, concepts, and design; sampling and selection of study areas and participants; development and
Research design and procedures

pilot testing of research methods; interpretation of research findings; and the generation of recommendations and the theory of navigated environmental performance. The participant group was formed at the completion of the main data gathering phases in 2011 and contributed to the generation of results, critique and verification of research findings, and development of recommendations and the theory of navigated performance.

6.4 A multi-phase and mixed methods approach

A multi-phase, mixed method design combining concurrent\(^\text{23}\) and sequential\(^\text{24}\) elements was employed in this research in parallel with the PAR process (Creswell & Clark, 2011). The multi-phase research design addressed incremental research questions and contributed to subsequent phases of data collection and interpretation (Creswell & Clark, 2011). The multi-phase design also facilitated the PAR process, which included iterative cycles of planning, action, and reflection over two and a half years (Bargal, 2008). A mix of quantitative and qualitative research procedures was employed in the context of the multi-phase design, including Geographic Information Systems (GIS) analyses, systematic observations of potential study areas, administration of a survey and supplementary earthquake questions, activity diaries, photovoice\(^\text{25}\) procedures, and focus group discussions. These techniques were applied at varying stages of the research process to address different aspects of the research question. While the study was conducted over a several phases, the design was fundamentally cross-sectional. Within this framework, there were opportunities to collect similar data at different time points in relation to the earthquakes of 2010 and 2011. However, this was completely serendipitous and not pre-determined as a longitudinal data collection exercise.

6.5 Ethical considerations

6.5.1 Ethical approval

Ethical approval for the research was granted by the University of Otago Human Ethics Committee in four separate stages commensurate with an iterative and participatory research design and changes made in response to the Canterbury earthquakes (appendix 13.2). In the first stage (March 2010), ethical approval was obtained for the reconnaissance phase of

\(^{23}\) Quantitative and qualitative methods combined during the same research phase.

\(^{24}\) Diverse types of data collected at different research stages.

\(^{25}\) Participant use of cameras to represent their local conditions and promote critical discussion.
the research, which included approaches to the Elder Care Canterbury Consumer Group to recruit project collaborators. In the second stage (September 2010), full approval was granted for the remainder of the study, including proposed sampling procedures and research methods. In the third stage (October 2010), fast-track approval was granted for the distribution of questions addressing the potential impacts of the September 4, 2010, earthquake. In the final stage (March, 2011), fast-track approval was granted for the redistribution of the earthquake questions following the February 22, 2011, earthquake.

6.5.2 Participant consent and confidentiality

Reference group members provided informed, written consent to participate as collaborators in the research following an introductory presentation in May 2010. Research participants consented to study participation and publication of aggregated and anonymous data through the return of a completed survey in late 2010. During data collection and analysis, participant names and addresses were stored separately from the raw data and linked only by a generic code. Raw data (including surveys, activity diaries, and photovoice materials) were stored in a locked cabinet in the office of the lead researcher consistent with the University of Otago's storage and security policies. Identifying information was only accessible by the lead researcher and two supervisors. Quantitative data were aggregated during analysis, so participant anonymity was ensured in the publication of all statistical results. Age- and area-related descriptors were used to distinguish qualitative data (including participant statements and photographs). No names were associated with qualitative data. It was decided among stakeholders that it would be appropriate to connect individual age and location information with the qualitative data for several reasons: (a) these data were directly relevant to the research question; (b) they emphasised the embodied and emplaced experiences of older adults in particular urban contexts; and (c) they recognised that participants were active contributors to the research process and not simply passive and vulnerable subjects. Respondents' visual identity was not concealed in the photographic data as returned images were self-censored. Participants were free to return only material that they deemed publishable. In some cases, participants chose to return none of their photographs. Consent was sought for the publication of photographic data in which respondents' family, friends, or associates were potentially identifiable (appendix 13.21). Where consent could not
be obtained\textsuperscript{26}, faces were digitally obscured.

### 6.6 The research field

Christchurch is the second largest city in New Zealand with a population exceeding 348,000 at the last Census in 2006 and an older population structure than other large urban areas (Statistics New Zealand, 2007b). Christchurch is less ethnically diverse than other cities in New Zealand and is known for its social stratification and the demarcation between affluent and deprived sectors (Statistics New Zealand, 2010b; Wilson & Reed, 2005). Christchurch is a planned city that was designed in the mid 19\textsuperscript{th} Century and was laid out in a rectangular grid pattern around a central square and cathedral (Wilson & Reed, 2005). Christchurch's development was influenced by garden-city concepts of town planning, and several public parks were accommodated in the original city layout (McIntyre, 2000). The uniformity of the central grid is broken by the Avon River, which wends through the inner city from west to east. Since the inception of the town plan in 1850, the general pattern of development has included both concentric outward growth from the central city along major transport corridors and development around larger suburban nodes (McIntyre, 2000; Wilson & Reed, 2005). Christchurch has a diverse physical and social environment and comprises housing at lower and higher densities, varying socio-economic conditions, large-scale retail and business zones, access to coastal land and hill country, rivers and estuaries, community facilities, and open space areas (Christchurch City Council, 2011a; Wilson & Reed, 2005). While the built environment of Christchurch reflects progressive and sophisticated urban development, the natural environment has been degraded significantly since the time of European settlement. Wetlands were drained, sand dunes were excavated, native forest was milled, and waterways were appropriated for residential and agricultural uses (Pawson, 2000). As described in the introduction, Christchurch was struck by a sequence of powerful earthquakes during 2010 and 2011, which significantly altered environmental conditions and restricted access to resources in many parts of the city.

\textsuperscript{26} Only one photovoice participant returned an image for which they were unable to gain the consent of photographic subjects. The photograph showed an outdoor exercise class from which the participant had subsequently withdrawn. The participant did not know how to contact the group leader or members.
6.7 Selection of study areas

6.7.1 Purposive selection of areas

Twelve study areas were purposively selected on the basis of pre-determined criteria, a GIS analysis of geographic and demographic data, systematic observations, and discussions with the reference group. The purposive selection of areas was determined largely by the qualitative and action research imperatives of the study, which required access to respondents living in particular types of areas. GIS software was used to identify 36 urban areas with higher numbers of older adults and diverse geographic and demographic attributes. The researcher then led a discussion with older adults from the reference group to make a selection from these that would reflect a variety of urban conditions. All members of the reference group had lived for many decades within Christchurch and were familiar with all potential study areas. In this way, it was possible to draw on their intimate knowledge and experience of these spaces to select a smaller sample of locations that would provide a diversity of conditions under which to conduct the study. A purposive approach to area sampling suited the needs of the research as the study was focussed on identifying areas with the following characteristics: higher proportions of older residents, a range of land uses, varying socio-economic conditions, and diverse environmental attributes. This approach to sampling targeted particular areas for their perceived capacity to address the research question and reduce “noise in the data” attributable to random sampling (Morse, 2007, p. 234). The concept of noise in the data as it is used in this instance refers to the extreme variability (and potential outliers) generated through random sampling approaches that potentially influence the selection of areas (or participants) and conclusions reached about the data. These can be accounted for in analyses, but it can be difficult to completely rule out their influence. A potential drawback of this non-probability sampling is that it may lead to the inadvertent exclusion of certain populations (Victor et al., 2007); however, collaboration with local older adults, and the use of multiple assessment techniques arguably attended to this concern. By working with older adults who were familiar with Christchurch, research areas and participants could be selected that represented diverse and potentially rich data sources that would be particularly useful for the qualitative component of the study. The use of multiple methods across three research phases also provided opportunities to confirm findings at a number of stages in the study, which arguably increased validity. In comparison, simple or systematic random sampling would have yielded a highly dispersed sample and made it
difficult to delineate contextual or compositional differences across areas, potentially compromising the study (Morse, 2007).

### 6.7.2 GIS analyses

Geographic mapping software (MapInfo Professional Version 10.0) was used to analyse publicly available demographic, land use, local resource, and socio-economic deprivation data. To identify environments inhabited by larger communities of older adults, demographic and land-use data were analysed to locate residential areas with the following characteristics: two or more contiguous mesh-blocks\(^{27}\) with greater than 20% of the population aged 65 years or older and individual mesh-block populations of more than 100 individuals. Two or more contiguous mesh-blocks (mesh-blocks with shared boundaries) with analogous characteristics were used to control for the potential influence of aged-care facilities located within individual areas. To control for the possibility that selected areas represented locales with favourable environmental conditions that older adults had self-selected into, two control areas with less than 5% of their population aged 65 years or older were included in the study sample.

Besides the identification of areas with higher and lower proportions of older adults, the analysis sought diverse settings that could potentially influence the activity participation of residents. The main criteria used to establish differences across urban locations were area-level socio-economic deprivation and residential density. Area deprivation is often used by researchers as a proxy measure for the physical and social environmental conditions of areas, and studies have reported that health and activity participation tends to be graded by deprivation such that those who live in lower-deprivation (more affluent) areas tend to be healthier and more active than those who live in higher-deprivation (poorer) areas (Annear et al., 2009; Breeze et al., 2005; Giles-Corti, Timperio, Bull, & Pikora, 2005). The Deprivation Index (NZDep2006) is a small area index of aggregated socio-economic conditions in New Zealand, which is constructed from indicators taken from the 2006 Census of Population and Dwellings\(^{28}\) (Salmond & Crampton, 2002). In the context of the present research, contiguous mesh-blocks were selected for consideration if they exhibited higher (8-10) or lower (1-3) deprivation levels.

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27 Small geographic areas used for government administration.

28 A national Census of population and dwellings is undertaken in New Zealand every five years; however, due to the earthquakes that affected Christchurch during 2010 and 2011, the March 2011 Census was cancelled and has been rescheduled for March 2013. As a consequence, more recent demographic data were not available during the research.
scores on the NZDep2006. It should be noted, however, that some studies have shown that area deprivation does not always reliably predict the physical and social conditions of particular locations (Cattell, 2001).

Residential density was also used as a selection criterion for potential study areas. Residence in higher- or lower-density areas has previously been found to be associated with differences in activity participation and health among older adults (Dwyer et al., 1994; Knipsheer et al., 2000; Lim & Taylor, 2005). Diverse and haphazard zoning patterns (associated with historical and planning factors), however, made it impossible to assign directly comparable land-use typologies to each of the selected areas. Despite difficulties imposed by the complexities of urban zoning, efforts were made to obtain a broad representation of residential locations in different parts of the city, which included higher-density inner city areas, lower-density suburban areas, and peri-urban or coastal locations. Land-use type was defined generally as either lower density or higher density and was used primarily as a descriptive device due to the complex interplay of overlapping zone codes.

Once locations suitable for inclusion in the research were identified, a 400 metre buffer zone was added to the perimeter of each area. A buffer of 400 metres provided a conservative estimate of the prevailing activity space around an individual's place of residence and represented a distance that could be walked by a healthy older adult in five to ten minutes (Ball, Timperio, & Crawford, 2006; Pikora, Giles-Corti, Bull, Jamrozik, & Donovan, 2003). The buffer zone also provided a distance-based proxy for what is sometimes called a neighbourhood. In reality, however, the boundaries of neighbourhoods are highly subjective, reflecting differences in mobility, social capital, and resource provision (Giles-Corti, Broomhall, et al., 2005).

Following the preliminary selection of study areas, two further analyses were undertaken to assess resource availability and area quality: (a) a GIS analysis of local resource availability and (b) a systematic observation of areas. To assess the availability of resources relevant to activity participation, publicly available data were examined using geographic mapping software. Access to local resources, including public open space, community facilities, and commercial areas has previously been associated with health and activity participation among older adults in several studies (Addy et al., 2004; Ball et al., 2006; Giles-Corti, Timperio, et al., 2005; Mitchell & Popham, 2008). In Christchurch, data were available
for the following attributes: public green space, health centres, shopping areas, swimming pools, recreational facilities, churches, community centres, and libraries. The number of times each of these resources occurred within the 400 metre buffer zone surrounding selected areas was tabulated and summed as an indication of the relative density of activity related resources.

6.7.3 Systematic observations

The final stage in the assessment of areas involved systematic field observations with reference group members. Systematic observations allowed the research team to gain a greater understanding of potential study areas to inform the research process as well as providing ground truthing\(^{29}\) and triangulation of the geographic evidence (Clarke, 2007). Two adjacent street segments were randomly selected by the researcher from within each of the potential study areas. The researcher and a team of up to two older adults from the reference group walked both segments and undertook a systematic assessment using existing area audit instruments. The researcher completed the comprehensive Irvine-Minnesota Inventory: an inventory of local resources and conditions thought to be associated with active living among adults, which has previously demonstrated high levels of reliability and validity in diverse urban areas (Boarnet, Day, Alfonzo, Forsyth, & Oakes, 2006; Day, Boarnet, Alfonzo, & Forsyth, 2006). Examples of items in the Irvine-Minnesota Inventory include the following:

(a) Is this street segment characterized by a significant open view of an object or scene? (b) What types of land use are present in this area? (c) Rate the attractiveness of this street segment (appendix 13.23). The researcher also took several representative photographs of the areas to facilitate group discussions. Older-adult observers completed the St Louis check list: a community oriented inventory of area attributes relevant to activity participation (Brownson et al., 2004; Hoener, Ramirez, Elliot, Handy, & Brownson, 2005). Older-adult observers also completed an assessment of the extent to which each area supported active ageing (appendix 13.3). Examples of items in the St Louis check list include the following: (a) What type of recreational facilities/destinations are visible in this street segment? (b) How would you rate the walkability or bikability of this street segment? (c) Is physical disorder visible in this street segment? (appendix 13.24). No changes were made to audit tools prior to use in this study. Once observation data were processed and summarised, the researcher presented the

\(^{29}\) In geography, ground truthing refers to the process for checking that cartographic or satellite data is consistent with the resources that currently exist within a particular location.
findings for all areas to a meeting of reference group members. A final selection of areas was made based on this information, and the reference group selected 10 diverse study areas and a further two controls for inclusion in the research.

6.8 Research participants

6.8.1 The reference group

During the first research phase and commensurate with participatory procedures, a reference group composed of knowledgeable older adults was established (the reference group) to guide project development, implementation, and procedures. Members of the reference group were recruited from the Elder Care Canterbury Consumer Group: a diverse collective of volunteers formed in 1997 (including retired professionals and health-sector workers) who monitor local health systems, consult on research projects involving older adults, and report problems and issues to the Canterbury District Health Board and other agencies (Presbyterian Support, 2010). Following an initial presentation of the proposed research at a regular meeting of the Consumer Group in May 2010 (appendix 13.1), eight older adults (from a group of 20) provided written consent to collaborate in the research. All reference group members were volunteers. Each of the reference group members resided in a different location in Christchurch. All were familiar with the selected study areas and some had resided in these areas during their adult life. Indeed, one reference group member lived in the New Brighton study area during the study. The reference group were composed of individuals of varying socio-economic backgrounds. Using employment as an approximate indicator, one had been a doctor and another an accountant. The remaining members of the group, however, reflected a comparatively lower socio-economic status and reported employment in nursing, aged care, and rest home management. In general, the group had a high level of education, with most reporting a tertiary qualification (degree, diploma, or vocational training). This group was not intended to be representative of the wider population of Christchurch as they were deliberately sought out for their knowledge of research and issues related to older adults who live in Christchurch. The reference group played a different role in the research process to study participants and as such did not receive the same level of scrutiny of their demographic and socio-economic details. The use of advisory groups of knowledgeable older adults has been previously applied in gerontological research and identified as an important mechanism for project formulation and review (Ray, 2007).
In practice, reference group members were heavily involved in the design and development of the study. The group met for two hours during five separate sessions over the course of the research. Each session began with a 20 to 30 minute presentation from the researcher. This presentation provided information about the proposed research (options for questions, designs, methods, participants, and study locations), provided updates about the status of research phases, and an overview of any challenges or unexpected outcomes that had arisen during the research process. The next hour of each meeting was devoted to addressing the current issue. Examples of issues that were discussed during the project included the selection of 12 study areas from a pool of 36 candidates, responses to the 2010 and 2011 earthquakes, pilot testing and refinement of research methods, and appropriate modes of dissemination. In one example of the decision making process that older adults were involved in, the researcher presented and explained four types of qualitative data collection strategies: a) interview, b) observation, c) diary, and d) photovoice. After discussion, the group agreed to use a combination of activity diaries and photovoice as the main data collection tools in the qualitative research phase. Interviews were rejected by reference group members as they felt that as frequent targets of health-related research older adults are overexposed to interview methods and my be disinclined to participate in research that used this method. Observations were ruled out due to time constraints and potential ethical problems associated with obtaining consent. Activity diaries with photovoice were regarded as superior by the older adults as they were seen as novel and interesting. The reference group also felt that they provided older adults with more control over their data by allowing them to contribute to the study at a time that suited them and also allowed them to edit the information or be more selective in their responses. The final 20 to 30 minutes of each meeting was devoted to agreeing a plan of action, resolving any disagreements, addressing administrative issues, and reflecting upon the efficacy of the research process and the involvement of reference group members. Where there were disagreements concerning an appropriate course of action, group members used a secret vote (votes were written on a piece of paper and placed in a hat). This system was only used once when determining a course of action following the earthquakes. In all other decisions, reference group members achieved consensus through discussion and debate. The research supervisors were present at initial reference group meetings, but did not participate substantively in discussions. Each session was organised in a question and answer format (from a Power Point presentation) with the researcher facilitating the discussion. All reference group members contributed to discussions, and the researcher questioned quieter members of the group to ensure that every individual was consulted. Each meeting was audio
recorded and minutes were distributed to all attendees to assure that the content and proposed were mutually agreed (options were provided to amend the minutes if disagreement arose). No payment was made to reference group members, although light refreshments (tea and coffee) were provided.

6.8.2 Survey participants

All available adults aged 65 years and older who were living independently within the 12 purposively selected study areas were included in the research. Convenience sampling of this type is typically applied in studies involving emergent designs to locate persons who have experience of the conditions under investigation and can provide the perspective of a knowledgeable insider (Morse, 2007). The research definition of independent living\(^{30}\) included older adults who resided within their own homes or rented accommodation, those who were living in government housing, and those in private units within retirement villages. Adults over the age of 65 years who were living in aged-care facilities or institutions were not considered for inclusion in the research as they were likely to have a higher burden of disease, disability, or cognitive impairment than older adults in the community\(^{31}\), which could negatively impact on their ability to participate in the research process or engage in activities in their local environment and beyond. Contact details for all eligible older adults were obtained via the national electoral roll\(^{32}\). A total of 790 older adults across 12 urban areas were eligible for study participation.

6.8.3 Activity diary and photovoice participants

Following survey administration in phase two, 140 older adults volunteered to participate in further research procedures (including the third research phase and focus group discussions) by responding to an invitation at the end of the questionnaire. After discussions with reference group members, it was decided that a maximum of 10 participants would be selected from each study area. Where study areas had fewer than 10 volunteers, all available

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\(^{30}\) In the context of this research, living independently does not refer to living or acting on one's own, but rather to the capacity and agency to select dwelling location and modes of activity participation.

\(^{31}\) In New Zealand, admissions to aged-care facilities are based on an assessed need for a specific level of care and support.

\(^{32}\) A database of the demographic details of all registered voters in New Zealand. Only the general adult roll was used. The Māori (local indigenous population) electoral roll was not used. This was because the proportion of Māori aged 65 years and over in Christchurch is relatively low and the general roll also includes individuals from many ethnic groups, including Māori.
Research design and procedures

109 subjects were selected. The selection of no more than 10 individuals per area was a purely subjective decision made in collaboration with reference group members. It reflected a need to obtain feedback from a number of individuals in each area (to ensure a diversity of opinion and to try to minimise differences in response due to communication skills or education) and also the imperative to maintain a manageable sample size during the in-depth and qualitative research phase (associated with limited time, money, and resources available). In total, 97 older adults were selected for participation in the third research phase (activity diary and photovoice procedures). All potential respondents were contacted by telephone in December 2010 and again in February 2011 (following a large earthquake) to confirm their participation. During the diary procedures, respondents were asked to register their interest in participating in focus group discussions to critique the study results and contribute to the development of recommendations and a new theory of active ageing. Detailed profiles of participants in the qualitative research phase were not made as the focus was on the experience of areas rather than on the respondents themselves. General information (age and area of residence) was available for older adults in all areas, and this is reported in the results. A lack of respondent information in the third research phase is a potential limitation of this thesis.

6.8.4 Focus group participants

Potential focus group participants included individuals who had completed the preliminary survey and activity diary and who had requested further involvement in the research process. A total of 69 older adults were available for selection and 32 volunteered to participate in group discussions. Three focus group meetings were held with research participants between August and October 2011. In August, two meetings were held in church facilities in the West and North of Christchurch to discuss study results addressing environmental and personal influences on active ageing and the impacts of the 2010 and 2011 earthquakes on older adults' activity participation, local environments, and health. In October, the group met at a central community venue to discuss progress on the theory of navigated environmental performance and to develop recommendations for an age-friendly city. Each focus group was composed of a mix of return (those who had been to one or more focus group discussions) and new attendees who had previously completed the phase-two survey and requested further project involvement. Detailed demographic information concerning focus group participants was not taken as it was not the intention to categorise and classify all of those who collaborated on the research during the qualitative research phase. Some may view
this as a limitation of the study, although it should also be noted that PAR emphasises *research with* rather than *research on* individuals. Continual categorisation of participants reflects a post-positivist procedure that was subordinate in this thesis to the pragmatic, PAR approach. In the following table, the participation of older adults as collaborators in the research process is summarised.
Table 9: Older-adult participation in the research process

<table>
<thead>
<tr>
<th>Date</th>
<th>Participants</th>
<th>Meeting purpose and outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2010</td>
<td>Eldercare consumer group</td>
<td>Introduction to the proposed research and call for volunteer participants for the reference group.</td>
</tr>
<tr>
<td></td>
<td>(n = 25)</td>
<td></td>
</tr>
<tr>
<td>June 2010</td>
<td>Reference group meeting # 1</td>
<td>Negotiation of the research problem, concepts, methods, and sampling procedures. Selection of 12 urban areas for preliminary observation. Collaborative observations of potential study areas with reference group members.</td>
</tr>
<tr>
<td></td>
<td>(n = 8)</td>
<td></td>
</tr>
<tr>
<td>Aug 2010</td>
<td>Reference group meeting # 2</td>
<td>Final selection of study areas and research participants. Pilot testing of preliminary survey methods. Selection of qualitative research methods for the third research phase.</td>
</tr>
<tr>
<td></td>
<td>(n = 5)</td>
<td></td>
</tr>
<tr>
<td>Oct 2010</td>
<td>Reference group meeting # 3</td>
<td>Collaborative development of earthquake questions following 4/09/10 quake. Pilot testing activity diary and photovoice instruments. Participant selection and recruitment procedures for the qualitative research phase. Critique of the PAR process to date.</td>
</tr>
<tr>
<td></td>
<td>(n = 8)</td>
<td></td>
</tr>
<tr>
<td>Feb 2011</td>
<td>REFERENCE GROUP MEETING CANCELLED DUE TO FEBRUARY 22 EARTHQUAKE.</td>
<td></td>
</tr>
<tr>
<td>May 2011</td>
<td>Reference group meeting # 4</td>
<td>Review of project direction following 2010 and 2011 earthquake disruptions. Review of findings from preliminary survey, diary, and photovoice results. Planning for participant focus group discussions.</td>
</tr>
<tr>
<td></td>
<td>(n = 8)</td>
<td></td>
</tr>
<tr>
<td>Aug 2011</td>
<td>Participant focus group # 1</td>
<td>Presentation of main research findings and participant feedback.</td>
</tr>
<tr>
<td></td>
<td>(n = 19)</td>
<td></td>
</tr>
<tr>
<td>Aug 2011</td>
<td>Participant focus group # 2</td>
<td>Presentation of preliminary earthquake findings and participant feedback.</td>
</tr>
<tr>
<td></td>
<td>(n = 16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n = 16)</td>
<td></td>
</tr>
<tr>
<td>Mar 2012</td>
<td>Reference group meeting # 5</td>
<td>Review of final research findings, theory of active ageing, and recommendations. Planning for community symposium. Critique of the participatory research process to date.</td>
</tr>
<tr>
<td></td>
<td>(n = 7)</td>
<td></td>
</tr>
<tr>
<td>May 2012</td>
<td>Community symposium</td>
<td>Dissemination of salient research findings to community leaders and stakeholders. Presentation of illustrative photovoice images and diary comments.</td>
</tr>
<tr>
<td></td>
<td>(n = 60)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Focus group discussions and activities
6.9 Methods of investigation

6.9.1 Survey administration

Once study areas were selected for inclusion in the research, reference group members and researchers collaborated on the development and pilot testing of a survey instrument to explore the environmental and personal correlates that were potentially associated with older adults’ activity participation. The survey comprised five sections: (a) activity participation, (b) local environment, (c) health, (d) background information, and (e) supplementary earthquake questions (appendices 13.4 and 13.5). Where possible, survey items were adapted from existing measures that were known to have acceptable levels of reliability and validity, including the SF-12 health survey (Ware, Kosinski, & Keller, 1996) and the New Zealand Census of Population and Dwellings (Statistics New Zealand, 2006b). Where no appropriate items could be located, measures were created to fit the aims of the research and pilot tested prior to administration.

The activity participation section sought information about the type and frequency of activities undertaken by participants in the 14 days before survey administration. Survey respondents were also asked to indicate the social context of their activity participation. In the local environment section, respondents were asked to make an assessment of conditions in their area and to identify the primary location of their activity participation. The health section of the survey asked respondents to report their current health status and to consider the extent to which their health influenced activity participation. In the demographic information section, respondents were asked to report a variety of relevant background data, including their gender, age, length of area residence, ethnicity, living situation, and highest educational qualification. These items were identified as potential covariates in the relationship between activity participation and environment in the systematic literature review (Fernandez-Ballesteros, 2001; Holtzman et al., 2001; Lim & Taylor, 2005). The survey did not include measurements of psychological variables such as self efficacy, locus of control, attitudinal factors, and beliefs, which are often included in health and activity related studies and for which significant evidence already exists (Fisher et al., 2004; Hough et al., 2008; Kaplan et al., 1993). Similarly, health risk behaviours such as smoking, alcohol consumption, and obesity were not included in the study due to the proliferation of research in this area.
Following the September 4, 2010, Canterbury earthquake, three questions were added to the survey prior to administration. The supplementary questions explored disruptions to local environmental conditions, disruptions to regular activity participation, and subjective impacts and experiences of the disaster. Due to disruptions caused by the earthquake, distribution of the survey (scheduled for the first of October 2010) was delayed by two weeks. The survey was eventually distributed to 790 older adults who resided in 12 diverse areas in urban Christchurch in mid October 2010. Earthquake questions from the survey were re-administered to remaining study participants (a sub-sample of volunteers) in the third research phase following the February 2011 earthquake (appendix 13.19).

### 6.9.2 Activity diary and photovoice procedures

Following the collection and analysis of survey data, the reference group developed and pilot tested a qualitative assessment regimen incorporating semi-structured activity diaries and photovoice procedures. Activity diaries have been successfully used in participatory and health-related studies involving older adults (Milligan, Bingley, & Gatrell, 2005; Park, 2006), although research has generally been dominated by highly structured approaches, requiring participants to keep empirical records of their activities or time use over days or weeks (Rook, 2001; Verbrugge, 1980). Qualitative diaries provide a mechanism for recording the meaning and weight that respondents attach to activities and events as well as an avenue for identifying routine events and processes (Milligan et al., 2005). Activity diaries are considered a participatory research method as they place control over data in the hands of the research participants (Wang & Burris, 1997). Diary data were collected over 14 consecutive days in March and April 2011 following the February 22 earthquake. A diary period of two to four weeks is considered an optimal duration as it is deemed long enough to control for atypical activities and short enough to mitigate respondent fatigue (Keleher & Verrinder, 2003; Milligan et al., 2005). The introduction to the diary provided information about the aims of the research, definitions of key terms, and instructions for completing the exercise. At the outset of the diary, respondents were asked to explain how they came to live in their current location and how, if at all, aspects of the physical and social environment influenced their activity participation. Quantitative data were collected within a table in the diary, which recorded type, purpose, and location of daily activities. Qualitative questions were also included in the diary to draw out detailed information concerning environmental and personal factors that potentially influenced daily activity participation (appendices 13.16 and 13.17).
Photovoice was used as a complementary research method to increase understanding of the environments within which the older adults live, to facilitate the representation of older adults' experiences and perceptions of their environment, and to verify and extend the diary results. Photovoice is a qualitative research procedure wherein individuals use cameras to record and represent their everyday context and use the pictures taken to promote critical group discussion about personal and community issues and assets (Wang et al., 2004). Photovoice has previously been employed alongside other research methods, including surveys and focus group discussions, and has proved to be a useful tool for participatory research involving older adults (Baker & Wang, 2006; Lykes, 2006). Like activity diaries, photovoice is a participatory method because it allows participants control over the research process, assists in educating community members about an issue of importance, and potentially allows them contribute to social change within their community (Johnson & Onwuegbuzie, 2004; Wang, Wu, Zhan, & Carovano, 1998). Older adults who volunteered for the photovoice exercise were provided with a 27-exposure disposable camera and asked to photograph aspects of their everyday life or environment that they perceived to influence their activity participation. Before the commencement of the photovoice exercise, research participants were provided with detailed instructions concerning the operation of the camera, information about ethical behaviour, and guidelines for maintaining personal safety while photographing (appendices 13.16, 13.18, and 13.20). Once respondent photographs were processed, they were returned to participants who were then asked to choose a selection of up to six images that, in their opinion, best represented the everyday influences on their activity participation. Six images were selected as an appropriate number by the reference group as it was deemed that this would allow respondents to choose and comment on a manageable selection of high-quality images, reduce response fatigue, provide opportunities for self-censorship, and address issues associated with non-completion of the exercise (by failing to use all the film provided) or poor rendering of images. Other studies that have employed photovoice have typically asked respondents to return only a small portion of their photographs (Baker & Wang, 2006). Participants were asked to write a title and short explanation on the back of selected images to facilitate analysis.

Photovoice procedures and outcomes reported in this thesis form the basis of a research paper that has been submitted to the international journal *Leisure Studies*. The article is currently under final review with the editor.

Participants in the third research phase were given the option to opt in or out of this exercise based on their confidence and familiarity with a camera.
6.10 Pilot testing

6.10.1 Survey instrument

The survey instrument was pilot tested with eight older adults from the reference group before administration and peer reviewed by the supervisory team of a social gerontologist, geriatrician, and biostatistician. As a result of pilot testing and peer review, the following changes were made: the order and wording of definitions and questions were altered to facilitate greater understanding among older adults, questions from existing research instruments were incorporated into the survey to increase validity, several questions were reformatted to provide interval-level data to facilitate statistical analyses, and a question regarding marital status was replaced with a more general item concerning living situation. More extensive testing of the reliability and validity of the survey tool and individual items was not undertaken. This is a limitation in this study and a potential avenue for future research. It should be noted, however, that aspects of the survey were taken from existing measures that were known to have acceptable levels of reliability and validity (Ware, Kosinski, & Keller, 1996).

6.10.2 Activity diary and photovoice procedures

Activity diary and photovoice procedures were pilot tested with four older adults from the reference group over seven days in late 2010. As a result of pilot testing, the following changes were made: the glossary of key terms was simplified to improve understanding, minor changes were made to the wording of questions, a question was added to allow respondents to comment on their activities of daily living, photovoice was renamed camera activity to reduce confusion, photovoice instructions were simplified and unhelpful prompting questions were omitted, and ethical guidelines for participants concerning the photography of individuals or private property were updated. Pilot testing also led to the setting of diary duration at 14 days, which was deemed to be an appropriate length of time to account for meaningful, but infrequently performed activities.
6.11  Research analyses and integration

6.11.1  Quantitative data analyses

Quantitative data generated from the survey were analysed to provide a range of descriptive and inferential statistics that addressed the research objectives and hypotheses. All quantitative data were analysed using SPSS statistical software (Version 17.0). Before the analysis of data, several procedures were undertaken to identify and overcome potential bias and eliminate erroneous values within the data.

6.11.1.1 Overcoming confounding and bias

A challenge for the statistical analysis was to overcome potential confounding and bias resulting from the non-random selection of study areas and research participants and the measurement of variables. Confounding refers to potential biases present in the estimation of effects resulting from issues arising in sampling, measurement, or analyses (Greenland, 2005). Several strategies were undertaken to reduce the impact of confounding and bias, including data cleaning and checking procedures; comparisons of available data from respondent and non-respondent populations; a nested research analysis, which accounted for the socio-economic conditions within which study areas were located; measurement of a variety of potential demographic influences on activity participation; and the use of two control groups within the study design.

6.11.1.2 Analysis of survey data

Several descriptive and inferential statistical tests were used to assess the survey data. Means and standard deviations were used to identify levels of 14-day activity participation, perceptions of local environmental conditions, and self-reported health status among respondents. Frequencies and percentages were used to ascertain prevailing activity locations and activity partner status. Several inferential analyses were undertaken to test research hypotheses and identify potential covariates. A one-way, between-groups ANOVA was undertaken to determine whether self-reported health varied by area of residence. A one-way ANOVA was also employed to assess potential differences in reported interactions between health and activity participation by study area. A further ANOVA was undertaken to determine
whether there were significant differences between study areas relative to the perception of local environmental conditions. A correlation matrix was used to identify survey variables that were potentially associated with selected modes of activity participation. Finally, a series of four nested ANOVA, incorporating covariates identified from the correlation matrix, were undertaken to determine whether there were significant differences in activity participation among respondents across 12 study areas, nested in particular socio-economic conditions. The selection of areas for inclusion in this study was based, in part, upon the identification of local socio-economic status (deprivation level) as this is often used as a proxy for area quality (Annear et al., 2009; Breeze et al., 2005). For this reason, area deprivation was used as a nesting variable in the analysis. The nested ANOVA was used as a mechanism for incorporating multi-level data of participants within areas of interest, and those areas within fixed deprivation categories (high or low). The nested ANOVA was viewed as a pragmatic alternative to multi-level modelling, which was deemed to be an unnecessarily complex approach in the context of a preliminary and exploratory analysis (one research phase of three) that employed purposive (non-random) selection of study areas within a broader mixed-methods investigation. Nested ANOVA is a less sophisticated approach than multi-level modelling, but it does account for different levels of data within a single analysis. Had this research been undertaken solely as a quantitative exercise, different objectives and statistical analyses may have been entertained.

6.11.1.3 Analysis of quantitative earthquake data

Quantitative earthquake data were gathered in October 2010 and March 2011 following separate disasters. Descriptive statistics, including means and standard deviations, were employed to identify the impacts of both earthquakes on local environmental conditions and activity participation among older adults. Paired samples t-tests were undertaken to determine whether there was a significant change in reported disruption to local environment and activity participation between the first and second earthquakes. A series of Pearson correlations were undertaken to determine the strength and direction of the relationship between reported disruption to the environment and disruption to activity participation. A correlation matrix was employed to determine whether any of the personal or environmental variables collected as part of the phase-two survey were associated with reported activity or environmental disruption following the September 2010 earthquake. Finally, two nested ANOVA were undertaken to determine whether reported activity and environmental
disruptions associated with the 2010 earthquake differed across study areas (nested in particular socio-economic circumstances) or by selected covariates.

6.11.1.4 Analysis of quantitative diary data

As part of the diary writing exercise, older adults reported the frequency, location, and type of activities undertaken over a 14-day period in March and April 2011. SPSS was used to create a heat map, which displayed mean activity participation by environmental setting and activity type for the diary period. This analysis revealed the interaction between activity participation and environmental context for older adults who resided in diverse urban areas and provided verification of survey data. These data were developed mainly to provide some context for the consideration of qualitative diary responses.

6.11.2 Qualitative data analyses

A variety of qualitative data were obtained during different phases of the research, including written descriptions of subjective earthquake impacts, activity diary entries, photovoice images and descriptions, and focus group comments. All qualitative data were entered directly into databases within NVivo (Version 8.0), which was used to facilitate the organisation and thematic analysis of the diary and photovoice data. Initially, qualitative data were coded to identify general and specific categories that related to the research question and objectives. Coding refers to the process of developing a label or phrase that classifies units of qualitative data for synthesising, summarising, and developing an analysis (Lofland & Lofland, 1995). Coding procedures were composed of two parts: organisational coding of data into basic categories, and focussed or theoretical coding to identify the central or recurring themes (Charmaz, 2008).

Theoretical coding formed the link from raw data to memo development. Memoing is an analytic procedure whereby a written explanation is constructed that best reflects the collective content inherent within coded data (Grbich, 2007; Lofland & Lofland, 1995). According to Glaser (1978), a memo is the theorising write-up of ideas about codes and their relationships as they occur to the researcher during the coding procedure and exhausting the researcher's momentary ideation based on data with some conceptual elaboration. Memos were gradually developed into themes as a result of constant interaction between the researcher and the data and ongoing discussions with participants and advisers. Raw data,
preliminary coding, and emergent memos were reviewed by the research supervisor who had expertise in the area of qualitative data analysis. Emergent themes were further verified with research participants during focus group discussions in August and October 2011. As a result of focus group discussions, several emergent themes were curtailed and others were expanded. Data collection and memo development were halted once a state of theoretical saturation had been reached where no new themes or insights emerged (Bryant & Charmaz, 2008).

6.11.3 Data integration and theory development

Qualitative and quantitative data were integrated using the social scientific processes of diagramming and concept abstraction. Diagrams were used to create a sense of order within a complex and varied data set, to delineate and summarise personal and environmental variables relevant to activity participation, to explain the pathways between antecedent conditions and active ageing behaviours, to assist in the expression and dissemination of results to community stakeholders, and to facilitate the generation of theoretical concepts (Bryant & Charmaz, 2008; Lofland & Lofland, 1995). Diagrams evolved over the course of the analysis as understanding of the results increased and as respondent feedback was incorporated into the analysis.

The development of emergent concepts and propositions represented an abductive process whereby research stakeholders engaged in an imaginative and creative procedure to abstract plausible and generalised meanings from within a complex data array (Charmaz, 2008). The process of conceptual abstraction was eloquently described by Holton (2008):

The skill of the theorist is to abstract concepts by leaving the detail of the data behind, lifting the concepts above the data and integrating them into a theory that explains the latent social pattern underlying the behaviour in a substantive area (p. 273).

In practice, the results from each research phase were collaboratively examined and explanatory concepts and propositions were identified, which encapsulated multiple research themes or findings and omitted references to the specific setting and sample (Becker, 1998; Glaser, 1978; Urquhart, 2008). The final model derived from the data was conceived as a mid-range theory (Merton, 1968), which would have relevance beyond the immediate research location and sample. The emergent theory of navigated environmental performance was also
compared with existing theories of ageing and environment, which further established the place and limits of the model within modern gerontology (Glaser, 1978; Urquhart, 2008).

6.12 Chapter summary

The research design and methods described in this chapter reflect a pragmatic focus on an issue of concern for older adults in urban Christchurch: environmental influences on active ageing. The design and methods also accommodated disruptions arising from the 2010 and 2011 Canterbury earthquakes. The research was separated into three phases, which addressed different aspects of the research problem. Non-random sampling procedures were used to select study areas and participants to maximise the diversity of response and access older adults who were both knowledgeable and committed to an ongoing research process. Within the multi-phase design, several methods were employed to address different research objectives, including GIS analyses of geographic and demographic data, systematic observations of areas, surveys, activity diaries, photovoice procedures, and focus group discussions. All methods were the result of collaborative design and pilot testing, and several of the approaches also facilitated significant participant control over the data. Data analyses incorporated a mix of descriptive and inferential statistics to address specific research hypotheses, and inductive and abductive procedures to explore the potential pathways from environment to active ageing.
7 Results and discussion one: reconnaissance and contextual analysis

7.1 Introduction and organisation

This chapter describes the reconnaissance and first phase of the participatory action research (PAR) process. The objective of the first phase of the research was to identify diverse geographic areas within urban Christchurch inhabited by larger older-adult populations, which potentially influence active ageing. In the first section of this chapter, the reconnaissance and problem identification procedures are outlined (figure 7). In the second section, elements of the PAR process are described, including planning, action, analysis and outcomes. Next, the characteristics and resource availability of study areas are presented based on GIS analyses. Following this, the results of a collaborative and systematic observation of study areas are detailed. Thereafter, the results of the first research phase are discussed in relation to the reviewed literature and the limitations of the research methods are identified. Finally, reflections and learning from the initial stages of the PAR process are addressed.
7.2 Reconnaissance and problem identification

The preliminary stage of the research is conceived as the moment that “co-researchers come together to explore an agreed area of human activity” (Heron & Reason, 2006, p. 145). The reconnaissance involved the establishment of a sustainable and collaborative partnership with research stakeholders, formulation of the research problem, development of the preliminary question and objectives, and consideration of appropriate research design and methods. An initial presentation was made to the Eldercare Canterbury Consumer Group during May 2010, which addressed the trends for and implications of population ageing in Christchurch and New Zealand; theory and evidence for interactions among ageing.

A local health advocacy group representing and composed of older adults that has been in existence since 1997.
environment, health, and activity participation; the concept of active ageing; a tentative research proposal and time line; and a call for volunteer collaborators for the research.

Following the presentation, eight older adults (from the group of 25) volunteered to act as advisers, referred to as the reference group, for the duration of the study. In June 2010, the first project meeting was undertaken with the reference group. The purpose of the meeting was to introduce the PAR methodology, negotiate ground rules and responsibilities, define the research problem, negotiate key concepts, and identify potential research participants and study areas. This format for the induction of research collaborators is commonly employed in PAR studies (Heron & Reason, 2006). Several outcomes were achieved at the first group meeting: (a) participant rights and responsibilities were agreed; (b) a time line for meetings and research phases was negotiated and group members committed their participation until 2012; (c) informative outcomes were proposed and accepted, including the goal to develop a new theory of active ageing and dissemination of findings to local stakeholders; (d) research questions and objectives were developed; (e) a locally relevant definition of environment was generated, which gave priority to physical and social surroundings; (f) the concept of active ageing was discussed and the inclusion of six component behaviours were supported; (g) the focus of the research was determined to be adults aged 65 years and older who were living independently within the community or retirement living environments; (h) potential study areas were selected for initial observations based on a collective consideration of geographic and demographic characteristics; and (i) strategies for the systematic observation of potential study areas were identified and instruments were selected.

7.3 PAR phase one: June 2010 – August 2010

Once the research problem and key relationships were established, the reference group and researcher considered how best to undertake an examination of environmental influences on active ageing. The first and substantive phase of the research comprised assessment and selection of areas for inclusion in the study, which incorporated GIS analyses of secondary data and systematic observations with older-adult collaborators. This analysis sought to identify geographic areas in urban Christchurch inhabited by comparatively larger (and smaller) populations of independently living older adults, which potentially influence active ageing. The purpose of this phase was not only to identify appropriate areas for study

36 Rather than transformative or emancipatory outcomes.
inclusion, but also to gain a deeper understanding of the diverse urban contexts within which older adults reside. Researchers have long argued for more direct observation and assessment of areas in investigations concerning interactions between ageing and environment (Bowling & Grundy, 1998; Yen et al., 2009).

7.3.1 Planning

During a focus group discussion in June 2010, the reference group determined the most appropriate way to explore environmental influences on active ageing within urban Christchurch. The group agreed that GIS analyses of existing geographic and demographic data (undertaken by the researcher) combined with a collaborative, direct observation and assessment of potential study areas was the most practical approach to area selection. After consideration of the geographic and demographic data, the reference group selected 10 diverse areas for potential inclusion in the study. A further two areas with much lower numbers of older adults (less than 5% of the total population) were added as controls. The reference group then considered several potential assessment instruments. It was agreed that the researcher would complete the comprehensive Irvine-Minnesota Inventory (Day et al., 2006) and take photographs of the areas, while members of the reference group would simultaneously complete the St Louis check-list (Hoener et al., 2005) and a subjective assessment concerning the extent to which each area appeared to support active ageing.

7.3.2 Action

During July 2010 (mid winter in New Zealand), the researcher and reference group members visited each of the 12 potential study areas. Most observations were conducted with different members of the reference group, although one participant attended multiple assessments. The researcher and these older adults navigated two randomly selected streets within each area on foot and discussed their impressions of the area as they undertook their individual assessments. Data gathered were then synthesised and summarised by the researcher and evaluated by the reference group during a regular group meeting.

37 The decision to add areas with significantly lower populations of older adults as controls arose out of discussions with the reference group and academic advisers who identified the possibility of self selection of older adults into areas with better environmental conditions.
7.3.3 Analysis and outcomes

During August 2010, the reference group met to discuss and analyse the observation findings. The main results from each area and illustrative photographs were presented to group members. Key findings are presented in more detail below, but the general results were as follows: (a) no areas were identified as completely supportive of active ageing; (b) there was significant diversity in the quality and accessibility of local resources for activity participation within each area; (c) retirement villages and older-adult housing estates were identified in several areas; and (d) there appeared to be no clear distinction between areas on the basis of level of neighbourhood deprivation. Due to the tremendous diversity across all of the assessed areas and the lack of clearly discernible patterns of support for active ageing, the reference group elected to retain all 12 locations for subsequent study phases (appendix 13.22). Reference-group members contended that all adults over the age of 65 years who resided within selected study areas should be invited to participate in the study, and a convenience sampling approach was implemented. The reference group felt that systematic or stratified sampling of individuals within selected areas would potentially reduce the available sample size and risk excluding knowledgeable participants.

7.4 Overview of area characteristics

Using Mapinfo Professional (Version 10.5), recent demographic and geographic data were overlaid onto a map of Christchurch. These data were then queried within the program to determine which areas within the city met study criteria: two or more contiguous mesh-blocks with greater than 20% of the population aged 65 years or older and individual mesh-block populations of more than 100 individuals. In total, 36 areas were identified that met the criteria for study inclusion. During focus group discussions with the reference group, 12 areas (including two controls) were purposively selected for the systematic observations. Areas were selected to represent the diverse land uses and demographic composition within urban Christchurch (table 10). Following the systematic observation of areas by the researcher and older-adult collaborators, all 12 areas were retained for the subsequent research phases.
Table 10: Demographic and geographic characteristics of selected areas

<table>
<thead>
<tr>
<th>Study area</th>
<th>Proportion of residents aged 65 and older</th>
<th>Total residential population</th>
<th>Deprivation designation and score</th>
<th>Residential density / land use^b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawthorndon</td>
<td>27.1% (N = 117)</td>
<td>432 (three contiguous meshblocks)</td>
<td>Lower deprivation (2-3, NZDep2006)</td>
<td>Lower density (L1, Ru5)</td>
</tr>
<tr>
<td>South Hornby</td>
<td>22.7% (N = 30)</td>
<td>132 (two contiguous meshblocks)</td>
<td>Higher deprivation (8-9, NZDep2006)</td>
<td>Higher density (B4, B5, L1, L2)</td>
</tr>
<tr>
<td>North Hornby / Hei Hei</td>
<td>24.0% (N = 72)</td>
<td>300 (two contiguous meshblocks)</td>
<td>Lower deprivation (2-3, NZDep2006)</td>
<td>Lower density (L1)</td>
</tr>
<tr>
<td>Papanui (high deprivation)</td>
<td>22.2% (N = 30)</td>
<td>135 (two contiguous meshblocks)</td>
<td>Higher deprivation (8, NZDep2006)</td>
<td>Higher density (B1, L3, L2)</td>
</tr>
<tr>
<td>Papanui (low deprivation)</td>
<td>68.9% (N = 345)</td>
<td>501 (two contiguous meshblocks)</td>
<td>Lower deprivation (2-3, NZDep2006)</td>
<td>Higher density (L1, L1B, L2)</td>
</tr>
<tr>
<td>Holmwood</td>
<td>22.8% (N = 61)</td>
<td>267 (two contiguous meshblocks)</td>
<td>Lower deprivation (1, NZDep2006)</td>
<td>Lower density (L1)</td>
</tr>
<tr>
<td>Central City</td>
<td>59.7% (N = 111)</td>
<td>186 (two contiguous meshblocks)</td>
<td>Higher deprivation (8, NZDep2006)</td>
<td>Higher density (L3, L4A)</td>
</tr>
<tr>
<td>New Brighton</td>
<td>30.3% (N = 69)</td>
<td>228 (two contiguous meshblocks)</td>
<td>Higher deprivation (9-10, NZDep2006)</td>
<td>Higher density (L1, L2)</td>
</tr>
<tr>
<td>Ferrymead</td>
<td>41.4% (N = 108)</td>
<td>261 (two contiguous meshblocks)</td>
<td>Higher deprivation (9-10, NZDep2006)</td>
<td>Lower density (L1)</td>
</tr>
<tr>
<td>Redcliffs</td>
<td>28.3% (N = 96)</td>
<td>339 (two contiguous meshblocks)</td>
<td>Lower deprivation (1, NZDep2006)</td>
<td>Lower density (L1, LH)</td>
</tr>
<tr>
<td>Bryndwr (control)</td>
<td>3.8% (N = 18)</td>
<td>474 (three contiguous meshblocks)</td>
<td>Higher deprivation (9-10, NZDep2006)</td>
<td>Lower density (L1)</td>
</tr>
<tr>
<td>Rutland (control)</td>
<td>4.2% (N = 12)</td>
<td>288 (two contiguous meshblocks)</td>
<td>Lower deprivation (1, NZDep2006)</td>
<td>Lower density (L1)</td>
</tr>
</tbody>
</table>

38 Local government land use zones: (L1) Low-density residential living, (L1B) Low-density residential living, (L2) Low- to medium-density residential living, (L3) Medium-density residential living, (L4A): Medium- to high-density Central City residential living, (LH): Low-density residential living (Port Hills), (Ru5) Low-density rural living, (B1) Local centre / small scale retail, (B4) Suburban industrial zone, (B5) General industrial zone.
Figure 8: Map of selected study areas and land use in Christchurch
7.5 Activity resource availability

Once areas were selected for inclusion in the systematic observation, a further analysis was undertaken to explore the availability of activity related resources (table 11). These data facilitated a more detailed understanding of study areas, triangulated results obtained via systematic observations, and provided explanatory information for the subsequent research phases and the discussion of results. Within the available data sets, information was obtained concerning the distribution of a range of resources that were potentially relevant to older adults’ activity participation, including public green space, libraries, health facilities, shopping areas, churches, community centres and halls, swimming pools, and recreational facilities. Resource availability was calculated for each area, including a 400 metre buffer zone surrounding the perimeter to represent approximate walking distance (a strategy frequently employed in environmental assessments) (Ball et al., 2006; Pikora et al., 2003).

Table 11: Local services and facilities within 400 metres of study areas

<table>
<thead>
<tr>
<th>Study areas</th>
<th>Green space &gt; 1000m²</th>
<th>Libraries</th>
<th>Health facilities</th>
<th>Shopping &amp; service areas</th>
<th>Churches</th>
<th>Community centres / halls</th>
<th>Swimming / recreation facilities</th>
<th>Total resource availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central City</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Ferrymead</td>
<td>15</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>South Hornby</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>New Brighton</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Papanui LD</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Papanui HD</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Redcliffs</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>North Hornby</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Holmwood</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Bryndwr (control)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Rutland (control)</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>
Across all areas, the most readily available activity resource was public green space, which included a range of local and metropolitan parks, riparian and coastal environs, and sports grounds. There was also proximate access to health facilities, churches, and shopping destinations in most study areas. Across the entire sample, however, there was relatively poor access to libraries, community centres, swimming pools, and recreational facilities. The highest levels of resource availability were observed in the more deprived areas of Central City and Ferrymead. Areas with the widest variety of available resources included Central City, Ferrymead, South Hornby, New Brighton, Papanui High Deprivation, and Redcliffs. Worse access to community resources for activity was identified in lower deprivation (more affluent) areas and in control areas, which had low numbers of older adults. These data suggest that there may be better access and a wider variety of community resources relevant to active ageing in higher-deprivation areas with larger populations of older adults. The comparatively low levels of total resource access in the control areas suggests that these locations may have a generally different resource complement to other areas in the study. However, areas such as Holmwood also exhibit similarly low levels of resource access. This is a potential limitation of this research.

7.6 Systematic observation results

Following the analysis of demographic and geographic data, direct observations of potential study areas were undertaken with older adults from the reference group during July 2010. The findings from two reliable and valid audit instruments (the Irvine-Minnesota Inventory and the St Louis check list) and a subjective assessment of the extent to which areas potentially supported active ageing are summarised in table 12. A short overview of the effects of the 2010 and 2011 earthquakes on each of the observed study areas has also been included in the table, which was established from media reports and online databases (Rebuild Christchurch Foundation, 2011; The Christchurch Press, 2011). The Irvine-Minnesota Inventory and the St Louis Checklist were not originally designed for use with older-adult populations. Both tools were also designed primarily to assess the suitability of physical environments for physical activity, although some social characteristics are also assessed. Despite these limitations, both measures provide a comprehensive assessment of myriad local characteristics that potentially affect activity participation. These tools could form the basis for the development of an audit instrument that would assess the capability of particular areas to support active ageing among older adults and to guide the development of appropriate
urban redevelopment and renewal. This is a promising area for future research.
<table>
<thead>
<tr>
<th>Study area</th>
<th>Age of area</th>
<th>Physical environment</th>
<th>Social environment</th>
<th>Reference group member assessment of area support for active ageing.</th>
<th>Impacts of the 2010 and 2011 earthquakes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Brighton</td>
<td>ca. 1880s</td>
<td>Derelict and abandoned houses, tracts of vacant land, absence of street trees, uneven walking surfaces (cracks and tree roots), and significant commuter traffic in the area.</td>
<td>Houses oriented to the street, proximity to beach and riparian walking tracks, public seating and bus stops, good street connectivity and contiguous pedestrian infrastructure, access to community facilities.</td>
<td>Graffiti and rubbish in some areas.</td>
<td>Significant effects, including soil liquefaction, flooding, loss of drinking and waste-water infrastructure, structural damage to buildings, damaged roads and bridges, evacuation of residents in social housing and aged care facilities, and closure of many local shops and services.</td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>ca. 1940s</td>
<td>Discontinuous footpaths in some locations, large transmission towers and power lines overhead (visual distraction), lack of community facilities.</td>
<td>Diverse housing styles, open rural views from some locations, houses oriented to the street, low and permeable fencing, grass berms separate the footpath from the road, low traffic volumes, abundant street trees, accessible green space, proximity to a shopping area.</td>
<td>None observed.</td>
<td>Area largely unaffected by the earthquakes. Superficial damage to some brick chimneys and fences.</td>
</tr>
<tr>
<td>South Hornby</td>
<td>ca. 1890s</td>
<td>Older and unattractive housing, absence of street planting and urban design, abandoned and dilapidated properties in the area, inappropriate land-use mix (heavy industry, large-scale retail, and low-density residential), busy road and rail corridors bisect the area, lack of bicycle lanes, narrow and uneven footpaths, deep drains abut the footpath, obstacles on walking surface (pylons, street signs, and pot holes).</td>
<td>Good street connectivity, bus stops and shelters present, pedestrian crossing aids in places (hand rails, pedestrian islands, tactile paving, signalised crossings), access to a variety of community facilities.</td>
<td>Liquor store within the residential environment.</td>
<td>Area largely unaffected by the earthquakes. Superficial damage to some brick chimneys and fences, and temporary disruptions to water services.</td>
</tr>
</tbody>
</table>

Partial support "Potential for development of parks, gardens, and footpaths.”

Limited support “No proper recreational facilities for older people.”

Limited support “This is an older area... footpaths not user friendly.”
<table>
<thead>
<tr>
<th>Study area</th>
<th>Age of area</th>
<th>Potential constraints to activity</th>
<th>Potential facilitators of activity</th>
<th>Social environment</th>
<th>Reference group member assessment of area support for active ageing</th>
<th>Impacts of the 2010 and 2011 earthquakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>North1 Hornby</td>
<td>ca. 1990s</td>
<td>Homogeneous residential design, areas of concealment and lack of provision for older adults in open space areas, lack of bus stops, a busy transport corridor borders the area, poor integration with surrounding community, and limited access to local facilities.</td>
<td>Houses oriented to the street, little or no fencing on private property, access to a large open space area, homes and gardens well maintained, under-grounding of telephone and power cables, wide and smooth footpaths with grass berms, good street connectivity, shared pathways for walkers and cyclists, pedestrian aids in places (hand rails and pedestrian islands).</td>
<td>Few people on the street.</td>
<td>None observed</td>
<td>Limited support</td>
</tr>
<tr>
<td>Papanui High Deprivation</td>
<td>ca. 1880s</td>
<td>A busy transport corridor abuts the area, and there is a lack of access to public green space.</td>
<td>Well-maintained homes and gardens oriented to the street, low or permeable fencing, evidence of urban renewal and low impact water treatment systems, significant street planting, wide and smooth footpaths, landscaped buffers between street and footpath, short blocks and good street connectivity, traffic calming measures (narrow carriageways, speed humps, reduced speed limit), and access to a variety of community facilities.</td>
<td>None observed.</td>
<td>People on the street (including an older-adult walking group), neighbourhood watch signs visible.</td>
<td>Partial support</td>
</tr>
<tr>
<td>Papanui Low Deprivation</td>
<td>ca. 1950s</td>
<td>Adjacent rural land is swampy and unattractive, incomplete footpaths in some areas, uneven surfaces, pot holes and raised drainage covers on the pavement, lack of community facilities, area is low lying and minor surface flooding was observed.</td>
<td>Diverse architectural styles, location of a large retirement village, well-maintained properties, under-grounding of telephone and power cables, access to green space areas and riparian walking tracks, minimal traffic, good street connectivity, bus shelters available.</td>
<td>Graffiti and rubbish on the outskirts of the area near to the retirement village.</td>
<td>People on the street (including older adults), neighbourhood watch signs visible.</td>
<td>Limited support</td>
</tr>
<tr>
<td>Study area</td>
<td>Age of area</td>
<td>Physical environment</td>
<td>Social environment</td>
<td>Reference group member assessment of area support for active ageing.</td>
<td>Impacts of the 2010 and 2011 earthquakes.</td>
<td></td>
</tr>
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<td>-------------</td>
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<td>------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Central City</td>
<td>ca. 1850s</td>
<td>Haphazard land-use pattern, derelict or abandoned properties and areas of vacant land, unattractive public environment and lack of urban design, uneven pavement punctuated with obstacles (raised drain covers), long blocks, lack of street trees or landscaping, significant traffic volumes, absence of bicycle lanes, lack of green space areas.</td>
<td>Wide footpaths, signalised crossing points, good access to a variety of community facilities, location of several aged-care facilities and retirement villages. Rubbish and graffiti in the public realm. Lack of street trees.</td>
<td>Many people on the street (including older adults), neighbourhood watch signs visible. Partial support “Close to cultural amenities. More civic, spiritual, and physical amenities close at hand. Within safe walking distance of city centre.”</td>
<td>Structural failure of older masonry buildings and some multi-storey complexes. Many areas sectioned off for repair or demolition. A legacy of death and disorder remains.</td>
<td></td>
</tr>
<tr>
<td>Holmwood</td>
<td>ca. 1890s</td>
<td>Houses oriented away from street, high fences and security gates, busy roads and long blocks, broken pavement in places, lack of seating and bus stops, absence of bicycle lanes, lack of community facilities.</td>
<td>Attractive homes and gardens, private activity resources observed (tennis courts and swimming pools), traffic calming measures (speed humps and reduced speed limit), pedestrian aids (tactile paving), landscaped buffers between footpath and street, proximity to local shops, access to large parks and gardens. Few people on the street. Neighbourhood watch signs visible.</td>
<td>Limited support “Lack of crossing points for pedestrians to get to parks and for safe crossing of busy roads (arterial type). No facilities for community to enjoy social, cultural, and physical activities close by. Distanced from public transport – high fences.”</td>
<td>Major damage to older masonry houses and churches. Demolition of a local shopping precinct. Closure of some roads for repair.</td>
<td></td>
</tr>
<tr>
<td>Ferrymead</td>
<td>ca. 1860s</td>
<td>Unattractive and utilitarian urban environment, older housing stock, dilapidated properties, major roads bisect the area, lack of pedestrian and bicycle infrastructure in some areas, and large areas of undeveloped land.</td>
<td>Significant open views, undergrounding of telephone and power cables, signalised crossing points on main roads, landscaped and walkable green space along riparian margins, access to community facilities, location of a retirement village in the area. Few people on the street. None observed.</td>
<td>Limited support “No sign of any facility which would support active ageing.”</td>
<td>Significant earthquake impacts, including damaged roads, land subsidence, closure of shops and businesses, and private property damage.</td>
<td></td>
</tr>
<tr>
<td>Study area</td>
<td>Age of area</td>
<td>Physical environment</td>
<td>Social environment</td>
<td>Reference group</td>
<td>Impacts of the 2010 and 2011 earthquakes.</td>
<td></td>
</tr>
<tr>
<td>------------</td>
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<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Redcliffs</td>
<td>ca. 1880s</td>
<td>A major road bisects the area, uneven walking surface, narrow footpaths, deep drains abut the footpath, lack of recreational facilities and green space.</td>
<td>Diverse architectural styles and landscaping, significant open views, houses oriented to street, pedestrian aids (zebra crossings, hand rails, tactile paving), and access to community facilities.</td>
<td>Graffiti observed in the public realm.</td>
<td>Many people on the street (including older adults)</td>
<td>Limited support “No evidence of resources or facilities which would support active ageing.” Significant rock falls damaged homes and closed roads in the area. Many properties were evacuated due to cliff instability. The area also suffered soil liquefaction, cracked water and sewerage pipes, structural damage to buildings, and the loss of community facilities.</td>
</tr>
<tr>
<td>Bryndwr</td>
<td>ca. 1950s</td>
<td>Older homes and state housing within the area, generally unattractive and utilitarian design, lack of green space and community facilities.</td>
<td>Pedestrian aids (pedestrian islands and handrails), smooth and barrier-free footpaths, mature street trees throughout the area, low traffic volumes, homes oriented to the street,</td>
<td>Significant graffiti (tagging) in some areas, rubbish and glass on the footpath, in places, few people on the street.</td>
<td>None observed.</td>
<td>Partial support “Feels more like a young family neighbourhood.” Comparatively minor earthquake impacts with some damage to chimneys, roads, and fences.</td>
</tr>
<tr>
<td>Rutland</td>
<td>ca. 1910s</td>
<td>High fences and security gates, narrow footpaths and obstacles present (pylons), deep drains abut the footpath in places, poor access to green space and community facilities.</td>
<td>Well-presented homes and gardens, pedestrian aids (tactile surfaces), smooth footpaths, grass berm between footpath and road in some areas, street planting and landscaped public areas, traffic calming measures (speed humps), and bus stops with seating.</td>
<td>Few people on the street.</td>
<td>Neighbourhood watch signs visible, alarm systems and security lights on most homes.</td>
<td>Limited support No comment Comparatively minor earthquake impacts. Some damage to older structures and brick chimneys.</td>
</tr>
</tbody>
</table>
Example: the Central City (prior to the 2010 and 2011 earthquakes)

The Central City study area comprises a residential block to the immediate north of the main business district of Christchurch. There has been residential housing in this area since the mid 19th century when the city was first settled by European colonists. The Central City has the widest variety of housing styles of all study areas (including historic villas and bungalows, multi-storey apartment complexes, blocks of flats, town houses, government housing, rest homes, and retirement villages), and incorporates medium- and higher-density living environments with intensive retail and business land uses. The integration of diverse land uses appeared haphazard, however, and larger developments related poorly to the surrounding environment. There were several poorly maintained and abandoned properties in this area and large tracts of vacant land where older buildings had been removed to make way for residential intensification. The public environment was generally unattractive with moderate amounts of rubbish and graffiti visible, an absence of street trees and landscaping, and significant traffic volumes. Most intersections were signalised, but crossing times were too short for older observers, blocks were long, and there were limited areas where pedestrians could safely cross the road. Footpaths were wide, but often uneven and with obstacles present (such as raised drain covers and broken glass). There was also a lack of infrastructure provision for cyclists in the area (such as shared pavement or dedicated cycle lanes). Bus stops with seating and shelter were provided throughout the Central City, which potentially aided older-adult mobility. Despite some evidence of degradation, the area felt relatively safe during the day. There were neighbourhood watch signs present and many people, including older adults, on the street. Prior to the earthquakes of 2010 and 2011, there was proximate access to a range of services and facilities in the Central City, including health centres, pharmacies, cafés and restaurants, and historic churches. There was, however, comparatively poor access to public green space and recreational facilities. Observers agreed that the Central City somewhat supported active ageing. While there were a wide variety of services and facilities available in the area and a vibrant community atmosphere, there were significant traffic barriers and a lack of access to large green spaces and recreational facilities, which could potentially constrain activity participation. The inner city of Christchurch was extensively damaged during the 2010 and 2011 Canterbury earthquakes. Many masonry buildings and multi-storey complexes suffered significant structural damage, and much of the area remains behind cordons as demolition and repair work continues. The area to the immediate north of the Central City, which formed the majority of the study area, was relatively unaffected, although access to adjacent inner-city resources was severely constrained.
Results and discussion one: reconnaissance and contextual analysis

Figure 9: Map of the Central City land-use characteristics and resource availability

Figure 10: Representative images of the Central City

- Large tract of vacant land
- Tagging (anti-social behaviour)
- Small inner-city reserve
- Higher-density living environment
7.7 Summary and discussion of phase-one results

7.7.1 Summary and diagram of phase-one results

The aim of the first research phase was to identify diverse areas where older adults resided, which potentially influence active ageing. The GIS analysis identified a total of 36 areas with higher numbers of older adults from which 10 were chosen by reference group members to represent a diversity of land use, socio-economic circumstances, and geographic conditions across Christchurch. Two control areas with lower proportions of older adults were also added to the sample. A further GIS analysis was undertaken to explore the availability of local resources that were potentially relevant for older-adult activity participation. This analysis revealed variations in access to resources by area, with lower socio-economic locations having generally better access than more affluent areas or neighbourhoods with lower numbers of older adults. The pattern of resource availability across diverse urban areas revealed that none of the study locations had good access to community halls, recreational centres, swimming pools, and libraries. Green space areas, health facilities, churches, and shopping areas were comparatively more prevalent.

Systematic observations of 12 selected study areas were undertaken in collaboration with reference group members to identify potential environmental influences on active ageing and to triangulate data obtained from the GIS analyses. Using valid and reliable environmental audit tools, observers identified a variety of potential constraints and facilitators to activity participation within each area. In general, none of the study areas was identified as completely supportive of active ageing and all presented potential constraints to activity participation. Four higher-deprivation urban areas were identified as partially supportive of active ageing by the older-adult observers, including Central City, Bryndwr, Papanui High Deprivation, and New Brighton. Potential constraints to activity participation included lack of targeted facilities or existing resources not designed for older-adult use, heavy traffic, inappropriate or unsafe pedestrian infrastructure, unattractive urban design and signs of physical disorder, lack of people on the street (during daytime observations) and poor oversight of public areas, inappropriate integration of diverse land uses, and a lack of bus stops, seating, and shelter.
Findings of the systematic observations are summarised in figure 11. The diagram shows the relative level of support for active ageing in assessed areas against a backdrop of antecedent constraint. The diagram also depicts the observed barriers and facilitators of activity participation across a spectrum of urban settings. The summary diagram shows that constraints to active ageing are likely to be routinely experienced by older adults in a range of urban settings.

Figure 11: Diagrammatic representation of phase-one results

### Discussion of phase-one results

#### Ubiquitous activity constraint

The observation that environmental constraints to activity participation appeared to be ubiquitous across urban areas was unexpected. Most national and international studies have reported dichotomies of supportive and unsupportive environmental settings within a defined urban area (Annear et al., 2009; Balfour & Kaplan, 2002; Breeze et al., 2005; Michael, Beard,
Potential activity constraints identified during the systematic observations were congruent with the findings of previous studies of older-adult activity. Local and international studies have previously reported lack of access to appropriate resources, traffic and transportation problems, and unattractiveness and signs of disorder as barriers to activity participation for older residents (Annear et al., 2009; Gallagher et al., 2010). Alignment of observed constraints with existing gerontological findings is unsurprising as the data collection instruments were constructed from known or hypothesised environmental influences on adult activity participation (Day et al., 2006; Hoener et al., 2005). Only the apparent haphazard integration of land uses was not previously identified as a potential constraint to activity participation in the assessed literature. It is possible that an unthoughtful integration of diverse land uses may discourage older-adult activity by presenting a confusing array of resources that creates access or navigation difficulties.

Several research studies support the constraints to activity participation observed in the first research phase, although contradictory findings also exist. Lack of appropriate and proximate resources has been reported as a barrier to older-adult activity, particularly physical activity, in a number of international studies (Fisher et al., 2004; Kemperman & Timmermans, 2009). Others have reported, however, that resource availability is not associated with activity participation in later life, which suggests that such barriers may depend on the particular context, population, or outcome being measured (Mota et al., 2007; Subramanian et al., 2006). Transportation-related concerns, including heavy traffic and a lack of appropriate pedestrian and public transportation infrastructure, have frequently been reported as barriers to activity participation in the literature (Annear et al., 2009; Balfour & Kaplan, 2002; Fisher et al., 2004; Gallagher et al., 2010). In some cases, however, researchers reported that characteristics of the pedestrian environment, including street connectivity and walking infrastructure, were unrelated to older adults' physical activity (Mota et al., 2007). Such results are likely to be influenced by the composition of the study population as higher-functioning and independently living older adults are likely to experience fewer constraints in the walking environment than those who are frail or disabled. Other potential influences on activity participation included unattractive surroundings and signs of neighbourhood disorder, which have previously been identified as physical and social environmental barriers to older-adult activity in local and international studies (Annear et al., 2009; Wilcox et al., 2000). One study reported, however, that the attractiveness of the local environment is not associated with activity participation in later life and asserted that factors such as gender and perceptions of
Results and discussion one: reconnaissance and contextual analysis

Safety are more relevant in later life (Mota et al., 2007). It is possible that attractiveness is a proxy for other neighbourhood features, such as the availability of parks or the age of urban areas, or that it functions only as a facilitator of activity participation and not as a constraint. There is currently limited evidence that land-use factors play any role in the activity participation of older adults. While there is evidence for the influence of general characteristics, such as rural or urban context (Dwyer et al., 1994; Kemperman & Timmermans, 2009) and population density (Fisher et al., 2004; Walters et al., 2004), there is comparatively little research that investigates how the coherence or configuration of the built environment contributes to the health and activity participation of older adults. Evidence in the published literature supports most of the observed barriers to activity participation, but contrary evidence suggests that measures of neighbourhood support may vary by setting, population, and outcome.

Most studies that have examined patterns of activity participation among older-adult populations have focussed on differences between geographic areas. Such studies often hypothesise that certain types of environments are likely to be more advantageous for older-adult activity than others. It may be equally true, however, that few urban areas support active ageing or health even in the context of significant environmental variation. In support of the observation for ubiquitous activity constraint, World Health Organisation research undertaken in 33 cities has previously identified that physical and social environmental barriers to active ageing are commonly reported in both more and less developed urban areas, which has provided rationale for the global promotion of age-friendly cities (World Health Organisation, 2007). There are several reasons why urban areas may be characterised by constraints to activity participation: (a) population ageing is a relatively new phenomenon for which local communities and governments may be relatively unprepared; (b) there may be a poor understanding of the environmental needs of independently living older adults and a tendency to take a one-size-fits-all approach to the provision of services and facilities; (c) the inherent complexity of cities and the need to manage the diverse commercial and community interests may lead to trade-offs that create deleterious conditions for health and activity for certain groups; and (d) constraints to activity participation may have become normalised, unquestioned, and taken-for-granted in environments that have not traditionally supported large populations of older adults.

Living in an environment that supports activity and health is not an inalienable right,
though Lawton (1980) has argued that it should be, and where private resources are sufficient older adults have choices to reside in areas that better meet their needs and preferences. However, even when older adults exercise their agency in the selection of residential dwelling locations, they are likely to encounter environmental barriers to participation irrespective of underlying geographic or socio-economic conditions. If constraints are ubiquitous, then older-adult activity may be associated not only with specific environmental facilitators but also with individual capacities to overcome barriers and adapt to changing circumstances. Notably, having good health and a low level of disability is one of the most frequently reported personal influences on activity participation among older adults, which may assist in both the execution of activities and overcoming antecedent constraints within one's surroundings (Lim & Taylor, 2005; Richard et al., 2008). Capacity necessary to overcome environmental obstacles may, however, require more than good health and the absence of disability. It may also require such attributes as belief in personal skills and abilities, adaptability and resilience, and motivation to be active (Fisher et al., 2004; Kowal & Fortier, 2007).

Based on a GIS analysis of resource availability and systematic area observations with older adults, two concepts are proposed to explain the prevailing urban context and older adults' emplaced activity: (a) *ubiquitous activity constraint* and (b) *requisite capacity*. Ubiquitous activity constraint refers to the general lack of support for active ageing across urban areas and the proliferation of physical and social environmental barriers to participation. In an environment of ubiquitous constraint, older adults are likely to require physical and mental resources to overcome barriers to activity participation and adapt to age-related or environmental changes. Requisite capacity, therefore, refers to an individual's capability for overcoming prevailing environmental demands.

### 7.7.2.2 Variable access to activity related resources

The GIS analysis and collaborative observations identified a diversity of environmental resources potentially relevant for older persons' activity across 12 study areas. It was also discovered that areas of higher socio-economic deprivation (with higher numbers of older adults) appeared to have access to a greater diversity of activity related resources than lower-deprivation areas and neighbourhoods with lower numbers of older adults. Higher-deprivation areas were also generally perceived by older adults to be more supportive of active ageing as a result of better access to appropriate resources and infrastructure and a
more vibrant community atmosphere. These observations are consistent with other GIS analyses previously undertaken in New Zealand, which identified better access to public resources for health and recreation in more deprived areas (Pearce, Witten, Hiscock, & Blakely, 2007; Stevenson et al., 2009). Pearce et al. have previously stated, “[our] results challenge that widely held, but largely untested, view that areas of high social disadvantage have poorer access to community resources” (p. 348). Internationally, however, research addressing access to resources for health and activity participation has reported significantly better conditions in lower-deprivation (more affluent) areas, which potentially places Christchurch at odds with other locations and suggests a unique resource configuration that is possibly more egalitarian than other cities (Cagney et al., 2005; Giles-Corti & Donovan, 2002). While higher-deprivation areas appeared to have generally better access to activity-related resources, they often exhibited signs of neighbourhood deterioration (graffiti, rubbish, dilapidated housing, vacant land, and a lack of urban design), which may constrain activity participation for some older adults.

Reported associations between resource access and activity participation in the international literature suggest that there may be more support for active ageing in higher-deprivation areas of Christchurch. Several researchers have reported that in areas where community resources are readily available, older-adult activity is increased as a result (Berke, Koepsell, et al., 2007; Gauvin et al., 2008; King et al., 2005). Others, however, have found no such association, which could be due to the influence of resource quality, utility, and typology, or to the particular population or activity being measured (Mota et al., 2007; Nagel et al., 2008; Vik et al., 2007). There are several possible explanations for the observed variations in resource access across areas and more favourable conditions in higher-deprivation areas. Firstly, residents of lower-deprivation areas may have access to private resources (such as tennis courts, swimming pools, larger gardens, and libraries), which reduces demand for public facilities in those areas. Secondly, a history of redistributive government provision within Christchurch may have led to greater numbers of public services and facilities in areas of higher deprivation (Pearce et al., 2007). Thirdly, older adults who have limited personal resources may move to areas where there is a higher provision of public facilities or services in order to enjoy a better quality of life without financial burden. Finally, the vagaries and history of urban planning within Christchurch; which reflects continual land-use change, urban development, and population growth over 150 years; may have led to significant differentials in resource provision across the city.
The findings of the GIS analysis and systematic observations suggest that support for active ageing is inconsistent across areas and that higher deprivation locations may provide better access to activity related resources within Christchurch. Better access is a relative proposition and is set against a backdrop of a high level of urban constraints to activity participation across all areas. These observations are conceptualised as *environmental continuum* and *opportunity paradox*. The concept of environmental continuum describes the variation in resource availability and quality observed across urban areas of Christchurch. The opportunity paradox concept refers to the unexpected finding associated with observations for greater levels of resource provision in areas of higher socio-economic deprivation. While it could be argued that findings for an opportunity paradox may associated with the purposive method of sampling, the 12 areas were deliberately selected to provide a high level of diversity in terms of deprivation, land use, and geographic location.

### 7.7.3 Potential limitations of the phase-one research methods

There are limitations associated with the methods employed in the first research phase, which potentially influenced the results. Limitations include the availability and validity of spatial data and the characteristics and utilisation of audit instruments during the systematic observations.

Concerning the GIS analysis of resource availability, data for only a limited number of potential activity related amenities were available from publicly accessible databases. No data were available for such features as non-Christian churches or temples, walking tracks, cycle lanes, social groups and clubs, and private resources (such as tennis courts or swimming pools), which have been identified by researchers as potentially important for older peoples' activity participation (Hough et al., 2008; Kowal & Fortier, 2007). It is also likely that there were resources relevant to older adults' activity participation that were unknown to the researcher and, therefore, not considered as part of this analysis. Additionally, resource data did not reflect either the quality or utility of available facilities and services. Questions could be raised, therefore, about the validity of using proximity to generic resources as a measure of activity support among older adults. To address these limitations, spatial data addressing resource availability were confirmed and elaborated with area observations to provide a more accurate picture of the accessibility, quality, and utility of local facilities and services. Furthermore, gerontological studies have previously reported associations between access to
community resources and activity participation among older adults, which provides rationale for the research (Addy et al., 2004; Giles-Corti, Timperio, et al., 2005).

With regard to the systematic observation of areas, the audit instruments (the Irvine-Minnesota Inventory and St Louis Check-list) focussed predominantly on an assessment of the physical environment, with comparatively minor consideration of the social context (Day et al., 2006; Hoener et al., 2005). As a consequence, selection of study areas was based primarily on knowledge of the built and natural environment. This limitation was addressed to some extent by the pre-selection of study areas based on antecedent demographic and socio-economic conditions and the utilisation of photographs, group discussions, and subjective assessments of support for active ageing. An additional limitation of the audit instruments related to their original design for the assessment of physical activities, particularly walking behaviour (Day et al., 2006; Hoener et al., 2005). To address this limitation, observers completed a subjective assessment of the extent to which each area supported active ageing, which included a consideration of the six activity domains. Finally, the use of multiple observation instruments as check lists of area features that potentially influenced older-adult activity limited the analysis to a narrative and descriptive summary. The Irvine-Minnesota Inventory, for example, can produce an objective score that facilitates direct comparison of areas; however, this approach usually entails multiple assessments of numerous street segments within larger areas, which often involves teams of observers (Day et al., 2006). The pragmatic use of the audit instruments in the present research was sufficient to obtain a descriptive overview of the characteristics of study areas.

7.7.4 Reflection and learning from the first research phase

The first research phase constituted the establishment of a working relationship with older adults from within the community under investigation, negotiation of the research problem, and a thorough and collaborative exploration of study contexts. From the beginning of the PAR process, the knowledge, capacity, and interest of older adults in the research was evident. Members of the reference group communicated their significant professional and volunteer experiences in health advocacy and familiarity with the many challenges faced by older adults who were living independently in urban Christchurch. Within the group, the formulation of the research question, definition of concepts, and research design and methods selection were rapidly progressed due to the knowledge held by participants concerning
research procedures and local conditions. It should be acknowledged that the older adults who participated in the reference group may be atypical of the wider sample of older adults in Christchurch as a result of their familiarity with research processes and routine interactions with researchers. One of the roles of the Elder Care Canterbury collective, from which the reference group was recruited, is to advise on health-related studies involving older adults, so from this standpoint they were well-versed in consultation and research procedures. Because of this, it was easier for the research team to trust in the expertise of the reference group and act upon their informed suggestions.

The reference group was not directly involved in the preliminary GIS analyses of area attributes and pre-selection of potential study locations, which is a potential threat to the participatory aims of the study. Reference group members, however, made considered selections of 12 areas from a pool of 36 diverse urban locales from the analysis. During focus group discussions, respondents argued that the geography of areas was less important to them than what happens in each locality and older adults' experiences of particular places. For this reason, focus group participants ascribed more value to the observations than the GIS analyses. In the context of the observations, the older adults had a high level of familiarity with assessed study areas. As a result of their years of experience living and working within Christchurch, most observers were cognisant of the historical development of the areas under investigation and changes made for better or worse over time, which the researcher was often unaware of. Older adults' knowledge of areas were only used in this research to aid in the selection of study locations and to provide context to the consideration of the results. It was beyond the scope of the present research to develop a specific database of participant knowledge, although this may be a promising avenue for future research. As observers were also part of the group being studied, their experience of each area was different from that of the researcher. Participants frequently identified finer-grained, potential influences on activity participation, such as uneven walking surfaces or a lack of resources designed specifically for older adults.

A particular challenge associated with the observations was the withdrawal of one of the older adults with sickness and their subsequent absence from the reference group. While the observation session was repeated with other observers, the loss of a foundational collaborator was troubling as there was no way to continue to involve them in proceedings other than by sending them informational updates. There are few contingencies for participant
withdrawal in a PAR process. The compliance of the reference group with the PAR process was perhaps too smooth upon reflection, and the extent to which older adults went along with researcher suggestions through courtesy, perceived lack of expertise, or fear of embarrassment, is another potential limitation. With their familiarity with consumer consultation, knowledge of Christchurch, and experience in the health and service development area, however, reference group members were well placed to critique the research process and participate as equal partners (arguably more so than other community members). In order to address concerns about meaningful engagement, participants were asked at the end of each focus group discussion to reflect upon the efficacy of their involvement and were encouraged to divulge any concerns that their feedback was not being listened to or acted upon. The first research phase, therefore, developed the necessary trust, focus, and ground rules, which set the scene for subsequent research phases.
8 Results and discussion two: potential correlates of active ageing

8.1 Chapter introduction and organisation

This chapter presents the findings from the second research phase, which build upon and extend the results presented in chapter seven. The second phase of the research employed a survey and an earthquake addendum, which explored the composition, context, and potential environmental and personal correlates of active ageing among independently living older adults who reside in diverse urban areas in Christchurch. In order to address this objective, several hypotheses were proposed:

(a) Older-adult activity is comprised predominantly of physical and social modes of participation undertaken in the context of home, local environment, and social networks.

(b) Both environmental and personal variables are significantly associated with older-adult activity.
   • Older-adult activity varies by area of residence.
   • Older-adult activity varies by socio-economic status of areas.
   • There is a significant association between health and activity participation.

(c) The Canterbury earthquakes of 2010 and 2011 had a significant, negative impact on local environmental conditions and older-adult activity participation (illustrating environmental impacts on activity participation).

It was necessary to initiate and analyse the results of the quantitative survey before the collection of qualitative data in phase three (chapter nine) in order to identify whether there was sufficient evidence for environmental influences on activity. The existence of relationships between environmental factors and activity participation justifies subsequent and in-depth investigations and provides opportunities to validate and elaborate findings across research phases.
Results addressing the impacts of the 2010 and 2011 earthquakes are presented separately to maintain continuity with the original research process. The earthquakes provided opportunities to investigate the impacts of unforeseeable environmental events on active ageing consistent with the original research question. In particular, the disasters reveal how sudden and significant changes to the physical and social environment potentially influence active ageing – exacerbating existing problems, creating new challenges, or presenting opportunities for community engagement.

In the first section of this chapter, an overview is provided of the PAR process (figure 12). In the next section, the distribution of the data, response rate information, and a demographic profile of respondents and non-respondents are presented. Following this, descriptive and inferential statistics are presented concerning the potential interactions among participant health, environment, and activity participation. The potential consequences of the 2010 and 2011 Canterbury earthquakes on older-adults' activity participation are then considered. Finally, the results are summarised and discussed with reference to existing literature, emerging concepts are abstracted from the data as a prelude to theory development, the limitations and strengths of the research methods are considered, and reflections are made concerning the PAR process.
8.2 PAR phase two: August 2010 – August 2011

8.2.1 Planning

Following the collaborative selection of study areas and research participants, the reference group discussed appropriate methods for addressing the research objectives during a focus group meeting in August 2010. The group agreed that a survey would be the most efficient means to gather preliminary data and an appropriate mechanism for recruiting participants into a subsequent, qualitative research phase. The survey was designed in collaboration with older adults and four sections were included: (a) activity participation, (b) perceptions of environment, (c) current health status, and (d) demographic information.
Following the September 2010 earthquake, an additional section concerning the influence of the disaster on activity participation and local environment was added to the survey after consultation with the reference group. Pilot testing of the survey was undertaken by eight reference group members who recommended changes to the order and wording of questions, simplification of definitions of key terms, and replacement of a sensitive question concerning marital status with a more general assessment of living situation. All recommendations were implemented prior to survey administration. The reference group suggested a telephone follow-up with non respondents four weeks after survey distribution as it was felt that personal contact would yield a greater response than postal communication among older adults. The survey was also conceived as a medium for the recruitment of independently living older adults for a subsequent, qualitative data collection phase. A question was added to the end of the survey that invited older adults to volunteer for future research activities. During a further focus group discussion in October 2010 and after considerable debate, the reference group reached the understanding that although the earthquake activity had altered environmental conditions in many parts of Christchurch, the original research question remained relevant. As a result of this discussion, both original and amended objectives were independently addressed within the research as examples of different environmental influences.

8.2.2 Action

Administration of the survey, including an earthquake addendum, was undertaken in October 2010. Distribution was delayed by two weeks to allow time for a return to normal patterns of activity and remediation of minor environmental problems following the September 4 earthquake. Follow-up telephone calls were made to non respondents during November 2010 to encourage survey response and to reassure participants that the study had not been adversely affected by the disaster.

8.2.3 Analysis and outcomes

The reference group did not wish to be directly involved with the statistical analysis of survey data, but requested the opportunity to critique aggregated results, recommend additional analyses, and offer their interpretations of the findings. Survey response, analytical tests, and preliminary research findings were presented to the reference group in May 2011.
Survey results were also presented to study participants at focus group discussions in August 2011. Reference group members and research participants made numerous observations and recommendations in relation to the survey findings and analyses, which were subsequently addressed by the researcher. Focus group participants requested that response rate information be provided for individual study areas and that analyses be undertaken to determine whether living situation (alone or with others), dwelling type (community or retirement setting), and gender were associated with activity participation following the earthquakes of 2010. Respondents were concerned that increased social isolation may have had a significant impact on activity and health for some older adults. It was felt that individuals who lived with others or in a retirement setting may have coped significantly better than those who lived alone in the aftermath of the earthquakes. Focus group members also argued that older adults who replied to the survey may be more representative of a resilient, educated, and active subpopulation, and that isolated and vulnerable older adults may not have responded. Furthermore, some respondents criticised the study for not including the poorest suburbs of Christchurch where vulnerable older adults may reside (such areas were omitted in the first research phase due to their relatively small older-adult populations). Participants commented that many older adults who participated in the research may be disinclined to report negative effects associated with earthquake experiences due to personal or generational beliefs about self reliance and resilience. Concerning the activities reported by respondents, focus group members observed that distinctions between physical and social activities were likely to be somewhat artificial considering the diverse motivations that older adults have for participation. High levels of reported social activity were identified as potentially associated with an imperative to avoid isolation or compensate for reduced activity capacities in other areas of life. Group members also cautioned that care should be taken when considering the frequency of reported activities and that this should not be unduly confused with the meaning or value ascribed to such behaviours. With regard to the influence of the earthquakes, older adults noted that reported disruptions to activity participation were likely to be higher among active individuals due to the proliferation of environmental barriers. In particular, the reference group commented that the highly active Central City sample group were likely to encounter environmental constraints to activity following the earthquakes due to the closure of many parts of the inner city. Reference group and participant feedback facilitated data analysis and interpretation and also highlighted limitations associated with the study design and methods.
8.3 Survey results

8.3.1 Distribution of continuous data

Prior to the analysis of the survey results, the distribution of the data were examined and assessed for normality (appendix 13.6). Data were visually inspected using histograms, and a Kolmogorov-Smirnov test for normality was performed. None of the continuous variables was normally distributed. It is common for social science data, however, to be skewed either positively or negatively as this often reflects the underlying nature of the constructs being measured (Corty, 2007). Due to the relatively large size of the survey sample ($N = 355$), skewness of continuous variables was unlikely to have a major bearing on the outcomes of parametric tests (Tabachnick & Fidell, 2007). This is because the large size of the sample indicates that the sampling distribution of the mean scores on continuous variables will be approximately normal as described by the central limit theorem (Corty, 2007). It is reasonable, therefore, to use parametric tests in the analysis (including t-tests and ANOVA). The parametric tests employed in the analysis of results are also robust to minor violations of the assumption of normal distribution and homogeneity of variance of the data (Cone & Foster, 1993; Pallant, 2007). Many of the continuous values recorded in the survey contained a small number of outlier values; however, inspection of box plots and 5% trimmed means identified that these outliers had only a minor influence on overall values. Previous checking of the data corrected any potential erroneous values that may have exerted undue outlier effects. Consequently, all cases were retained in the final analysis.

8.3.2 Survey response and potential sources of bias

In the context of the present research, response rate was defined as “the number of complete surveys (or diaries) divided by the number of eligible reporting units in the sample” (The American Association for Public Opinion Research, 2011, p. 5). After telephone follow-up with non respondents four weeks after survey distribution, a total response rate of 45% ($N = 355$) was achieved. The total older-adult population of Christchurch numbers approximately 47,000. The sample size achieved was slightly lower than power calculations indicated would be desirable for the study ($N = 381$). There is an increased probability, therefore, of committing a type-II error (acceptance of the null hypothesis when it is actually false) in the analysis of the survey results (Swinscow & Campbell, 2002). The total number of non
respondents was 435, which included 7 incomplete returns, 1 late return, 11 non completions due to poor health or disability, 7 undeliverable surveys due to earthquake damage, 7 confirmed deaths prior to survey administration, and 59 refusals to participate. No contact was received from the remaining 343 eligible respondents. As the preliminary survey was administered in the weeks immediately after a significant earthquake, it is likely that this has had some impact on study participation and reduced the overall response rate. The relatively high rate of non response in the survey is a concern as gerontologists have observed reduced research participation among unwell, physically impaired, or socially isolated older adults (Victor et al., 2007). Considering the relatively high proportion of non respondents, it was necessary to compare the attributes of respondents and non respondents to determine whether there was potential bias in the results. Data that were able to be compared between the two groups included study area (1–12), area deprivation level (higher or lower), gender (male or female), dwelling type (community based or retirement village) and age (table 13).

8.3.2.1 Did survey response differ by study area?

A Chi-square test for independence was undertaken to determine whether there was a significant association between study area and survey response. The data indicated that there was indeed a significant association between study area and rate of response, \( \chi^2 (11, 790) = 21.9, p = .03 \), Cranmer’s V = .17. This result suggests that the survey findings are more representative of some areas than others and, therefore, subject to a degree of geographical bias. Higher rates of response were achieved in Papanui, Rutland, and South Hornby (in the north and west of the city), while lower rates of response were recorded in Bryndwr and the Central City. The geographic bias in the pattern of response may be partly attributable to the September 2010 earthquake, which caused varying levels of disruption to different parts of the city and an exodus of thousands of residents. Central and eastern suburbs were particularly affected.

8.3.2.2 Did survey response differ by area-deprivation level?

A further Chi-square test for independence was undertaken to determine whether survey response varied by the deprivation level of study areas. The data indicated that there was not a significant difference between respondents and non respondents with regard to level of area deprivation, \( \chi^2 (1, 790) = .12, p = .73 \), Cranmer’s V = .02. In total, 65% of respondents
were from lower-deprivation (more affluent) areas, while the remaining 35% lived in higher-deprivation (poorer) areas.

8.3.2.3 Did survey response differ by age across study areas?

A two-factor, crossed ANOVA was undertaken to examine whether study participants were older or younger than non participants and whether any such difference was consistent across study areas (appendices 13.7 and 13.8). The results indicated that overall study participation was not significantly associated with age $F(1, 13.95) = 0.06, p = .81$. There were, however, significant interactions between participation and study area in relation to the age of participants $F(11, 761) = 3.17, p < .001$. The interaction between area and study participation in relation to age indicated an inconsistent bias. In some study areas (such as Papanui High Deprivation and Bryndwr) participants were much younger than non participants, while in other areas (such as Rutland and New Brighton) participants were much older than non participants. In some neighbourhoods, there was little difference between the ages of participants and non participants. Therefore, while there was no overall difference in age between participants and non participants, there were potential age biases associated with certain study areas.

8.3.2.4 Did survey response differ by gender and dwelling type across study areas?

The Mantel-Haenszel statistic (Mantel & Haenszel, 1959) was employed to determine whether survey response varied by gender (male or female) stratified by study area (appendix 13.9). This statistic was also used to determine whether survey response varied by dwelling type (community or retirement village) stratified by study area. The Mantel Haenszel statistic is commonly used for the analysis of stratified, categorical data when the response variable is potentially influenced by a covariate (Armitage, Berry, & Matthews, 2002). The analysis revealed that there were no significant gender differences by study area with regards to survey participation and non participation, $\chi^2 (1, N = 787) = .00, p = .99$, when analysed with stratification across study areas. Furthermore, there was no significant difference in dwelling type among participants and non participants, $\chi^2 (1, N = 787) = .46, p = .50$, when analysed with stratification across study areas.
Table 13: Overview of the characteristics of respondents and non-respondents

<table>
<thead>
<tr>
<th>Descriptive information</th>
<th>Respondents (N = 355)</th>
<th>Non-respondents (N = 435)</th>
<th>Christchurch 65+ population (N = 49,275)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>77.29 years, SD = 7.34</td>
<td>77.38 years, SD = 7.44</td>
<td>75.42 years, SD = 7.66</td>
</tr>
<tr>
<td>Age range</td>
<td>35 years</td>
<td>31 years</td>
<td>43 years</td>
</tr>
<tr>
<td>Minimum</td>
<td>65 years</td>
<td>65 years</td>
<td>65 years</td>
</tr>
<tr>
<td>Maximum</td>
<td>100 years</td>
<td>96 years</td>
<td>108 years</td>
</tr>
<tr>
<td>Mean age – male</td>
<td>77.14 years, SD = 7.05</td>
<td>76.53 years, SD = 7.76</td>
<td>No data</td>
</tr>
<tr>
<td>Mean age – female</td>
<td>77.18 years, SD = 7.27</td>
<td>77.93 years, SD = 7.18</td>
<td>No data</td>
</tr>
<tr>
<td>Proportion 65 – 74 years</td>
<td>40% (n = 140)</td>
<td>37% (n = 160)</td>
<td>50% (n = 24,657)</td>
</tr>
<tr>
<td>Proportion 75 – 84 years</td>
<td>42% (n = 148)</td>
<td>45% (n = 195)</td>
<td>37% (n = 18,363)</td>
</tr>
<tr>
<td>Proportion 85+ years</td>
<td>19% (n = 66)</td>
<td>18% (n = 79)</td>
<td>13% (n = 6,255)</td>
</tr>
<tr>
<td>Gender – Male</td>
<td>40% (n = 142)</td>
<td>39% (n = 171)</td>
<td>42% (n = 20,928)</td>
</tr>
<tr>
<td>Gender – Female</td>
<td>60% (n = 210)</td>
<td>61% (n = 264)</td>
<td>58% (n = 28,347)</td>
</tr>
<tr>
<td>Community based</td>
<td>80% (n = 284)</td>
<td>82% (n = 355)</td>
<td>No data</td>
</tr>
<tr>
<td>Retirement village</td>
<td>20% (n = 71)</td>
<td>18% (n = 80)</td>
<td>No data</td>
</tr>
<tr>
<td>Higher deprivation areas</td>
<td>35% (n = 123)</td>
<td>36% (n = 157)</td>
<td>No data</td>
</tr>
<tr>
<td>Lower deprivation areas</td>
<td>65% (n = 232)</td>
<td>64% (n = 278)</td>
<td>No data</td>
</tr>
</tbody>
</table>

* Based on 2006 census results.

### 8.3.3 Demographic profile of participants

In addition to information concerning age, gender, dwelling type, geographic location, and deprivation level, other demographic data were also collected, including length of area residence, living situation, education level, and ethnicity (table 14). All of these factors have previously been identified as potential confounding variables or covariates in the relationship among environment, activity, ageing, and health (Fernandez-Ballesteros, 2001; Kaplan et al., 1993; Yao & Robert, 2008). An overview of response rates by individual study area is presented in Appendix 13.9. Across the sample of older-adult respondents, the mean length of area residence was 12.05 years (SD = 12.51) with a range from less than 1 year to 75 years. Greater length of time in an area of residence was observed in lower-deprivation areas in particular. Living in higher-deprivation areas or a retirement village appeared to be associated with shorter periods of residence. With regard to the living situation of research participants,
54% of respondents lived with one or more people, while the remainder lived alone. Living alone appeared to be associated with residence in a higher-deprivation area or retirement village. In general, respondents were highly qualified, and 61% reported having a post-secondary school qualification (trade certificate, diploma, or degree). There was, however, a high level of non-response in relation to this question \((n = 95)\), and it is possible that those who elected not to answer were less educated than those who did. The relatively high number of respondents who reported having a tertiary qualification is a potential limitation and strength of the research. Firstly, it suggests that the purposive sampling approach has accessed a particularly educated and interested subset of the older-adult population in Christchurch, which clearly restricts the generalisability of the statistical results. From a qualitative perspective, however, an educated and articulate sample may be particularly well placed to reflect upon their relationship with their local environment and produce high-quality subjective data about the emplaced experience of ageing through diary and photovoice methods. Two higher-deprivation areas, Ferrymead and South Hornby, had considerably lower proportions of respondents who reported a tertiary qualification. It is possible that there may be an association between higher-deprivation and lower levels of education, although such analyses are beyond the scope of the present study. With regard to the ethnicity of respondents, New Zealand European participants \((n = 322)\) dominated the sample and there were very low numbers of Māori \((n = 4)\), Samoan \((n = 1)\) and other \((n = 17)\) respondents. While the future of ageing in New Zealand is likely to be one of increasing ethnic diversity, the present generation of older adults (particularly in Christchurch) is composed largely of those claiming European heritage. The control areas of Bryndwr and Rutland were not observably different from the main study areas with regard to most demographic criteria, including age, gender, length of residence, living situation, and dwelling type. Control areas did, however, have noticeably higher levels of non-European respondents. In the main study areas, 90% or more of respondents identified with the European New Zealand ethnicity. In control areas, however, 80% or less of respondents claimed European ethnic identity. These data suggest that the older-adult population may be more ethnically diverse in areas with a lower density of residents aged 65 years and older. A detailed overview of response rate by study area is provided in appendix 13.9.
Table 14: Demographic information by study area

<table>
<thead>
<tr>
<th>Study areas</th>
<th>Dep level</th>
<th>Gender</th>
<th>Mean length of residence (years)</th>
<th>Living situation</th>
<th>Dwelling type</th>
<th>Education</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Alone</td>
<td>With others</td>
<td>Community</td>
<td>Retirement village</td>
</tr>
<tr>
<td>Holmwood</td>
<td>Low</td>
<td>14 (54%)</td>
<td>12 (46%)</td>
<td>26.88 (SD = 16.64)</td>
<td>5 (20%)</td>
<td>20 (80%)</td>
<td>26 (100%)</td>
</tr>
<tr>
<td>Central City</td>
<td>High</td>
<td>3 (25%)</td>
<td>9 (75%)</td>
<td>7.79 (SD = 6.02)</td>
<td>9 (75%)</td>
<td>3 (25%)</td>
<td>12 (100%)</td>
</tr>
<tr>
<td>Papanui High Deprivation</td>
<td>High</td>
<td>12 (48%)</td>
<td>13 (52%)</td>
<td>7.78 (SD = 8.69)</td>
<td>5 (20%)</td>
<td>20 (80%)</td>
<td>25 (100%)</td>
</tr>
<tr>
<td>Papanui Low Deprivation</td>
<td>Low</td>
<td>21 (28%)</td>
<td>53 (72%)</td>
<td>6.56 (SD = 4.76)</td>
<td>47 (64%)</td>
<td>26 (36%)</td>
<td>5 (7%)</td>
</tr>
<tr>
<td>New Brighton</td>
<td>High</td>
<td>8 (36%)</td>
<td>14 (64%)</td>
<td>13.21 (SD = 14.77)</td>
<td>14 (70%)</td>
<td>6 (30%)</td>
<td>23 (100%)</td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>Low</td>
<td>20 (44%)</td>
<td>24 (56%)</td>
<td>14.52 (SD = 14.36)</td>
<td>15 (35%)</td>
<td>28 (65%)</td>
<td>44 (100%)</td>
</tr>
<tr>
<td>North Hornby</td>
<td>Low</td>
<td>11 (33%)</td>
<td>22 (67%)</td>
<td>11.94 (SD = 2.76)</td>
<td>11 (33%)</td>
<td>22 (67%)</td>
<td>34 (100%)</td>
</tr>
<tr>
<td>South Hornby</td>
<td>High</td>
<td>10 (53%)</td>
<td>9 (47%)</td>
<td>11.76 (SD = 12.18)</td>
<td>8 (42%)</td>
<td>11 (58%)</td>
<td>19 (100%)</td>
</tr>
<tr>
<td>Redcliffs</td>
<td>Low</td>
<td>22 (51%)</td>
<td>21 (49%)</td>
<td>18.45 (SD = 15.87)</td>
<td>12 (29%)</td>
<td>30 (71%)</td>
<td>43 (100%)</td>
</tr>
<tr>
<td>Ferrymead</td>
<td>High</td>
<td>12 (34%)</td>
<td>23 (66%)</td>
<td>6.24 (SD = 8.52)</td>
<td>24 (71%)</td>
<td>10 (29%)</td>
<td>34 (97%)</td>
</tr>
<tr>
<td>Bryndwr (control)</td>
<td>High</td>
<td>2 (22%)</td>
<td>7 (78%)</td>
<td>11.11 (SD = 15.72)</td>
<td>4 (44%)</td>
<td>5 (56%)</td>
<td>9 (100%)</td>
</tr>
<tr>
<td>Rutland (control)</td>
<td>Low</td>
<td>7 (70%)</td>
<td>3 (30%)</td>
<td>26.80 (SD = 16.41)</td>
<td>3 (30%)</td>
<td>7 (70%)</td>
<td>10 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>142 (40%)</td>
<td>210 (60%)</td>
<td>12.05 (SD = 12.51)</td>
<td>157 (46%)</td>
<td>188 (54%)</td>
<td>284 (80%)</td>
</tr>
</tbody>
</table>
8.3.4 Self-reported health and the perceived influence on activity participation

The mean, self-reported health rating for the respondent population was 3.70 ($SD = 0.93$) on a scale running from 0 (poor) to 5 (excellent), which indicated that older adults generally considered themselves to have a moderate to good level of health. A one-way, between groups ANOVA was undertaken to determine whether self-reported health varied by area of residence. The data indicated that there was not a significant variation in health status across study areas: $F(11, 335) = 1.33, p = .21$. The mean, self-reported impact of current health state on activity participation was 3.48 ($SD = 1.33$) on a scale running from 0 (activity limited a lot) to 5 (activity not limited at all). These results indicated that respondents believed that their current state of health was not a significant impediment to active ageing. A further one-way, between-groups ANOVA identified that there was not a significant variation in reported interactions between health and activity participation by study area: $F(11, 335) = 0.91, p = .53$. The control areas of Bryndwr and Rutland did not exhibit observable differences in reported health status or the impact of health on activity participation\(^{39}\).

![Figure 13: Mean self-reported health by study area ($N = 355$)](image)

\(^{39}\) Due to the relatively small number of participants from control areas ($n = 19$), it was not possible to undertake inferential tests to compare mean scores with other study areas.
8.3.5 Perceived local environmental conditions

Survey respondents were asked to rate the conditions of their local environment on a scale running from 0 (poor) to 5 (excellent). The mean local environment rating across the entire respondent population was 3.97 ($SD = 0.99$), which suggested that respondents had a generally favourable impression of their local surroundings. A one-way, between groups ANOVA was undertaken to determine whether there were significant differences between study areas in relation to the perception of environmental conditions. The analysis revealed a significant difference at the $p < .05$ level between study groups: $F(11, 323) = 3.36, p = < .001$. The effect size (calculated using eta squared) was .1, a large effect. Post-hoc comparisons using the Turkey HSD (Honestly Significant Difference) test indicated that the mean score for Papanui Low Deprivation ($M = 4.39, SD = 0.75$) was significantly higher than the mean scores for South Hornby ($M = 3.53, SD = 0.87$) and Ferrymead ($M = 3.33, SD = 1.05$). None of the other study areas differed significantly. It is notable that Papanui Low Deprivation is the location of a large retirement village. The control areas of Bryndwr and Rutland did not report discernibly different perceptions of their local environment in relation to other study areas. The survey question was designed and pilot tested prior to the advent of the September 2010 earthquake. It is possible that some respondents reflected their perception of a changed environment, while others reported on their setting as they knew it before the earthquake. This apparent contradiction is a limitation of the present study. It was potentially exacerbated by the fact that the survey was disseminated only days after the earthquake and by the differential levels of damage in various parts of the city. In an attempt to reduce confusion in addressing this question, participants were instructed to comment on the effects of the earthquake in a separate questionnaire that was distributed with the active ageing survey (see supplementary questions in appendix 13.5).
Figure 14: Mean self-reported environmental rating by study area ($N = 355$)
8.3.6 Activity setting and activity partner status

The majority of older adults indicated that their primary location for activity participation either varied based on the type of activity undertaken or was located within the local environment, including the home. Activity participation undertaken within the settings of home and local environment accounted for 45% of the total response to this question. Activity participation was often undertaken with one or more people or varied by activity type. In total, 48% of respondents were routinely active in the company of others. These data indicated that respondents were less likely to be active outside their local environment or on their own.

Table 15: Main activity location and partner status of survey respondents

<table>
<thead>
<tr>
<th>Main activity location</th>
<th>n</th>
<th>Main activity partner status</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varies based on activity type</td>
<td>146 (49%)</td>
<td>Varies based on activity type</td>
<td>114 (40%)</td>
</tr>
<tr>
<td>Within local environment</td>
<td>103 (34%)</td>
<td>Part of a group</td>
<td>96 (34%)</td>
</tr>
<tr>
<td>At home</td>
<td>33 (11%)</td>
<td>With one other person</td>
<td>39 (14%)</td>
</tr>
<tr>
<td>Beyond local environment</td>
<td>16 (5%)</td>
<td>Alone</td>
<td>31 (11%)</td>
</tr>
<tr>
<td>No activity participation</td>
<td>1 (&lt;1%)</td>
<td>No activity participation</td>
<td>3 (1%)</td>
</tr>
</tbody>
</table>
8.3.7 Reported activity participation

Participation in physical, social, and cultural activities were most commonly reported by respondents. Spiritual, economic, and civic activities were reported comparatively less often. For the remainder of the statistical analyses, physical, social, cultural, and total activity participation are focussed on due the greater levels of respondent involvement in these domains. A focus on these activities was supported by the reference group who asserted that the physical and social domains, in particular, were likely to be of greatest significance to older adults. Low levels of civic activity among older adults are particularly surprising and may reflect the effects of the earthquakes, which restricted access to the central city and many venues that provided a base for volunteer activities.

Figure 15: Mean 14-day participation by activity domain ($N = 355$)
8.3.8 Total activity participation

Survey respondents appeared to be an active group, reporting participation in multiple activities on a daily basis. The continuation of diverse activities in the weeks following the September 2010 earthquake is also indicative of a relatively active and resilient population. Mean total activity frequency for the sample was 19.77 (SD = 13.17, Mdn = 18) bouts over the 14-day period prior to study administration. Prior to the February 2011 earthquake, residents of the Central City reported the highest levels of total activity participation within the sample. The control areas of Bryndwr and Rutland were not noticeably different from main study areas with regard to total activity participation.

Figure 16: Mean total activity participation by area (N = 355)

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40 The term *bouts* is used as a descriptor of the number of times that a particular activity is performed within a given time period. The notion of a bout is used in determining the general frequency of activity participation, although this concept is limited in the extent to which it can determine duration or intensity of engagement. While these are meaningful considerations, they were deemed to be less relevant than the act of participation in this study.
8.3.9  Physical activity participation

Mean physical activity participation across the sample was $7.40\ (SD = 5.16, \ Mdn = 6)$ bouts over the 14-day period prior to survey administration. Higher levels of physical activity were reported in the Holmwood study area. The less-aged control areas of Bryndwr and Rutland reported lower levels of physical activity participation, although they were not appreciably different from other study areas.

Figure 17: Mean physical activity participation by area ($N = 355$)
8.3.10 Social activity participation

Mean social activity participation across the sample was 5.91 ($SD = 4.29$, $Mdn = 4$) bouts over the 14-day period prior to survey administration. Higher levels of social activity participation were reported by respondents from the Holmwood study area. The less-aged, control areas of Bryndwr and Rutland reported lower levels of social activity, although these were not appreciably different from other study areas.

Figure 18: Mean social activity participation by area ($N = 355$)
8.3.11 Cultural activity participation

Mean cultural activity participation across the sample was 3.25 (SD = 4.91, Mdn = 1). Cultural activity participation was considerably higher in the Central City study area. The less-aged control areas of Bryndwr and Rutland were not observably different from other areas in relation to cultural activity participation.

Figure 19: Mean cultural activity participation by area (N = 355)
8.3.12 Correlates of activity participation

A correlation matrix (table 16) was employed to identify survey variables potentially associated with respondent activity participation. This exercise was undertaken to identify potential covariates to be included in a nested ANOVA. Several items within the matrix were found to be significantly correlated with four activity domains (total, physical, social, and cultural) using a Pearson product-moment correlation coefficient. Study variables that were identified as potentially associated with the four domains of activity participation included length of area residence, age, local environmental rating, health status, education level, and living situation. No relationship was identified among area deprivation level, gender, dwelling type, ethnic group, and the activity domains. Identified correlations were relatively small, but remain significant in the context of the research due to the large size of the population sample. Bivariate correlations were calculated without taking account of the clustering by study area and serve only to identify variables of interest, rather than being definitive. The sampling distribution for correlations involving dichotomous variables was also ignored.
Table 16: Correlation matrix for study covariates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dep. Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
<th>Dep. Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
<th>Dep. Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
<th>Dep. Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deprivation level (1 = high dep; 2 = low dep)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.04</td>
<td>.49</td>
<td>339</td>
<td>.01</td>
<td>.79</td>
<td>338</td>
<td>.09</td>
<td>.79</td>
<td>329</td>
<td>.02</td>
<td>.12</td>
<td>350</td>
</tr>
<tr>
<td>Gender (1 = male; 2 = female)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.02</td>
<td>-.07</td>
<td></td>
<td>.01</td>
<td>.67</td>
<td></td>
<td>.09</td>
<td>.83</td>
<td></td>
<td>.001</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Length of time at residential address</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.05</td>
<td>.36</td>
<td>337</td>
<td>-.02</td>
<td>.75</td>
<td>336</td>
<td>-.13*</td>
<td>.02</td>
<td>328</td>
<td>.05</td>
<td>.02</td>
<td>348</td>
</tr>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pearson Correlation</td>
<td>-.20**</td>
<td>-.08</td>
<td>337</td>
<td>-.03</td>
<td>.12</td>
<td>335</td>
<td>-.22**</td>
<td>.56</td>
<td>327</td>
<td>-.001</td>
<td>.001</td>
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<tr>
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<td>333</td>
<td>.11*</td>
<td>.047</td>
<td>333</td>
<td>.06</td>
<td>.07</td>
<td>326</td>
<td>.17**</td>
<td>.002</td>
<td>349</td>
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<tr>
<td>Current living situation</td>
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<tr>
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<td>.03</td>
<td>319</td>
<td>.20**</td>
<td>&lt;.001</td>
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<td>.10</td>
<td>&lt;.001</td>
<td>313</td>
<td>.17**</td>
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<td>Highest qualification (1 = no qualification; 2 = formal qualification)</td>
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<td>249</td>
<td>.16*</td>
<td>.01</td>
<td>249</td>
<td>.16*</td>
<td>.015</td>
<td>243</td>
<td>.19**</td>
<td>.002</td>
<td>255</td>
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<tr>
<td>Ethnic group (1 = European; 2 = other)</td>
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<td>328</td>
<td>-.05</td>
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<td>327</td>
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<td>.14</td>
<td>328</td>
<td>.04</td>
<td>.42</td>
<td>339</td>
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<tr>
<td>Dwelling type (1 = general residential; 2 = retirement unit)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.09</td>
<td>.10</td>
<td>339</td>
<td>-.06</td>
<td>.27</td>
<td>338</td>
<td>.08</td>
<td>.13</td>
<td>329</td>
<td>-.10</td>
<td>.10</td>
<td>350</td>
</tr>
<tr>
<td>Current living situation (1 = alone; 2 = with others)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.17**</td>
<td>.002</td>
<td>329</td>
<td>-.01</td>
<td>.80</td>
<td>328</td>
<td>-.02</td>
<td>.78</td>
<td>321</td>
<td>.05</td>
<td>.34</td>
<td>340</td>
</tr>
</tbody>
</table>

* Correlation is significant at the $p < 0.05$ level
** Correlation is significant at the $p < 0.01$ level

41 Bivariate correlations using dichotomous variables (such as deprivation level or gender) are permissible providing that the outcome variable is continuous (Pallant, 2007).
8.3.13 Nested ANOVA with covariates

A series of two-factor, nested ANOVA were undertaken to determine whether mean activity participation differed by study area (nested in particular socio-economic circumstances) or by selected covariates (table 17). Area deprivation was included in the analysis as it was a criterion used in the initial selection of study areas. The purpose for using a nested design was to account for the location of study areas within pre-existing socio-economic circumstances that contributed to the purposive selection of areas in the research. Several covariates were added to each ANOVA, including age, current health state, local environmental rating, qualification level, living situation, and length of time at residential address. Covariates used in the analysis included variables that had been identified as having a significant correlation with one or more of the main outcome measures (table 16).

Several salient findings were revealed by the nested ANOVA (see appendices 13.10–13.13 for parameter estimates). No significant variation in 14-day activity participation (including total, physical, social, or cultural activity) was found in relation to the independent variable of area deprivation, reinforcing the results of the bivariate correlation. Total activity participation varied significantly by study area, age of participant, and current state of health; however, local environmental rating and qualification level were found to have no significant association. Respondents reporting better health were more likely to have higher total activity participation ($B = 1.86$) over 14 days than those reporting lower levels of health. Greater age was associated with lower total activity participation among respondents ($B = -0.52$). Central City respondents participated in more total activity than residents from other high-deprivation study areas ($B = 15.64$ relative to Bryndwr at 0, with Papanui High Deprivation at -10.19).

Physical activity participation varied significantly by age and current state of health, but there was no significant association identified with either study area or local environmental rating. Physical activity was found to decline with age beyond 65 years ($B = -1.20$) and was also associated with better reported health ($B = 0.69$). Social activity participation varied significantly by study area (nested in deprivation) and by local environmental rating, but there was no significant association with either current state of health or qualification level. Residents of the Holmwood study area had a higher level of social activity participation relative to other study areas ($B = 4.32$ relative to Rutland). Respondents who reported better environmental conditions were also more likely to participate in social activity ($B = 0.87$). Cultural activity participation varied significantly by study area (nested in deprivation), but
showed no relationship with length of time at a residential address or qualification level. Cultural activity participation was notably higher in the Central City in relation to other areas ($B = 5.03$). A potential limitation of this analysis concerns the possibility of polynomial relationships between independent and dependent variables.

8.3.14 Summary of main survey results

Descriptive analyses of the survey results indicated that independently living older adults from 12 urban areas were generally active, in good health, and had positive perceptions of their local environment (with some differences across areas). Older adults were commonly active in the context of home and local environment and in the company of one or more other people. Survey participants were active across a range of domains, although physical, social, and cultural activities were the most commonly reported. The control areas of Rutland and Bryndwr, which represented residential areas with lower populations of older adults, did not exhibit discernibly different levels of activity participation in relation to study areas with larger populations. This finding indicates that respondent selection into areas that support active ageing is unlikely to be a major influence on activity participation in this study.

Inferential analyses indicated that both personal (health and age) and environmental (perception of local environment and area of residence) variables appeared to influence activity participation among the sample of older adults, which supports the hypothesis for multiple levels of influence (both personal and environmental) on activity. Results of the inferential analyses also support the hypothesis for an independent association between health and activity participation and an independent association between residential location and activity participation. Other personal (gender, ethnicity, and education) and environmental (length of area residence, dwelling type, and living situation) variables, however, were found not to be associated with the domains of activity, which presents a complex picture of the influences on activity participation. The findings show that potential correlates of activity participation are likely to be domain specific. That is, certain personal and environmental attributes are associated with particular domains of activity. There was no apparent association between activity participation and the independent variable of area deprivation, which supports the null hypothesis concerning the potential influence of neighbourhood poverty or affluence. As a nesting variable, however, area deprivation was associated with activity participation in certain residential locations, including Central City and Holmwood,
which supports a role for area deprivation as a potential moderator of activity participation in some urban locations.

Table 17: Two-factor nested ANOVA results

<table>
<thead>
<tr>
<th>Outcome measures and covariates</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean total activity participation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level</td>
<td>1, 12.2&lt;sup&gt;e&lt;/sup&gt;</td>
<td>.51</td>
<td>.49</td>
</tr>
<tr>
<td>Study area (nested under deprivation)</td>
<td>10, 222</td>
<td>3.53</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age</td>
<td>1, 222</td>
<td>16.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Health state</td>
<td>1, 222</td>
<td>3.76</td>
<td>.05</td>
</tr>
<tr>
<td>Environmental rating</td>
<td>1, 222</td>
<td>3.03</td>
<td>.08</td>
</tr>
<tr>
<td>Qualification</td>
<td>1, 222</td>
<td>2.37</td>
<td>.13</td>
</tr>
<tr>
<td><strong>Mean physical activity participation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level</td>
<td>1, 14.5</td>
<td>.05</td>
<td>.82</td>
</tr>
<tr>
<td>Study area (nested under deprivation)</td>
<td>10, 289</td>
<td>1.72</td>
<td>.08</td>
</tr>
<tr>
<td>Age</td>
<td>1, 289</td>
<td>6.27</td>
<td>.01</td>
</tr>
<tr>
<td>Health state</td>
<td>1, 289</td>
<td>4.18</td>
<td>.04</td>
</tr>
<tr>
<td>Environmental rating</td>
<td>1, 289</td>
<td>3.28</td>
<td>.07</td>
</tr>
<tr>
<td>Living situation</td>
<td>1, 289</td>
<td>2.96</td>
<td>.09</td>
</tr>
<tr>
<td><strong>Mean social activity participation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level</td>
<td>1, 14.9</td>
<td>&lt;.01</td>
<td>.96</td>
</tr>
<tr>
<td>Study area (nested under deprivation)</td>
<td>10, 217</td>
<td>1.92</td>
<td>.04</td>
</tr>
<tr>
<td>Health state</td>
<td>1, 217</td>
<td>1.03</td>
<td>.31</td>
</tr>
<tr>
<td>Environmental rating</td>
<td>1, 217</td>
<td>7.12</td>
<td>.01</td>
</tr>
<tr>
<td>Qualification</td>
<td>1, 217</td>
<td>2.00</td>
<td>.16</td>
</tr>
<tr>
<td><strong>Mean cultural activity participation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level</td>
<td>1, 15.1</td>
<td>&lt;.01</td>
<td>.99</td>
</tr>
<tr>
<td>Study areas (nested under deprivation)</td>
<td>10, 228</td>
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<td>.04</td>
</tr>
<tr>
<td>Length of time at residential address</td>
<td>1, 228</td>
<td>2.72</td>
<td>.10</td>
</tr>
<tr>
<td>Qualification</td>
<td>1, 228</td>
<td>1.86</td>
<td>.17</td>
</tr>
</tbody>
</table>

42 Denominator values for degrees of freedom are commonly expressed as whole numbers. In a two-factor, nested ANOVA, however, they are sometimes expressed as fractional numbers when statistical corrections are applied during analysis using SPSS.
8.4 Quantitative earthquake results

A questionnaire administered to research participants in October 2010 (phase two) and March 2011 (phase three) explored the potential impact of two large earthquakes on activity participation and local environmental conditions among independently living older adults in Christchurch. It also illustrated how sudden environmental disruptions potentially influence active ageing and constituted what could be considered to be an unplanned intervention. It was hypothesised that the earthquakes would have a significant and negative influence on reported activity participation and environmental conditions.

8.4.1 Disruption to activity participation

The mean score for reported activity disruption among the older-adult sample \((n = 342)\) following the September 2010 earthquake was 1.11 \((SD = 1.40)\) on a scale running from 0 (no disruption) to 5 (significant disruption). This result suggests a relatively low level of reported disruption following the 2010 earthquake. The mean score for reported activity disruption among the remaining sample \((n = 62)\) following the February 2011 earthquake was 2.97 \((SD = 1.59)\), a considerable increase. A paired-samples t-test was undertaken (matching data from participants who completed a questionnaire in both 2010 and 2011) to determine whether there was a significant difference in mean activity disruption scores between 2010 and 2011. There was a statistically significant increase in the activity disruption scores from 2010 \((M = 1.30, SD = 1.48)\) to 2011 \((M = 2.97, SD = 1.61)\), \(t(59) = -7.32, p < .0005\) (two tailed). The mean increase in activity disruption scores was 1.67 with a 95% confidence interval ranging from 1.21 to 2.12. The eta squared statistic (.48) indicated a large effect size. The data confirmed that the February 2011 earthquake had a large and negative impact on activity participation across the sample and was reported to be significantly more disruptive than the September 2010 earthquake. The results addressing the impact of the September 2010 earthquake support the null hypothesis (negligible impacts), while those addressing the

43 While the total number of returned surveys in the second research phase was 355, a lower number of respondents returned the associated earthquake questionnaire. Moreover, some respondents returned only partially completed earthquake questionnaires. This may have been due to sensitivity to the disasters in the weeks immediately after the events.

44 A total of 62 older adults completed the earthquake questions following the February 2011 earthquake; however, two respondents were excluded from the paired-samples t-test as they had not previously returned the earthquake questionnaire following the September 2010 earthquake. Respondents who returned the earthquake questionnaire in March and April 2011 (phase three) were a subset of the larger survey sample who had opted into multiple study phases.
The impact of the February 2011 earthquake indicate that this disaster had a comparatively large and negative impact on activity participation.

A one-way, between groups ANOVA was undertaken to determine whether there were statistically significant differences in disruption to activity participation by study area in relation to the September 2010 earthquake. It was not possible to statistically compare study areas following the February 2011 earthquake due to the smaller sample sizes (there were less than five respondents in some areas). The analysis identified that reported disruption to activity participation following the September 2010 earthquake did not differ significantly by study area: $F(11, 330) = 1.13, p = 0.34$. This result indicates that activity disruption was reported at relatively low levels across all study areas following the September 2010 earthquake. Survey respondents from most study areas reported increased activity disruption after the February 2011 earthquake. Reported disruption to activity participation was greatest in central and eastern areas (including Central City, Ferrymead, New Brighton, and Redcliffs). Only respondents from South Hornby, who were furthest from the epicentre of the 2011 earthquake and closest to the epicentre of the 2010 earthquake, reported less disruption to activity participation following the 2011 earthquake.
There is potentially some confounding in these results as a consequence of the much smaller sample in 2011. The survey of respondents following the February 2011 earthquake was not originally intended in this study and was a pragmatic response to a spontaneous and unpredictable event.

Figure 20: Mean disruption to activities in 2010 (n = 342) / 2011 (n = 62)
8.4.2 Disruption to local environment

The mean score for reported disruption to the local environment among the sample (n = 340) following the September 2010 earthquake was 1.07 (SD = 1.30) on a scale running from 0 (no disruption) to 5 (significant disruption). This result suggests a relatively low level of reported environmental disruption following the 2010 earthquake. The mean score for reported disruption to the local environment among the sample (n = 62) following the February 2011 earthquake was 2.65 (SD = 1.61), a large increase. A paired samples t-test was undertaken to determine whether there was a significant difference in the mean environmental disruption scores between 2010 and 2011. There was a statistically significant increase in the reported disruption to the local environment from 2010 (M = 1.28, SD = 1.22) to 2011 (M = 2.63, SD = 1.63), t(59) = -5.80, p < .0005 (two tailed). The mean increase in reported disruption to the local environment was 1.35 with a 95% confidence interval ranging from 0.88 to 1.82. The eta squared statistic (.36) indicated a moderate effect size. In congruence with the previous result for activity participation, the February 2011 earthquake was reported to be significantly more disruptive to the local environment than the September 2010 earthquake. The results addressing the impact of the September 2010 earthquake support the null hypothesis (negligible impacts), while those addressing the impact of the February 2011 earthquake indicate that this disaster had a comparatively greater and negative impact on local environmental conditions for many respondents.

A one-way, between groups ANOVA was undertaken with the September 2010 sample to determine whether there were significant differences in earthquake disruptions to local environmental conditions by study area. The analysis identified the presence of significant differences between study areas in relation to reported disruption to the local environment: F(11, 328), p < 0.001. Post-hoc comparisons using the Turkey HSD (Honestly Significant Difference) test indicated that respondents from the Holmwood area reported significantly higher levels of environmental disruption (M = 2.50, SD = 1.38) than residents in most other study areas (with the exception of Central City, Papanui High Deprivation, and Bryndwr). While the aggregated results for the reported impacts of the 2010 earthquake on environmental conditions support the null hypothesis, there were clearly differences in reported effects by area. It was not possible to statistically compare study areas following the February 2011 earthquake due to the smaller sample size. Respondents from all study areas reported increased disruption to local environmental conditions following the February 2011
earthquake. Again, the highest levels of disruption were reported in central and eastern areas (including Central City, Ferrymead, New Brighton, and Redcliffs).

Figure 21: Mean disruption to environment in 2010 ($n = 342$) / 2011 ($n = 62$)

### 8.4.3 Correlations between activity participation and environmental disruption

The potential relationship between reported disruption to activity participation and disruption to the local environment resulting from the 2010 and 2011 earthquakes was investigated using a Pearson product-moment correlation coefficient. Following the September 2010 earthquake, there was a strong, positive correlation between reported disruption to activity participation and disruption to the local environment $r = .53, n = 338, p < .0005$\(^{46}\). Following the February 2011 earthquake, there was also a strong, positive correlation between reported disruption to activity participation and disruption to the local environment $r = .61, n = 62, p < .0005$. These results suggest that in the weeks following both the September 2010 and February 2011 earthquakes, higher levels of perceived environmental disruption.

\(^{46}\) Due to the clustering of study areas on the basis of deprivation level, there is likely to be minor deviation in the reported and actual significance level. Correlations, therefore, are largely descriptive, but are helpful for subsequent analyses.
disruption were associated with increased disruption to activity participation. As previously shown, however, differences in activity participation by area were not significant in relation to the 2010 earthquake. These findings suggest that the earthquakes of 2010 and 2011 potentially altered activity participation for certain individuals across a range of urban settings.

8.4.4 Correlations between potential covariates and earthquake-related activity and environmental disruption

A correlation matrix was employed to determine whether any of the personal or environmental variables collected during the phase-two survey were associated with reported activity or environmental disruptions following the September 2010 earthquake. This analysis presents the results of a series of bivariate correlations between individual covariates and outcome measures in tabular form (table 18). The correlation matrix identified potential covariates for inclusion in a subsequent nested ANOVA. Earthquake-related disruption to activity participation was found to be associated with gender, dwelling type, ethnic group, and age. Correlates of reported environmental disruption associated with the September 2010 earthquake included deprivation level, dwelling type, and age. The identified correlations were relatively small, but due to the sample size are of significance in this research.
### Table 18: Correlations between potential covariates and earthquake-related disruption to activity participation and environmental conditions

<table>
<thead>
<tr>
<th>Study covariates</th>
<th>Earthquake-related activity disruption</th>
<th>Earthquake-related environmental disruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deprivation level (1 = high dep; 2 = low dep)</td>
<td>Pearson Correlation: -.10</td>
<td>-.13*</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .08</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>( N ): 342</td>
<td>340</td>
</tr>
<tr>
<td>Gender (1 = male; 2 = female)</td>
<td>Pearson Correlation: .15**</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .01</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td>( N ): 341</td>
<td>339</td>
</tr>
<tr>
<td>Current living situation (1 = alone; 2 = with others)</td>
<td>Pearson Correlation: -.06</td>
<td>.04</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .25</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td>( N ): 333</td>
<td>331</td>
</tr>
<tr>
<td>Dwelling type (1 = general residential, 2 = retirement unit)</td>
<td>Pearson Correlation: -.13*</td>
<td>-.16**</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .02</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>( N ): 342</td>
<td>340</td>
</tr>
<tr>
<td>Highest qualification (1 = no formal qualification, 2 = formal qualification)</td>
<td>Pearson Correlation: -.07</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .29</td>
<td>.67</td>
</tr>
<tr>
<td></td>
<td>( N ): 250</td>
<td>250</td>
</tr>
<tr>
<td>Ethnic group (1 = European, 2 = other)</td>
<td>Pearson Correlation: .17**</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .01</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td>( N ): 332</td>
<td>330</td>
</tr>
<tr>
<td>Current state of health</td>
<td>Pearson Correlation: -.02</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .70</td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td>( N ): 336</td>
<td>334</td>
</tr>
<tr>
<td>Length of time at residential address</td>
<td>Pearson Correlation: .08</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .15</td>
<td>.31</td>
</tr>
<tr>
<td></td>
<td>( N ): 340</td>
<td>338</td>
</tr>
<tr>
<td>Age in years</td>
<td>Pearson Correlation: -.18**</td>
<td>-.11*</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .001</td>
<td>.04</td>
</tr>
<tr>
<td></td>
<td>( N ): 342</td>
<td>340</td>
</tr>
<tr>
<td>Local environmental rating</td>
<td>Pearson Correlation: -.09</td>
<td>-.02</td>
</tr>
<tr>
<td></td>
<td>( p ) (2-tailed): .10</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>( N ): 325</td>
<td>324</td>
</tr>
</tbody>
</table>

* Correlation is significant at the \( p < 0.05 \) level
** Correlation is significant at the \( p < 0.01 \) level

### 8.4.5 Nested ANOVA with covariates

Two nested ANOVA were undertaken (table 19) to determine whether reported activity and environmental disruptions associated with the September 2010 earthquake differed across study areas (nested in particular socio-economic circumstances) or by selected covariates (see...
appendices 13.14 and 13.15 for parameter estimates). Covariates used in the analysis included survey variables that had been identified as having a significant correlation with the main outcome measures (table 18). Several covariates were added to each ANOVA, including gender, dwelling type, ethnicity, age, and deprivation level. The results revealed that both gender and ethnicity were associated with increased disruptions to activity participation following the September 2010 earthquake. Examination of regression coefficients revealed that reported disruption to activity participation following the September 2010 earthquake was significantly higher among female respondents ($B = .44$) and non-Europeans ($B = .79$). Differences in reported disruption to local environment were evident across study areas, and an examination of regression coefficients revealed that reported disruption following the September 2010 earthquake was significantly higher among respondents from Holmwood (nested in low deprivation) ($B = 1.65$, relative to the reference area of Rutland). Reported disruption did not differ, however, with regard to deprivation level, dwelling type, or age.

Table 19: Nested ANOVA results concerning earthquake disruptions to activity participation and local environment

<table>
<thead>
<tr>
<th>Outcome measures and covariates</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake disruptions to activity participation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level (High Deprivation / Low Deprivation)</td>
<td>1, 28.9</td>
<td>1.03</td>
<td>.32</td>
</tr>
<tr>
<td>Area (nested in deprivation level)</td>
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<td>.51</td>
<td>.89</td>
</tr>
<tr>
<td>Dwelling type</td>
<td>1, 315</td>
<td>2.37</td>
<td>.13</td>
</tr>
<tr>
<td>Gender</td>
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<td>.01</td>
</tr>
<tr>
<td>Ethnic group (European / Other)</td>
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<td>6.19</td>
<td>.01</td>
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<tr>
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<td>3.44</td>
<td>.07</td>
</tr>
<tr>
<td>Earthquake disruptions to local environment</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation level (High Deprivation / Low Deprivation)</td>
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<td>.23</td>
<td>.64</td>
</tr>
<tr>
<td>Area (nested in deprivation level)</td>
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<td>.001</td>
</tr>
<tr>
<td>Dwelling type (community / retirement village)</td>
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<td>.03</td>
<td>.86</td>
</tr>
<tr>
<td>Age in years</td>
<td>1, 326</td>
<td>.79</td>
<td>.38</td>
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</tbody>
</table>
8.4.6 Summary of the earthquake results

Surveys administered following major earthquakes in 2010 and 2011 explored the potential influence of these disasters on reported activity participation and environmental conditions among older respondents from diverse urban areas. The survey data also illustrated how adverse changes to the environment potentially altered activity participation for older adults, addressing the overall research question. It was hypothesised that the earthquakes had a significant and negative influence on reported activity participation and local environmental conditions.

The survey data indicated that older adults from most study areas experienced relatively low levels of disruption to their activities and local environments following the September 2010 earthquake, which supports the null hypothesis. The situation was markedly different, however, following the February 2011 disaster after which respondents reported a significant increase in disruption to both activity participation and local environmental conditions. Following both the 2010 and 2011 earthquakes, there was a strong, positive correlation between reported disruption to local environmental conditions and activity participation. Those who experienced higher levels of environmental damage also reported increased disruption to activity participation. The February 2011 results and correlations between reported activity disruption and environmental disruption after both disasters support the hypothesis for substantial earthquake effects at both an individual and group level.

Inferential analyses undertaken following the September 2010 earthquake (when a sufficiently large respondent population was available) revealed that older women and non Europeans reported significantly higher levels of disruption to activity participation than other respondents. Reported disruptions to local environmental conditions varied by study area, and respondents from Holmwood (an area situated on riparian land with many older, masonry homes) reported higher levels of disruption than residents from other areas. Despite variations in reported environmental disruption, however, there were no significant area differences in reported activity participation following the 2010 earthquake. There appeared to be comparatively larger differences by study area in reported disruption to both activity participation and environmental conditions following the damaging February 2011 earthquake, although it was not possible to undertake inferential analyses to investigate such differences due to a reduced sample size in the third research phase. Descriptive data
indicated that those living in worse-affected central and eastern areas experienced increased
disruption to activity participation following the February 2011 earthquake.

8.5 Summary and discussion of phase-two results

8.5.1 Summary diagram of phase-two findings

The second research phase investigated the composition, context, and potential
environmental and personal correlates of active ageing among independently living older
adults who reside in urban areas in Christchurch by testing several hypotheses. This phase
also examined the impacts of the 2010 and 2011 Canterbury earthquakes on local
environmental conditions and activity participation. The salient findings of the second
research phase are summarised in figure 22 below. The digram shows the identified influences
on activity participation, the direction of influence, and relationships with commonly
undertaken behaviours.
Figure 22: Diagrammatic representation of phase-two results
8.5.2 Discussion of the phase-two results

8.5.2.1 Hypothesis one: Older-adult activity is comprised predominantly of physical and social modes of participation undertaken in the context of home, local environment, and proximate networks.

The characteristics of older adults' activity participation were ascertained during the phase-two survey to understand the prevailing environments, modes, and frequency of participation among respondents. The first hypothesis was supported by the data. The main environmental settings for activity participation included home, local environment, and social network. Respondents were active and frequently reported participating in physical, social, and cultural endeavours within the preferred settings.

When reporting the context of their activity participation, older adults stated that settings varied based on the type of activity undertaken (49%), activities were undertaken within the local environment (34%), or activities were undertaken in the context of home (11%). The lower level of reported home-based activity is notable as the survey was undertaken in the weeks following a 7.1 magnitude earthquake in the region. As mentioned earlier, however, the September 2010 earthquake was reported to have a relatively low level of environmental disruption for many older adults, which may have led to a continuation of activities in the local environment. Comparatively few respondents reported undertaking activities beyond their local environment. Older adults also indicated that there was a social-environmental component to their activity participation. When active, older adults reported that the social context of their participation varied based on the activity undertaken (40%), that they were active in a group setting (34%), or participated with one other person (14%). Preferences for activity in a group over a partner may reflect differences between those who are active with a spouse and those who live alone and must seek out the company of others. Comparatively few older adults reported undertaking activities on their own.

The gerontological literature has seldom examined the environments of older adults' activity participation in detail. In the small number of studies that have considered such settings, researchers have reported that home and local environment are preferred locations for the expressions of physical activities in particular (Annear et al., 2009; Barnett et al., 2007; Niva & Skar, 2006; Wiles et al., 2009). Gerontologists have offered several reasons
why home and local environment are likely to form a nexus of participation for older adults. A focus on home and local environment may be necessitated by declines in health or physical capacity, lack of access to suitable transportation, loss of a vehicle license, lack of driving confidence, reductions in social network size, or a lack of exposure to diverse environmental settings (Glass & Balfour, 2003; Smith, 2009). From a more positive perspective, a focus on the home and local environment as preferred activity settings may be associated with familiarity and intimacy with local settings, ageing in place and place attachment, accessibility and usability of resources and networks, contributions to identity, and perceptions of security (Barnett et al., 2007; Niva & Skar, 2006; Wiles et al., 2009). Another potential influence on the location of activities reported in the second research phase was the September 2010 earthquake. This event resulted in significant damage to roads and bridges, the implementation of cordons, and directives to avoid unnecessary travel in the days following the disaster. Such constraints potentially prompted older adults to avoid activities beyond their local environment. The results of the present research reinforce international and domestic findings for preferences for local activities among older adults.

Following a systematic literature review, there was a paucity of published studies concerning older adults' social activity, although there may have been a broader literature that was not located due to the search parameters, which addressed network participation and composition in ways that could have acted as a proxy for the concept of activity. While several studies explored the relationship among social activity, health, and environmental conditions (Bowling & Grundy, 1998; Richard et al., 2008; Unger et al., 1997), few explored the social context of activity. As stated in the introduction, social interactions are conceived as both a behavioural domain (relations with family, friends, and community members) and also as a particular environment (the composition and character of social networks). In the small number of studies that have examined the composition of older adults' social networks and the effects on health and activity participation, researchers have suggested that such interactions can facilitate or constrain health and activity depending on the characteristics of the population under investigation or the outcomes measured (Seeman et al., 1996; Wiles et al., 2009; Zunzunegui et al., 2003). There are several reasons why older adults are likely to exhibit preferences for engaging in activity in the company of others. Network interaction affords the opportunity for participation in valued social activities and addresses the threat of isolation, provides a setting for emotional support during times of difficulty (such as those experienced following the 2010 earthquake), and reinforces personal identity and social roles.
The phase-two results indicate tremendous variability in the contexts of older-adult activity participation, but also preferences for a socio-spatial core that revolves around home, local environment, and social network. The notion of a core of activities is consistent with the assertions of gerontologists for contracting social and geographical spheres of activity in later life and increasing reliance of local resources and networks (Glass & Balfour, 2003; Smith, 2009).

Within the settings of local environment, home, and social network, the prevailing modes of activity participation reported in the survey included physical, social, and cultural activity. There were comparatively lower levels of engagement in civic, spiritual, and economic activities among the sample group. The data also indicated that respondents were a highly active group and engaged in an average of 20 instances of activity over the 14-day period prior to survey completion and in the weeks following a major earthquake. Higher levels of activity and preferences for certain behaviours may be explained by responder bias (if the sample were more active than other older adults in the group) or by the Hawthorne effect (an observation that behaviour of respondents is modified when they know they are being observed or measured). These are potential limitations of this study, although they are also common challenges for many sociological endeavours.

It is difficult to compare reported activity levels with national and international studies due to the relatively limited research in this area, varying measures of participation, and inconsistency in the definition of activities. The relative youth of active ageing research also means there is a smaller body of literature addressing the component behaviours of this concept (Walker, 2002). Despite these challenges, there are several reasons why the research sample can be considered to be relatively active. Firstly, participation in diverse domains of activity were reported in the aftermath of a major urban disaster, which is potentially indicative of resilience within the group. Secondly, focus group respondents and reference group advisers regarded the reported levels of activity to be high in their experience of the older-adult group. Finally, the results compare favourably to national studies that have considered the activity levels of older New Zealanders (Koopman-Boyden & Waldegrave, 2009; Sport and Recreation New Zealand, 2008).
The finding for higher levels of physical activity participation is supported by national studies, which have reported that this is the most common behavioural domain among older adults (Koopman-Boyden & Waldegrave, 2009; Sport and Recreation New Zealand, 2008). Physical activity was also the focus for health-related gerontological studies, which reported older-adult preferences for activities such as walking and gardening and the potential health and societal benefits associated with participation (Annear et al., 2009; Booth et al., 2000; Salvador et al., 2009). The present research reinforces the existing international and domestic data for physical activity preferences among the older-adult group.

Preferences for social and cultural activities have been reported infrequently in the published gerontological literature. It is acknowledged, however, that there may be a body of work that addresses the social and cultural activities of older adults, but which potentially uses other descriptors to reflect these concepts. This is a limitation of the search parameters utilised in the literature review. It also potentially reflects a lack of engagement between researchers and the active ageing framework. Notably, social activity may not be considered as a relevant description of inter-personal engagement in later life. More appropriate terms may include social support or network interaction. It should be noted, however, that social support was not employed as a search term in the literature review because of connotations with dependence. A large-scale study of older-adult well-being in New Zealand reported that both social and cultural activities are commonly undertaken in later life (Koopman-Boyden & Waldegrave, 2009). Internationally, a small number of studies have explored the social activity of older adults and reported that participation in this domain is central to keeping older adults engaged with family and community networks (Haak et al., 2008; Richard et al., 2008). The paucity of activity research beyond the physical domain possibly reflects a lack of understanding among researchers about the important role that social, cultural, and other modes of participation may play in influencing health. Cultural activity, in particular, is seldom reported in the gerontological literature, and no studies were located that assessed participation in this domain in the systematic review. This research, therefore, provides local evidence for the importance of social and cultural activities among independently living older adults.

Higher levels of involvement in physical, social, and cultural activities among older adults are potentially associated with increased discretionary time, having sufficient health and functional capacity for participation, greater time spent within the home environment, the replacement of formal work activities with meaningful hobbies, or a desire to express or
develop skills or knowledge (Cameron & Waldegrave, 2009; Paul, Rashbrooke, & Rea, 2006; Statistics New Zealand, 2007a). It is also plausible, however, that the September 2010 earthquake influenced the mode and frequency of participation for some older adults. The earthquake potentially increased physical activity by necessitating increased involvement in home maintenance or community recovery activities. Social activity may have been increased by the need to support, or be supported by, family, friends, and neighbours. Finally, cultural activities, such as hobbies or reading, may have been increased by desires to stay close to one's home in the days and weeks immediately after the earthquake. Conversely, spiritual, civic, and economic activities may have been constrained by the earthquake. Spiritual activity was potentially influenced as many churches were heavily damaged. Lower levels of civic activity were potentially associated with a loss of community meeting facilities, although there was also opportunity for engagement in earthquake recovery activities following the disaster. Economic activity potentially declined as a result of damage to the Central Business District and the closure or demolition of hundreds of buildings. While it is possible that the September 2010 earthquake influenced the activity participation of older adults, many respondents reported only low levels of disruption to their activities following the 2010 disaster. It is plausible, therefore, that there may have been no significant change in the mode or frequency of participation for many older adults at this time.

The activity participation results suggest that active ageing may be a two-tiered concept, with primary and secondary expressions. While there is likely to be a distinction between meaningfulness and frequency of participation that is not fully explored in this thesis, active ageing was expressed as a fundamentally physical, social, and cultural practice by the research sample. The first tier of activity participation consists of physical, social, and cultural pursuits, while the second tier consists of the comparatively infrequently performed civic, spiritual, and economic activities.

It is difficult to be certain how the 2010 earthquake affected the setting and frequency of activity participation among the research sample as no baseline measures were undertaken prior to the commencement of the seismic events. Despite some uncertainty, preferences for home, local environment, and network settings as well as physical and social activities were supported by the literature. The results also highlight the importance of cultural activities for older adults and introduce the concepts of a socio-spatial core and two-tiered active ageing.
8.5.2.2 Hypothesis two: Environmental and personal variables are significantly associated with activity participation.

The second hypothesis was supported by the survey findings. The environmental variables of area of residence (nested in a particular deprivation context) and perceptions of environmental conditions were associated with social, cultural, and total activity participation among older adults. Additionally, the personal variables of health and age were associated with physical activity and total activity participation. These findings indicate that both personal and environmental factors play a role in the activity participation of older adults in Christchurch, although influences appear to vary by mode of activity. Published studies have generally explored singular domains of older-adult activity, particularly physical activity, which makes it difficult to compare the results of the present research with the relatively narrow findings in the existing gerontological literature (Annear et al., 2009; Chodzko-Zajko et al., 2009; King et al., 2005).

Despite a lack of focus on the diverse domains of active ageing in the gerontological literature, the finding for multiple levels of influence on particular behaviours is consistent with published results. Among studies that reported both personal and environmental influences on older-adult participation and in support of the present findings, both age and health have previously been identified as influences on physical activity by several researchers (Kowal & Fortier, 2007; Lim & Taylor, 2005; Wilcox et al., 2000). Other studies have reported that age and health are prevailing influences on physical activity that are identified irrespective of environmental conditions (Bird et al., 2009; King et al., 2000). It is likely that health declines or increased disability reduce capacity for physical activity, in particular, by limiting mobility, energy, or competence for participation (Prohaska et al., 2006). At older ages, poor health and disability increase at a population level, which may account for the observed association between older age and reduced physical activity (Alley & Crimmins, 2010). It is possible that poor health and advanced age also have interacting impacts on activity such that being both older and unwell potentially compound the negative effects on participation.

In addition to a central role for health and age, gerontological studies have also reported that ethnicity, level of energy and interest, self-efficacy, income, gender, available free time, smoking status, and awareness of activity benefits are influences on activity
participation (Fisher et al., 2004; Kemperman & Timmermans, 2009; Richard et al., 2008). A small number of potential personal correlates of activity participation were investigated as part of the phase-two survey. In addition to health and age, the variables of gender, ethnicity, and education level were also recorded. In contrast to several international studies, these variables were found to have no association with the domains of activity participation. Level of education has been identified as a correlate of physical activity in several international studies, and highly qualified older adults tend to be more active than those who are less educated (Fisher et al., 2004; Kemperman & Timmermans, 2009; Wilcox et al., 2000). The lack of evidence for the influence of education on physical, social, and cultural activity in the current study is potentially related to the consistently higher levels of academic achievement observed among participants. This is likely to have reduced variability within the sample and may reflect the type of individual who is interested in participating in research. Ethnicity has also previously been reported as having associations with activity among older adults in international studies, and ethnic minorities are often reported to have lower levels of participation than other groups (King et al., 2000; Wilcox et al., 2000). The research sample was predominantly European, which is consistent with the current demographic composition of Christchurch. It is possible that the low number of non-European respondents may have reduced the sensitivity of the statistical tests to detect differences in activity participation by ethnic group. Gender has also previously been reported as a correlate of activity participation, and older men are often reported to be more active than older women (Annear et al., 2009; Booth, 2000). No relationship was identified in the present research between gender and the domains of activity participation. When participant response rates were analysed, there was no gender bias evident among the respondent population compared to those who did not participate in the survey. It can be surmised, therefore, that gender may not be associated with the domains of activity participation among independently living older adults who participated in this research.

The present research reinforces local and international evidence for personal influences on older adults' activity participation. The data indicated that both health and age are potentially significant influences on activity participation for older adults in Christchurch, while other commonly reported personal influences (gender, ethnicity, and education level) may have no association with the behaviour of the population under investigation. The

47 These variables were included in the survey as they had previously been identified as potential correlates of activity participation in the literature and were available to be adapted from an existing national Census.
findings for personal influences on activity participation may be indicative of a personal threshold underlying the initiation of activity participation. It is possible that being older (within the context of the older-adult group) and having a poor state of health or restrictive disability are foundational constraints to activity participation that operate irrespective of environmental influence.

Environmental variables were also identified as potential correlates of activity participation during the second research phase. Area of residence (nested in a particular deprivation context) was correlated with social, cultural, and total activity participation among the sample, while perception of local environment was correlated with social activity. Neither area of residence nor area-level deprivation has previously been associated with either social or cultural activity participation among the assessed literature, although these variables were correlated with physical activity in several studies (Fisher et al., 2004; Kemperman & Timmermans, 2009; Lim & Taylor, 2005). Perceptions of environmental conditions were identified as a correlate of social activity and general activity participation in a small number of studies (Levasseur et al., 2008; Richard et al., 2008). It is conceivable that area of residence potentially influenced the activity participation of older adults via unique compositional or contextual attributes of particular urban locations that either constrained or facilitated participation. Evidence for area-level differences in activity participation are consistent with the findings from the first research phase, which suggest that there is a continuum of environmental support and constraint across Christchurch. Perceptions of local environmental conditions potentially influenced social activity via feelings of safety and security, the availability of networks, or awareness of neighbourhood social problems. This research is potentially among the first studies to identify a potential role for environmental variables as influences on the social and cultural activities of older adults.

In addition to area of residence and perceptions of local conditions, gerontological research has identified a variety of potential environmental influences on activity participation, including topography, scenery, the presence of other active people, social cohesion and support, density of the older-adult population, accessibility of resources for activity, level of urbanisation, safety of the urban environment, and social club participation (Fisher et al., 2004; Hough et al., 2008; Lian et al., 1999). A limited number of environmental variables were examined in the second research phase. In addition to area of residence and perceptions of environmental conditions, the survey also assessed length of area residence,
Results and discussion two: potential correlates of active ageing
dwelling type (community or retirement village), and living situation (alone or with others)\textsuperscript{48}. None of these variables was found to be correlated with activity participation among respondents following a nested ANOVA. In one of the few studies to assess the link between area of residence and activity participation, Annear et al. (2009) reported no association between time spent in a particular location and physical activity participation among older adults from two contrasting urban areas. Other studies reported that length of residence was a potential influence on older-adult health, but did not explore potential influences on activity (Aneshensel et al., 2007; Berke et al., 2007). It is possible that length of area residence may be unrelated to the domains of activity among older populations or that it acts in combination with other personal or environmental attributes to influence behaviour. Dwelling type was seldom considered within the assessed literature as a potential influence on activity participation as published studies generally focussed on older adults within a singular setting (community, aged-care facilities, or retirement village). The present results suggest that dwelling type may be inconsequential for activity participation in later life. Living situation (alone or with others) was also infrequently mentioned in the gerontological literature in relation to activity participation, although one study reported that living with a spouse influenced mortality outcomes among older women (Davis et al., 1997). Individuals who live with a spouse potentially have ready access to intimate social interactions, while those who live alone may have to cultivate relationships with networks beyond their home to foster activity participation and offset the threat of isolation.

None of the reviewed studies identified that same mix of potential influences of activity participation as the present research. This is potentially indicative of a lack of focus on multiple activity domains comprising the active ageing concept. The lack of corroborating results also suggests a unique array of influences within the context of urban Christchurch. The research findings are not straightforward, and environmental and personal variables appeared to be associated with specific domains of activity participation among older adults. In particular, the personal variables of health and age were associated with physical activity, while the environmental variables of area of residence (nested in deprivation) and perceptions of local environment were associated with social and cultural domains. These findings suggest that active ageing is not a singular concept or outcome, but rather a collection of diverse behaviours with attendant personal and environmental influences (a concept of domain

\textsuperscript{48} These variables were included in the survey as they had previously been identified as potential correlates of activity participation in the literature and were available to be adapted from a national Census.
Results and discussion two: potential correlates of active ageing

8.5.2.3 Sub-hypotheses two (a) and (b): Older-adult activity participation varies by urban area and level of area deprivation.

Sub-hypotheses two (a) and (b) were partially supported by the research findings. These hypotheses are considered together as area of residence was nested within the broader socio-economic contexts of higher or lower area deprivation. There was no independent association between area deprivation (higher or lower) and the domains of activity participation among respondents. As a nesting variable, however, area deprivation was associated with activity participation in some areas. Specifically, respondents from the Holmwood study area, nested in a lower-deprivation (more affluent) setting, reported significantly higher social activity participation than respondents from other areas. Respondents from the Central City study area, nested in a higher-deprivation (poorer) setting, reported significantly higher cultural and total activity participation than respondents from other areas. The results suggest that area-deprivation potentially moderates the relationship between area of residence and activity participation in some locations, but not in others. The findings also indicate that particular urban areas may be more advantageous for social and cultural modes of activity participation.

The focus on area-deprivation as a possible influence on activity participation was based upon earlier findings from a comparative study of two urban areas in Christchurch, which reported that deprivation level played a significant role in the physical activity of older adults (Annear et al., 2009). Annear et al. found that older adults who were living in lower deprivation areas reported significantly higher levels of leisure-time physical activity than those in higher-deprivation areas. It was speculated that this finding would be repeated with a larger sample, across multiple study areas, and in relation to diverse modes of activity participation. Numerous studies have reported that older adults who live in more deprived urban areas suffer worse health outcomes and increased constraints to activity participation (Annear et al., 2009; Fisher et al., 2004; Kobetz et al., 2003; Patel et al., 2003; Yao & Robert, 2008). Such studies have often reported that living in higher-deprivation urban areas is associated with increased exposure to diverse environmental problems (Annear et al., 2009; Breeze et al., 2005). These studies suggest that it is not specifically deprivation level that is

49 A background condition within which other variables are situated.
Results and discussion two: potential correlates of active ageing

injurious to health and disruptive of activity participation, but rather the associated negative physical and social conditions. For at least two decades, researchers have used deprivation level as a proxy measure for the quality of the physical and social environment as a result of hypothesised or observed interactions between markers of collective socio-economic status and conditions in urban areas (Macintyre, Maciver, & Sooman, 1993).

Several non significant and alternative findings have also emerged from the literature. A small number of international studies have previously reported no significant association between area deprivation and activity participation among samples of older adults (Anaby et al., 2009; Bird et al., 2009). These researchers reported that personal correlates of activity participation, including physical and mental health, cultural backgrounds, energy or motivation, fear of injury, and gender were more significant than contextual factors, including area deprivation (Anaby et al., 2009; Bird et al., 2009). In a particularly relevant example, New Zealand geographers reported that there was generally better access to health and activity related resources in higher-deprivation areas throughout New Zealand (Pearce et al., 2007). The authors surmised that a history of pro-equity resource distribution within New Zealand may be an explanation for this (Pearce et al., 2007). These published results support the present research findings. It is possible that a lack of evidence for independent associations between area deprivation and activity participation is indicative of a generally supportive or unsupportive urban environment. During area observations in the first research phase, it was found that constraints to activity participation appeared to be ubiquitous across urban areas in Christchurch. In the context of ubiquitous constraint, living in a less-deprived area would not necessarily limit an individual's exposure to potential environmental barriers to activity. The present results suggest, therefore, that area deprivation may not be independently associated with activity participation in Christchurch due to the universality of urban constraints and potentially better access to resources in some higher-deprivation areas.

The results of the present research indicate that area deprivation only matters for particular modes of activity participation and in certain urban areas. These findings, therefore, support a concept of deprivation moderation. Area deprivation appeared to influence activity participation in concert with attributes of particular urban environments, but was not independently associated with any of the assessed activity domains. The results also support the observations from the first research phase for the potential ubiquity of activity constraints in urban areas, which may explain why there was no independent association between higher
or lower levels of area deprivation and reported activity participation.

Internationally, urban area of residence has seldom been investigated as a potential influence on the activity participation of older adults. Several studies have investigated differences in health and activity participation in relation to dwelling in rural or urban setting (Dwyer et al., 1994; Knipsheer et al., 2000; Lim & Taylor, 2005), although there has been comparatively little analysis of differences among urban areas. Researchers have often sought to explain geographic differences in activity participation and health on the basis of variations in area deprivation, access to resources, or composition of the local population (Fisher et al., 2004; Gitlin et al., 2001; Richard et al., 2008). Such explanations often fail, however, to consider how idiosyncrasies of certain areas or the combination of diverse compositional and contextual characteristics within particular urban locations potentially facilitate or hinder activity in later life.

In the present research, the urban areas of Holmwood and the Central City (nested in particular deprivation contexts) were identified as influences on specific modes of activity participation. Significantly higher levels of social activity participation were identified in the lower-deprivation area of Holmwood. In support of this, the findings from the first research phase showed that Holmwood residents had access to a small shopping precinct (this was subsequently destroyed in the February 2011 earthquake) and historic parks and gardens where they could potentially interact with friends and community members. Further examination of the phase-one geographic and observation data, however, indicated that the physical environment also harbours potential constraints to social activity. Observed barriers included unsupportive pedestrian conditions, a lack of environmental incentives for social engagement (high fences and significant private activity resources), and a paucity of community facilities. Commenting on the potential problems in this location, a reference group member observed,

There is a lack of crossing points for pedestrians to get to parks and for safe crossing of busy roads (arterial type); no facilities for the community to enjoy social, cultural, and physical activities close by; distanced from public transport and high fences.

It is possible that Holmwood residents are more gregarious than those who live in other urban areas in spite of prevailing environmental problems. Older adults who live in this location may have greater motivation to affiliate with individuals who share a similar and high socio-
economic status. It is possible, therefore, that higher levels of social activity in the Holmwood area may be related to particular environmental characteristics (such as access to a shopping precinct or large park), the attributes of the population (such as collective gregariousness), or to a combination of personal and environmental factors. Higher levels of social activity participation in were not observed in other lower-deprivation areas, which suggests that Holmwood may be a unique community within the context of the study sample.

A higher-deprivation urban area, Central City, was also identified as the site of significantly greater levels of cultural and total activity among older residents. This finding is potentially explained by access to a higher number of diverse community facilities and services in this location. The phase-one geographic and observation data indicated that prior to the 2010 and 2011 Canterbury earthquakes the Central City had comparatively greater access to a range of local resources appropriate for a variety of activities, including a library, shopping and services areas, health facilities, churches, and small green spaces. Moreover, there was also an abundance of people on the street during observations, including older adults. Commenting on their experience of the Central City, a reference group member noted, “It is close to cultural amenities, more civic, spiritual, and physical amenities close at hand, and within safe walking distance of city centre”. The results from the Central City study area were not repeated in any of the other higher deprivation locations, which suggests that, like Holmwood, this area may be relatively unique in the context of the study sample.

The survey data revealed that two out of the twelve study areas were associated with activity participation among older adults. These results suggest that there are likely to be particular or unique attributes of environment, population, or the interaction between people and place within Holmwood and Central City that facilitate social and cultural activities. These findings support a concept of particularity, which suggests that there are specific and idiosyncratic attributes of some urban areas that may be difficult to reproduce; owing to unique geographical, historical, or compositional attributes; which support participation in certain activities.

8.5.2.4 Sub-hypothesis two (c): There is a significant, positive association between health and activity participation.

The potential interaction between health and activity participation is foundational to
the present research. Arguments for investigating environmental influences on active ageing rest, in part, upon the understanding that by constructing society in ways that support active ageing, improved health outcomes may be achieved for older adults and the opportunities of population ageing realised (Walker, 2002; World Health Organisation, 2002a).

The hypothesis for a positive association between health status and activity participation was supported by the research findings. Self-reported health status was found to be independently associated with physical activity and total activity participation among the older-adult sample. Better reported health was associated with higher levels of physical and total activity, while a poorer health was correlated with reduced participation. Across the sample, older adults generally reported being in good health and stated that their health status was not an impediment to their activities. There was no reported association between health status and social or cultural activity.

Internationally, several studies have identified a significant correlation between better health and higher levels of activity among older adults (Chodzko-Zajko et al., 2009; Fries, 1996, 2003). Within New Zealand, a national study of older-adult well-being reported that individuals with better health exhibit higher levels of participation in active leisure and recreational activities (Koopman-Boyden & Waldegrave, 2009). There is international support for the interaction between physical activity and corporeal and psychological health in particular (Fries, 1996; Prohaska et al., 2006; U.S. Department of Health and Human Services, 1998). Regular participation in physical activities at older ages is known to reduce the prevalence or severity of some chronic diseases, improve cardiovascular function, increase muscular strength and endurance, promote flexibility and balance, and foster a positive mental attitude (Chodzko-Zajko et al., 2009).

Several studies have also shown that older adults report improved physical and mental health outcomes as a result of social activity participation (Bowling & Grundy, 1998; Maier & Klumb, 2005; Smits et al., 1995; Zunzunegui et al., 2003). Positive health outcomes associated with social activity are thought to result from reduced stress, improved emotional states, mental stimulation, and maintenance of social roles and identity (Unger et al., 1997; Zunzunegui et al., 2003). Few, if any, studies have investigated or reported associations between cultural activity and states of health. There are several possible explanations for a lack of association between reported health status and social and cultural domains of activity.
in the present study. It is possible that respondents conceived health to be a predominantly physical phenomenon when they answered survey questions despite the provision of a holistic definition. It is also likely that social and cultural activities are more sustainable than other modes of activity across a variety of health states as they are likely to be less physically demanding in many instances. Therefore, there may be a higher threshold of poor health or disability that has to be reached before such activities are significantly impaired.

The findings of the present research reinforce existing results for a relationship between activity and health, particularly physical activity, which justifies the research approach as a response to population ageing and the potential expansion of morbidity in later life. The World health Organisation (2002a) has previously asserted that active ageing provides a framework for optimising health and other outcomes in later life. The results of the present study are supportive of health as a ubiquitous personal influence on activity participation. Health may be considered to be a component of a personal threshold that must be overcome before certain modes of activity participation can proceed.

8.5.2.5 *Hypothesis three: The Canterbury earthquakes of 2010 and 2011 had a significant and negative impact on local environmental conditions and activity participation.*

The third hypothesis was supported by the results of the second research phase. There was a strong, positive correlation between perceived environmental disruption and reduced activity participation following the 2010 and 2011 earthquakes. Individuals who perceived negative environmental disruptions reported higher levels of disruption to their activity participation following both disasters and in a variety of urban areas. The level of reported local environmental and activity disruption, however, was comparatively low following the September 2010 earthquake. Respondents reported significantly greater disruptions to environmental conditions and activity participation following the February 2011 earthquake, and central and eastern suburbs appeared to be disproportionately affected. Reported earthquake-related disruption to activity participation was also found to be higher among women and ethnic minorities in the aftermath of the September 2010 earthquake when a large study sample was available to facilitate inferential analyses. The present findings also support

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50 Inferential testing was not possible due to the smaller sample size available, but descriptive data support this observation. It is acknowledged, however, that the low numbers of participants also raise the possibility of sampling variability as a cause of increased reports of disruption. It should be noted that the present results are consistent with following and in-depth qualitative research phase.
the second research hypothesis, which asserted that environmental conditions influence older adults' activity participation. The earthquakes illustrate the potential effects of a negative environmental change on a population of older adults.

The finding for reported disruptions to local environmental conditions and activity participation among research participants is consistent with the assessed literature. Several studies have reported that older adults' regular activities and quality of life have been substantially disrupted in the aftermath of a major disaster as a result of significant environmental problems (Carswell, 2011; Shenk et al., 2010; Tuohy & Stephens, 2012). Other studies, however, have reported that in the midst of severe disruptions older adults' activities have increased in some domains, particularly social and community affairs (Ardalan et al., 2011; Lin et al., 2002). International studies have also shown that older adults are often more resilient in the aftermath of natural disasters than those in younger age cohorts (Knight et al., 2000; Norris & Murrell, 1988; Phifer, 1990). As this study was only concerned with the 65 years and older population, however, it was not possible to compare the impacts reported by older adults with those among other age groups.

The finding for significantly greater reported environmental and activity disruptions following a large aftershock (the February 2011 earthquake) has not previously been reported in the international literature. The review of 28 disaster-related studies indicated that the experience of multiple, large-scale disasters within a short period is an extremely rare phenomenon. The only comparable events reported in the literature were experiences of annually recurring floods in the United States, which were found to significantly increase levels of anxiety and depression among older adults (Kaniasty & Norris, 1993; Phifer, 1990). There are several reasons why environmental and activity disruptions may have been reported to a greater extent following the February 2011 earthquake. While technically an aftershock, the magnitude 6.3 earthquake that struck Christchurch in February 2011 had characteristics that made it considerably more devastating than the September 2010 earthquake. In particular, the epicentre was close to the city at a shallow depth, the earthquake generated extreme ground acceleration, many buildings and infrastructure were vulnerable to damage, and a large number of people were in central city when the disaster struck at midday on a Tuesday. Higher levels of reported activity disruption following the February 2011 earthquake were also potentially the result of the accumulation of environmental and psychological effects from five months of aftershocks.
The finding for greater reported activity disruptions among older women is consistent with the international literature. Gender has often been identified as a correlate of reported disruption to health and activities following a disaster, with older women generally reporting more problems than men (Ardalan et al., 2011; Chen et al., 2007; Salcioglu et al., 2003). There are several possible reasons for older women's increased vulnerability to activity disruptions that have been articulated by researchers: (a) there is a greater likelihood that older women will be living alone in the community as they tend to outlive men, (b) they may be more vulnerable to social network disruptions, (c) they may have an increased level of physical frailty associated with generational norms for age-appropriate behaviour among women, (d) they may have reduced capacity for coping with environmental problems if they do not have experiences of self-reliance, or (e) they may be more likely to experience disruption because of gendered roles and responsibilities (Chen et al., 2007; Salcioglu et al., 2003). The present results reinforce the existing literature and provide New Zealand evidence for the influence of gender on activity participation among older adults following a natural disaster.

In contrast to the international literature, the present research also found evidence that ethnicity was associated with reported activity disruptions in the aftermath of the September 2010 earthquake. In particular, non-European respondents reported significantly higher levels of disruption to their activities than older adults who claimed European heritage. The divergence between the present study and the international literature is possibly because several of the disaster research studies were undertaken in more ethnically homogeneous countries, such as Taiwan, Japan, China, and Armenia (Aoyama et al., 1998; Chen et al., 2007; Goenjian et al., 1994; Jia et al., 2010). Even in countries that are more culturally diverse, such as the United States, older-adult populations are often more ethnically homogeneous than younger age cohorts as a result of historic immigration patterns, government policy, and varying survival rates among ethnic groups. In contrast, the overwhelming majority of the Christchurch population aged 65 years or older claim European heritage. This will alter considerably in the coming decades. While the present sample of non-European research participants was small and further investigations will be required to confirm these results, the present research highlights the potential vulnerability of minority groups in multi-cultural societies following a natural disaster. Reasons for the vulnerability of non-Europeans in the aftermath of a natural disaster are potentially related to a lack of financial resources, the absence of proximate family members (who may live in other
countries), lower levels of integration with the community, or a lack of knowledge or confidence accessing help or information. This finding is likely to be of significance as cultural diversity is projected to increase steadily among older age cohorts in New Zealand (Statistics New Zealand, 2007a).

Other commonly reported correlates of older-adult health problems and activity disruptions following a natural disaster that have been identified in the international literature include pre-existing health conditions, level of social isolation or support, socio-economic status, marital status, education, death of friends or family, and material losses suffered during the disaster (Chen et al., 2007; Salcioglu et al., 2003; Seplaki et al., 2006; Watanabe et al., 2004). Of the variables assessed in the survey and in contrast to international findings, health, education level, and socio-economic status of local areas were found to be unrelated to the reported effects of the earthquakes on activity participation. A lack of evidence for differences in activity disruption by education level or health status is potentially explained by the observation that the study sample was relatively well educated and high functioning. In this way, there were possibly insufficient numbers of those with poorer health or lower educational attainment to facilitate an effective comparison. It is equally likely, however, that health and education are not significant correlates of activity disruption following a disaster among older adults in Christchurch. As socio-economic status was only measured for areas (aggregated) and not individuals, it is likely that these data constitute different potential influences on activity participation from those reported in the literature. It is possible that factors such as marital status, personal losses, and social isolation were also associated with older adults' post-earthquake activity levels; however, these data were not captured in the survey and further research is required to explore potential interactions.

This research is potentially among the first studies to examine the effects of sequential natural disasters on reported environmental disruption and activity participation among urban-living older adults. The data indicate that older adults have a high latent resilience and will attempt to maintain activity participation following a disaster. Latent resilience refers to the capacity of older adults to endure environmental disruption and maintain activity participation. This was evident in the relatively low levels of reported activity disruption following the September 2010 earthquake. Once a disaster threshold had been reached, referring to a highly disruptive event or the accumulation of effects sufficient to overcome resilience, it became significantly more difficult for older adults to maintain normal activity
participation. As the aftershocks from the September 2010 earthquake continued into 2011 and environmental conditions became materially worse in some locations, resilience was potentially exhausted and many older adults became constrained in their activities. The findings also indicate that the earthquakes had differential impacts on diverse population groups. Those who appeared to be worst affected included women, non-Europeans, individuals who perceived greater environmental disruption, and those living in central and eastern areas following the February 2011 earthquake.

8.5.3 Potential limitations of the phase-two research methods

The methods employed in the second research phase were subject to several limitations, including potential recall bias, the use of relatively untested survey items, and a low rate of response.

8.5.3.1 Survey instrument

The first limitation of the phase-two research methods was the presence of potential recall bias. Surveys that require respondents to remember previous activities are potentially constrained by imperfect recollection over time, an unwillingness to divulge sensitive information, or the intention to provide socially desirable answers (Sallis & Saelens, 2000). Previous studies involving older subjects have identified a tendency to overstate health and activity participation in some cases (Dergance et al., 2003; Sims, Smith, Duffy, & Hilton, 1999). To address the potential for recall bias in the second research phase, respondents were asked to report the frequency, mode, and context of activity participation in a third research phase (chapter nine), which provided a mechanism for validating the activity characteristics of older adults. A period of 14 days was also used for the survey as this was deemed to be short enough to address the threat of recall bias associated with imperfect recollection (Milligan et al., 2005).

Questions within the survey instrument included both previously validated and relatively untested items. The inclusion of research questions that had not previously been applied in gerontological studies potentially reduced the validity and reliability of the results. Searches of the literature were undertaken during survey development to identify existing instruments that had previously shown acceptable levels of reliability and validity among
older populations. The health questions were adapted from items in the Short-Form 12 health survey, which is a valid and reliable measure of general health among adult populations (Ware et al., 1996). Demographic and background details were ascertained using items from the New Zealand Census of Population and Dwellings (Statistics New Zealand, 2006b). Questions addressing activity participation, local environment, and the effects of the earthquake disasters, however, were not subjected to validity and reliability testing. To address this limitation, pilot testing and collaboration with reference group members during survey development were employed to ensure that items were suitable for application with older adults. A lack of testing of the psychometric properties of all items in the survey can be regarded as a limitation of the research.

8.5.3.2 Participant response

The overall rate of response to the phase-two survey was relatively low (45%), and the analysis of respondent and non-respondent data indicates that there were age and area variations in participation. The use of the national electoral roll to select research participants may have contributed to a low rate of response. If older adults had recently changed their residential address, then they would not have been contactable and would have automatically become part of the non-respondent population. The use of a national electoral roll may have also reduced access to older Māori who may have chosen to be listed on a roster of indigenous New Zealanders. This is a potential explanation for the low number of non-European respondents. It is possible that a low rate of total and area response was associated with the impacts of the 2010 Canterbury earthquake, which caused severe environmental disruption in some areas and resulted in the relocation of large numbers of residents. As evidence of this assertion, several surveys were returned by the New Zealand Postal Service as the residences of intended recipients had been permanently vacated due to earthquake damage. Those who chose to temporarily leave Christchurch and provided no forwarding address also became part of the non-respondent population. Numbers of respondents from Holmwood \( (n = 26) \) and the Central City \( (n = 12) \), identified as locations that had a potentially significant influence on older adults' activity participation, were also relatively low. It is plausible that respondents from these areas may have represented atypical and active population subgroups, which influenced the results of the research. To attempt to overcome the low rate of response,

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51 A planned national Census in early 2011 was cancelled due to the Canterbury earthquakes. This potentially reduced access to more up-to-date contact information for older Christchurch residents.
follow-up telephone calls were also undertaken in the weeks following survey administration to encourage increased participation and return of incomplete surveys. An implication of the lower than anticipated rate of response in the study (and in the aftermath of the 2010 and 2011 earthquakes) may be that participants represented a more resilient sub population within the group of older adults in Christchurch. This could potentially mean that there may be a larger population of older adults who suffered negative consequences associated with the earthquakes, but who were reluctant to participate in research.

During focus group discussions with reference group members and research participants in 2011, it was noted that respondents appeared to be a comparatively active and well-educated segment of the older-adult group. While directly comparable activity data were not available, education data suggested that respondents were more highly qualified than the general older-adult population. Over 60% of survey participants reported having a post-high school qualification, while national data indicate that approximately 44% of the cohort aged 65 to 84 have vocational training or university education (Koopman-Boyden & Waldegrave, 2009). It is possible that comparatively less active and educated older adults chose not to participate in the survey thereby also foregoing the opportunity to be involved in subsequent research phases. More educated older adults may have a heightened understanding of the benefits of activity and, therefore, had higher levels of participation. It is also possible that more educated older adults had a generally higher socio-economic status than non-participants, which may have afforded greater access to private activity resources across urban areas. In the context of a highly qualified study sample, it may have been difficult to identify education-related differences in activity level. Survey research has previously reported difficulties in recruiting less active, impoverished, poorly educated, female, and ethnic minority individuals from the older-adult group, so recruitment problems may be endemic to the field of gerontology (Fisher et al., 2004; King et al., 2000; Levasseur et al., 2008; Michael et al., 2006). The selection of multiple and contrasting study areas maximised opportunities for recruiting a diverse sample of older adults and the use of follow-up telephone calls with non-respondents was employed in an attempt to encourage participation.

8.5.4  Reflection and learning from the second research phase

The second research phase constituted the main quantitative data collection stage in the study. A challenge associated with the PAR process in the second research phase included
maintaining the full and meaningful involvement of older adults. One of the principles of PAR is that participants should be involved as equal partners in all phases of the research (Israel et al., 2005). In the present study, members of the reference group were invited to participate in data checking and analysis procedures, but declined due to an acknowledged lack of expertise concerning statistical tests and disinterest in the technical and administrative aspects of the project. Because the reference group chose to have no direct involvement in data analysis procedures, it is possible that they may have also been less inclined to critique the study results. The use of statistical analyses in PAR studies, therefore, creates potential road blocks to equal collaboration.

In practice, however, concerns about a lack of involvement in data analysis procedures proved to be unfounded. Prior negotiation of older adults' roles and responsibilities within the context of the reference group ensured that when the researcher acted independently during the quantitative data analysis older adults were given the opportunity to critique both the study outputs and testing procedures. Focus group discussions were undertaken with reference group members and study participants following statistical analyses in 2011. Older people were astute in their interpretations of findings, understanding of how sampling biases potentially affected results, and identification of additional reporting and testing requirements. Older adults provided several recommendations concerning the appropriate analyses and a critique of the preliminary statistical results. For example, older adults asked for a detailed analysis of response rates by study area, requested further analyses on potential differences between male and female respondents and among those in diverse living conditions and dwelling types, suggested that personal contact be made with non respondents, identified the potential activity and education biases within the study population, and provided explanation and anecdotes concerning how the earthquakes affected older residents.

All of the recommendations and interpretations provided by older adults were incorporated into subsequent procedures, analyses, and written results. A lesson arising from the present research was that it was both necessary and desirable to trust in the judgement and knowledge of participants. It was also important to provide opportunities for participants to critique the independent work of the researcher to maximise collaboration. While they did not wish to be involved directly in data analysis, participants displayed a high level of understanding of research procedures and limitations, which contributed to improved analysis and interpretation of results. PAR practitioners have stressed that one of the most important
skills for a researcher is learning to relinquish overarching control of the research and to trust the value of co-created knowledge (Fook & Gardner, 2007). In the context of the present research, PAR procedures worked effectively in concert with more traditional approaches, including quantitative surveys, and opened up new procedures, analyses, and interpretations that may not have been identified by researchers working in isolation.
9 Results and discussion three: pathways to active ageing

9.1 Introduction and organisation

This chapter presents the findings from the third phase of the study, which explored the emplaced activity experiences of urban living older adults and the subjective impacts of the 2010 and 2011 earthquakes. Data were collected between October 2010 and April 2011 using activity diaries, photovoice procedures, and a questionnaire administered after two major earthquakes. Focus group discussions with older-adult advisers and participants were also undertaken to analyse the research findings. In congruence with the second research phase, earthquake-related findings are presented separately from the main results. This section expands on the second research phase by providing validation and elaboration of the findings for environmental and personal influences on activity participation, including the impacts of the 2010 and 2011 earthquakes, and explicating how environmental and personal conditions potentially influence activity participation in later life.

In the first section of this chapter, the PAR process is described, including the planning, action, and reflection procedures undertaken with the reference group and participants (figure 23). In the second section, the diverse reasons for older adults' emplacement in their current area of residence are elaborated to provide background to the interpretations of potential environmental influences on activity participation and to identify potential self selection issues. In the third section, the finer-grained activity participation characteristics of research participants are presented, including regularly reported activities and settings, which provide validation and elaboration for statistical results. In the fourth section, the potential environmental and personal pathways and barriers to active ageing are presented. In the fifth section, the influence of 2010 and 2011 earthquakes is considered. In the final section, the results are discussed in relation to the literature, key research concepts are abstracted and explained, the limitations of the research design and methods are considered, and reflections are provided concerning the efficacy and challenges of the PAR process.

52 These data are presented for all domains of activity participation. While the analysis of survey results focussed on the commonly reported physical, social, and cultural domains (to expedite statistical analyses), such distinctions are not made in this chapter due to the interconnection of multiple modes of activity participation in the qualitative data.
9.2  PAR phase three: October 2010 – October 2011

9.2.1  Planning

Planning for the third research phase began at a focus group discussion in August 2010. Reference group members indicated their preference for activity diaries augmented with photovoice procedures as the data collection methods. Other methods, including face-to-face interviews, were rejected as they were considered to be overused in gerontological studies. Reference group members consented to a seven-day period of pilot testing to develop the instruments. The reference group met again in late October 2010 to discuss the results of pilot testing and the selection of participants for the third research phase. It was agreed that up to 10 older adults from each study area would be selected for participation in the third phase.
Results and discussion three: pathways to active ageing

(diaries and photovoice) from the population of survey respondents who had indicated a desire for further research involvement. As a result of pilot testing, the following changes were made to phase-three procedures: adjustments were made to diaries so reported daily activities could be represented in multiple domains, instructions and definitions were clarified, a question was added to the diary to address activities of daily living, the duration of both exercises was extended to 14 days to capture infrequently performed activities, the name of the photovoice procedure was changed to *camera activity* to reduce confusion, six photographs were determined as an appropriate number for photovoice participants to return, prompting questions for photovoice descriptions were identified as superfluous and removed, problems with the camera flash were identified and corrective guidelines were developed, and instructions about the ethics of photographing others were added. As a consequence of the February 2011 earthquake, an open-ended question and two quantitative items were redistributed to participants with the approval of the reference group during the third research phase. The inclusion of earthquake questions following the 2011 earthquake also required additional approval from the University of Otago Human Ethics Committee.

9.2.2 **Action**

Data collection for the third research phase was undertaken over 14 consecutive days during March and April 2011 in the weeks following a second major earthquake. Qualitative data were also gleaned from an open-ended item in the earthquake questionnaire, which was administered following the September 2010 and February 2011 earthquakes. Activity diaries and disposable cameras were mailed to participants three days prior to the 2011 earthquake (Appendices 3.16 – 3.20). As a consequence, all participants in the third research phase were contacted in early March and presented with three options: (a) continue the research process from the first of March if they had already begun diary and photovoice procedures; (b) postpone participation until the first of April; or (c) withdraw from the study if they felt unable to continue. Fortunately, 66 respondents (67% of volunteers for the third research phase) continued research involvement as planned or postponed for one month. Within this sample of 66 individuals, 25 (69% of those who were provided with a camera prior to the February 2011 earthquake) completed the photovoice exercise. Only three cameras were made available to participants in each study area. This was primarily due to cost constraints and the unfamiliarity of some volunteers with photography.
Table 20: Overview of phase-three research participants

<table>
<thead>
<tr>
<th>Study area</th>
<th>Number of participants</th>
<th>Response / completion</th>
<th>Male</th>
<th>Female</th>
<th>Mean age</th>
<th>Deprivation level of area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holmwood</td>
<td>7</td>
<td>70%</td>
<td>3</td>
<td>4</td>
<td>74</td>
<td>Low</td>
</tr>
<tr>
<td>Central City</td>
<td>4</td>
<td>67%</td>
<td>2</td>
<td>2</td>
<td>75</td>
<td>High</td>
</tr>
<tr>
<td>Papanui LD</td>
<td>9</td>
<td>90%</td>
<td>3</td>
<td>6</td>
<td>77</td>
<td>Low</td>
</tr>
<tr>
<td>Papanui HD</td>
<td>10</td>
<td>83%</td>
<td>5</td>
<td>5</td>
<td>73</td>
<td>High</td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>7</td>
<td>58%</td>
<td>3</td>
<td>4</td>
<td>75</td>
<td>Low</td>
</tr>
<tr>
<td>New Brighton</td>
<td>4</td>
<td>67%</td>
<td>0</td>
<td>4</td>
<td>79</td>
<td>High</td>
</tr>
<tr>
<td>North Hornby</td>
<td>6</td>
<td>75%</td>
<td>0</td>
<td>6</td>
<td>72</td>
<td>Low</td>
</tr>
<tr>
<td>South Hornby</td>
<td>2</td>
<td>67%</td>
<td>1</td>
<td>1</td>
<td>73</td>
<td>High</td>
</tr>
<tr>
<td>Redcliffs</td>
<td>6</td>
<td>55%</td>
<td>3</td>
<td>3</td>
<td>82</td>
<td>Low</td>
</tr>
<tr>
<td>Ferrymead</td>
<td>7</td>
<td>70%</td>
<td>3</td>
<td>4</td>
<td>74</td>
<td>High</td>
</tr>
<tr>
<td>Rutland</td>
<td>2</td>
<td>50%</td>
<td>1</td>
<td>1</td>
<td>78</td>
<td>Low</td>
</tr>
<tr>
<td>Bryndwr</td>
<td>2</td>
<td>50%</td>
<td>1</td>
<td>1</td>
<td>67</td>
<td>High</td>
</tr>
</tbody>
</table>

9.2.3 Analysis and outcomes

Reference group members did not wish to be involved in the coding and memoing procedures associated with qualitative data analysis, but they requested the opportunity to critique the preliminary findings, offer interpretations, and consider potential implications. In May 2011, the reference group met to discuss the preliminary results of the qualitative research. It was suggested that care be taken to identify and separate existing and emerging environmental problems following the February 2011 earthquake. Between August 2011 and October 2011, three focus group meetings were held in the western, northern, and central locations in Christchurch with 30 participants to discuss the findings from phase two and three and to develop recommendations and theoretical concepts. The 30 focus group respondents included older adults who had requested further research involvement following the second research phase and responded to invitations to discuss the research findings. These meetings also provided opportunities for the member checking of the qualitative results. There was broad support among research collaborators for most of the personal, environmental, and earthquake-related themes. Several themes, however, were omitted from the thesis following consultation with respondents as they were deemed to be less relevant to active ageing or

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53 Due to the significant impact of the 2011 earthquake, reference group members requested that study data be investigated for physical and mental health impacts in addition to considerations of the potential effects on activities and environment. These data could not be accommodated in the present thesis and are published elsewhere.
lacking sufficient evidence\textsuperscript{54}. Personal examples of individual themes were recounted by collaborators and the implications for activity were discussed. The qualitative results were regarded by both participants and reference group members as important for the development of age-friendly infrastructure and post-earthquake development, and it was requested that recommendations be developed and shared with key stakeholders. Both reference group members and research participants also provided input into the potential dissemination of results at a community symposium in 2012 by suggesting venues, invitees, appropriate content, and presentation format. Collaborators also identified potential limitations associated with the qualitative research methods.

\textsuperscript{54} Themes omitted from the thesis included personal intimacy, transitions to retirement, self confidence and self consciousness, and the redistribution of city residents following the earthquakes.
9.3 Residential location: Why do older adults live where they do?

As a prelude to in-depth investigations concerning the potential pathways from environment to activity participation, older adults were asked to explain why they chose (or did not choose) to live in their current location as part of the activity diary exercise. If personal agency dictated residential location, then it would be useful to know which factors influenced older adults' decision-making. Furthermore, if respondents had few choices in their selection of area of residence, this information would also be relevant as it may identify salient environmental differences between areas. This investigation also addressed the possibility of reverse causation. It is possible that active older adults move into environments that facilitate activity participation (Breeze et al., 2005).

Thematic analyses of qualitative diary data revealed diverse explanations for why older adults lived in their present location, but in most cases they made deliberate and considered decisions. The only constraints to area selection noted by respondents were the cost of housing and perceptions of crime. Focus group participants commented that the cost of housing and land were ubiquitous influences on residential location over which they had little control. They acknowledged, however, that there was enough diversity within the housing market and flexibility within their personal circumstances to allow a degree of choice in residential selection irrespective of personal wealth. This finding potentially supports the phase-two result for no independent association between area deprivation and activity participation. Personal resources and a diverse housing market also allowed older adults to generally avoid perceived higher-crime areas. While barriers to residential selection were identified, older adults reported that such challenges could generally be overcome. Environmental characteristics appeared to play an important role in the residential choices of older adults. Themes included environmental pull, environmental push, downsizing, changes to health and functional capacity, and ageing in place. In the section below and in subsequent presentations of qualitative data, participant comments in text are taken directly from diary entries (except where it is stated that they reflect focus group feedback). Comments shown with photographs have been taken from the photovoice exercise and relate to specific images.

9.3.1 Environmental pull

With a lifetime of financial resources, reduced work and family responsibilities, and
previous experiences living in diverse areas, many older adults were able to make considered selections regarding the type of environment in which they wished to live after the age of 65. Environmental pull factors were conceptualised as attributes of the physical and social environment that promote activity participation, independence, and quality of life. Environmental pull factors identified by older adults included proximity to local services, facilities, and public transport; opportunities for improved lifestyle, security, or care; and closeness to family or work. Environmental pull factors exist across many urban areas and may become more or less important as older adults' personal or family circumstances change. The following respondent quotation revealed the importance of proximity to services, facilities, and infrastructure in the selection of living areas: “[I chose to live in this location because] the area was close to shopping, handy to town, and also relatively close to family in the north-west and to the bowling club” (71, Papanui High Deprivation). In addition to proximity to desirable resources, some respondents moved to their present location to be closer to aged care, family members, or to experience an improved lifestyle: “[I chose to live in this location] to move to a job which enabled me to live at home to support and monitor the condition of my parents as my mother was terminally ill and my father's health was failing” (77, New Brighton). Another respondent wrote about how the movement from the community to an independent unit in a retirement village had been a positive experience, which facilitated independence and activity in a context of care:

[I chose to live in this location because of] the security, level of care and amenities that a retirement village such as this has to offer – also the ability to be able to enjoy garden surroundings without the need to be involved in the necessary care and attention (79, Papanui Low Deprivation).

Environmental pull factors across diverse urban settings provide opportunities for residential mobility into contexts that are potentially more amenable for activity, independence, and quality of life.

9.3.2 Environmental push

Diarists described a variety of environmental push factors, which prompted movement away from a previous dwelling and towards their current location. Environmental push factors were defined as undesirable physical or social elements within the local environment that conspired to prompt a residential transition. Environmental push factors described by
respondents included unmanageable distance to necessary services, poor access to appropriate care, social isolation, stress or grief associated with a place, air and noise pollution, lack of neighbourhood support, lack of security, unhealthy living conditions, steep topography, and inclement weather. Commenting on the impact of a lack of access to services, a respondent stated, “[At my previous residential location] I had no care and lived a long walk from the shops, so decided to make the move before I was too old” (86, New Brighton). Environmental factors often acted in concert with personal challenges to prompt a move to a new residential location as described in the following quotation: “[I moved from my previous location because] the suburb was polluted with industrial gases, I was surrounded by unfriendly neighbours, and my husband had recently died” (79, New Brighton). Diarists also commented on the unhealthy and isolating conditions of their previous home environment, which provided the impetus for change: “I have poor circulation and neighbours' trees were shading the house in winter; I was freezing in a large lounge, the heat went up straight up the stairs, and I was also isolated on back section” (78, Papanui Low Deprivation). Sometimes it was neither home nor local environment that provided the drive for a move, but rather the macro-environmental forces of weather and topography: “As I lived on a hillside, my house and garden became too difficult for me” (94, Papanui Low Deprivation). In other instances, the social context of a previous residential dwelling acted as a negative influence and a prompt for residential transition: “[I moved from my previous residential location] for physical and emotional health: I had a triple bypass and my relationship with my former husband was causing stress (irritation, argument, and withdrawal)” (69, Bryndwr). It is clear that the current residential location of research participants was the result of a complex mix of positive and negative environmental stimuli, health states, and life-history factors.

9.3.3 Downsizing

Moving to a smaller home with a more manageable section was a commonly articulated reason for older adults' choice of residential location. Downsizing was defined as a movement from an environment that had become difficult to manage to a location where one could maintain activity and independence, generally at a lower level of engagement. Reasons for downsizing were varied. Declining health, widowhood, increased financial independence, or a desire for more leisure time were among the factors influencing the decision to move to smaller accommodation. Downsizing for any reason provided older adults with the opportunity to maintain their independence, lifestyle, and activities in the context of changing
personal circumstances. Widowhood and illness were identified as a rationale for downsizing: “My wife had gone into care and as I wasn't coping with the requirements of the property and my own care and well-being – the property was sold and I moved into my current residence” (90, Ferrymead). Desires to reduce a mortgage or abandon the demands of a larger property were reported by participants: “[We moved to our present location] to lessen maintenance of a 50 year old home, reduce the mortgage, and have a smaller garden” (71, Papanui High Deprivation). Research participants who chose to downsize were also motivated by the lifestyle opportunities presented by living in a modern retirement village setting: “We were looking for a smaller place as we had retired and decided to come to this village now and then were set for life” (71, Papanui Low Deprivation). Respondent comments suggest that retirement villages provided both smaller and more manageable accommodation and improved opportunities for care and leisure contrary to stereotypical images of such locations as environments for the managed transition from autonomy to dependence.

While downsizing was commonly reported as a reason for area residence, a small number of respondents reported moving to a larger home or property in retirement. This situation was atypical in the context of the research, but did expose the diversity of experiences within the population of older adults who live independently. Practical needs associated with hosting other family members or the unexpected discovery of the perfect section or retirement project provided impetus for some older adults to purchase a larger dwelling. Older adults who reported a move to a larger property tended to be younger members of the sample.

While downsizing was not ubiquitous among respondents, it was a powerful motive for residential location and transitions for many in later life.

### 9.3.4 Health or functional changes

Related to the concept of downsizing was the experience of health and functional decline in later life, which often precipitated transitions to a more manageable living
environment in later life. In particular, joint and mobility problems, cardiovascular events, and age-related chronic disease were identified as factors driving the move to more appropriate accommodation. Smaller property sizes, flat topography, ease of access within the home, and proximity to health care services were main concerns for those who moved for health reasons. Linking their health to a need for more manageable accommodation respondents commented, “We lived in [a hilly street] and [my husband] had problems walking and needed knee replacements, so at age 70 we felt it was time to move off the hill (84, Redcliffs)”; and “We lived in [a rural area] on a small farm with a very large garden, which we loved, but we found it too much to manage as I had back and leg problems” (77, Papanui High Deprivation). Older adulthood is not always associated with a residential transition, however, and some respondents elected to continue to live in familiar circumstances.

9.3.5 Ageing in place

Ageing in place was defined simply as remaining in the family home beyond age 65 years. No judgement was made concerning whether this concept must be experienced as a single or partnered individual. As it is reflected in this research, ageing in place relates only to the themes and examples offered by respondents. There may, therefore, be a wider diversity of reasons as to why older adults choose to remain in a particular location in later life, although these were not identified in this research. The family home was a place where children were raised and educated, where the everyday experience of marriage was enacted, where the dream of home ownership was fulfilled, and where amenities and places of work or study could be readily accessed. The purchase of a family home may have originally been associated with proximity to school zones, access to places of work, and the cost of land or housing, but remaining in such a location beyond retirement was usually associated with different motives. For many older adults, the memories, familiarity, and convenience of the family home provided an incentive to age in place. Family homes were also often subdivided or renovated over time to meet changing family and functional requirements. The following quotations provide evidence for the importance of the family home as a viable residential option for older adults: “Had enough money to get a home, wanted to buy home rather than rent, liked the suburb and the character home, situated close to all amenities, being 35 plus felt it was time to get own home” (67, Rutland); and,
In 1967 with four children we needed a bigger house and this location was ideal for proximity to schools desired, and to my own work. In 1991 we subdivided and built a new house. We love the area being close to Hagley Park and the city (80, Holmwood).

Remaining in the family home helped to retain continuity with meaningful early life experiences and provided opportunities to realise the intangible benefits of a valued residence, such as memory and history.

9.3.6 Summary

Older adults identified five reasons to explain why they resided in their present location: (a) environmental pull, (b) environmental push, (c) downsizing, (d) health change, and (e) ageing in place. In each instance, older adults exercised their personal agency in choosing to move to or remain in their current residential address. None of the respondents considered themselves to be victims of circumstance; all had deliberately chosen their location within the limits of personal resources and knowledge. The findings suggest that there are both personal and environmental reasons for residential location in later life and that movement into settings more amenable to activity participation and health is common. Self selection of respondents into activity promoting areas could be considered a potential limitation of this research as most of the study areas were chosen, in part, because they had higher proportions of older-adult residents (>20% of total population). There are several reasons, however, why this is unlikely to be problematic: (a) personal factors, including health, also contribute to dwelling location in later life; (b) study areas were selected to maximise diversity of land use, deprivation characteristics, and population composition; (c) the ubiquity of choice among both well-off and less-affluent older adults suggests a continual search for better living circumstances across the life course irrespective of personal resources; and (d) comments from residents in the control areas of Bryndwr and Rutland supported both the environmental push and ageing in place themes, which suggests that choice of residential location was not limited to those who were located in areas with higher populations of older adults.

9.4 Expressions of active ageing

To provide validation and elaboration for the phase-two survey findings and assess participation in more detail, respondents were asked to keep a record of their activities for 14
Results and discussion three: pathways to active ageing

Days as part of diary writing procedures during the third research phase. The heat map below (figure 24) displays the mean activity participation scores for 66 diarists across a range of domains and settings over the course of 14 days in March and April 2011. The diary results were largely consistent with the survey findings. Physical, social, and cultural activities undertaken in the home and local environment were commonly expressed, while civic, spiritual, and economic activities were reported comparatively less often. In contrast to the survey results, home-based activities were reported more often than those in the local environment. As the diary was completed in the weeks after the devastating February 2011 earthquake, it is possible that higher levels of home-based activity were due to hazards in the local environment, damage to local services and facilities, and disruptions to transportation networks, which potentially constrained activities in the local environment and beyond.

Figure 24: Heat map for mean activity type and location over 14-days

Respondents were involved in a variety of activities during March and April 2011, which were reported as part of daily diary entries. Table 20 identifies all reported activities and highlights the manner in which older adults conceptualised the components of active ageing. The majority of diarists reported engaging in multiple activities across several domains on a daily basis, which reinforces survey findings for a relatively active study group.
The continuation of diverse activities in the aftermath of the February 2011 earthquake is also indicative of an active and resilient population. During focus group discussions in August 2011, respondents noted that while it was possible for them to define a main purpose or function, most activities undertaken reflected a range of domains. For example, focus group participants noted that many physical and social activities were often inseparable, such as playing bowls or participating in a walking group. Some respondents commented that they were not used to thinking about their activities in such a compartmentalised fashion. During diary completion, however, respondents were given the option to assign a specific activity to more than one activity domain to reconcile this concern. In practice, most activities were assigned to a single activity domain, which suggested that older adults recognised a main purpose for each of their reported behaviours. Older adults' subjective assignments of their activities to particular behavioural domains occasionally diverged from definitions provided in the diary. For example, economic activity was defined in the diary as earning money for self or family, but older adults also considered financial transactions, managing one's financial interests, or undertaking economising behaviour (such as growing and preserving fruit and vegetables) as examples of this type of activity.
Table 21: Activities undertaken during the 14-day activity diary exercise

<table>
<thead>
<tr>
<th>Activity type</th>
<th>Reported activities</th>
</tr>
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<tbody>
<tr>
<td><strong>Physical</strong></td>
<td></td>
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<tr>
<td></td>
<td>Walking for leisure, exercise, or transportation</td>
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<tr>
<td></td>
<td>Cycling for leisure, exercise, or transportation</td>
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<tr>
<td></td>
<td>Sports participation (bowls, tennis, golf, croquet)</td>
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<td></td>
<td>Fitness classes (Pilates, Tai Chi) or gym exercise</td>
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<tr>
<td></td>
<td>Physiotherapy or rehabilitation exercises</td>
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<tr>
<td></td>
<td>Swimming</td>
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<tr>
<td></td>
<td>Fishing</td>
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<tr>
<td></td>
<td>Gardening and home renovation</td>
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<tr>
<td></td>
<td>Earthquake repairs and clean-up activities</td>
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<tr>
<td></td>
<td>Activities of daily living (including self care and household chores)</td>
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<tr>
<td><strong>Social</strong></td>
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<tr>
<td></td>
<td>Socialising with family</td>
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<tr>
<td></td>
<td>Socialising with a spouse or partner</td>
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<td></td>
<td>Socialising with friends or workmates</td>
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<td></td>
<td>Visiting or hosting others</td>
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<tr>
<td></td>
<td>Social club participation or group outings</td>
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<td></td>
<td>Attending a local pub, working men's club, or war veterans' association</td>
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<tr>
<td></td>
<td>Visiting the hairdresser or beauty salon</td>
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<tr>
<td></td>
<td>Communicating with others via telephone, email, or letter writing</td>
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<tr>
<td><strong>Cultural</strong></td>
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<tr>
<td></td>
<td>Watching television or listening to the radio</td>
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<tr>
<td></td>
<td>Reading (books, newspaper, magazines, or internet websites)</td>
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<tr>
<td></td>
<td>Cooking, baking, and preserving</td>
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<tr>
<td></td>
<td>Playing games (board games, cards, puzzles, computer games, word or number problems)</td>
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<td></td>
<td>Theatre attendance</td>
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<tr>
<td></td>
<td>Writing for pleasure or publication</td>
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<tr>
<td></td>
<td>Studying or researching, University of the Third Age (U3A) attendance</td>
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<tr>
<td></td>
<td>Model making or craft work</td>
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<td></td>
<td>Quilting, sewing, or knitting</td>
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<td></td>
<td>Playing or listening to music / singing or choir</td>
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<tr>
<td><strong>Civic</strong></td>
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<td></td>
<td>Church responsibilities and charitable organisation roles</td>
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<td></td>
<td>Volunteer work (airport information, guided walks, citizen's advice)</td>
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<tr>
<td></td>
<td>Minding grandchildren</td>
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<td></td>
<td>Sharing food and other resources with neighbours</td>
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<td></td>
<td>Visiting unwell friends at home, hospital, or in an aged care facility</td>
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<tr>
<td></td>
<td>Taking care of homes or pets for friends, family, or neighbours.</td>
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<tr>
<td></td>
<td>Donating blood, books, or money</td>
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<td></td>
<td>Knitting clothes for underprivileged children</td>
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<td></td>
<td>Helping friends, family or neighbours with earthquake-related problems</td>
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<td></td>
<td>Contributing as a volunteer to the earthquake recovery activities</td>
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<td></td>
<td>Providing shelter and support for displaced family after the earthquake</td>
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<tr>
<td><strong>Spiritual</strong></td>
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<td></td>
<td>Prayers and bible reading</td>
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<tr>
<td></td>
<td>Meditation and contemplation</td>
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<td></td>
<td>Church service attendance or temple visits</td>
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<td></td>
<td>Alternative healing sessions</td>
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<tr>
<td></td>
<td>Funeral attendance (natural death and earthquake casualties)</td>
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<tr>
<td><strong>Economic</strong></td>
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<tr>
<td></td>
<td>Banking, financial planning, or share trading</td>
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<td></td>
<td>Meeting with lawyers, real estate agents, trades people, or sales people</td>
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<tr>
<td></td>
<td>Car servicing or warrant of fitness</td>
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<tr>
<td></td>
<td>Shopping for necessities</td>
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<tr>
<td></td>
<td>Paid employment or self employment</td>
</tr>
<tr>
<td></td>
<td>Preserving fruit or vegetables (economising behaviour)</td>
</tr>
<tr>
<td></td>
<td>Earthquake Commission claims and insurance matters</td>
</tr>
</tbody>
</table>
9.5 Environmental and personal influences on active ageing

I really believe in active ageing and think my generation is much younger than my parents were at the same age. Keeping active and being social with good friends is very important. Life is for living! (66, North Hornby)

The phase-two survey results indicated that several personal and environmental variables were associated with particular domains of active ageing. These results are extended by the diary and photovoice data gathered in 2011, which identify specific pathways through which environmental factors potentially influence active ageing. Reported environmental influences on activity participation were numerous and related to the contexts of home and local environment, retirement living communities, social networks, and climate. Personal influences were also identified and included health and disability; interest, motivation, and belief; and routine and continuity.

Following a recommendation from reference group members prior to the commencement of the third research phase, space was allocated in the diary to allow respondents to comment on the influences on their activities of daily living in addition to the six identified domains of active ageing. During completion of the 14-day diaries, however, respondents did not comment extensively on their activities of daily living. The diary was intended to be a record of meaningful rather than incidental activities, and respondents reported their activities in the manner that was intended. When they were mentioned, activities of daily living were conceptualised by respondents as self-care and grooming, household chores, meal preparation, and procurement of daily necessities. Such activities were often conceptualised within the physical or economic domains if they were mentioned at all. Commenting on their treatment of activities of daily living within the context of the diary respondents stated, “I mostly don't mention ADLs [activities of daily living] like showering, washing, ironing, window cleaning etc. as I class them as routine – I am able bodied therefore for me they present no problem” (70, North Hornby); and “Everyday I have showered, dressed, prepared things to eat, and undertaken minor housework – as these are basic daily requirements I have not included them [in the diary]” (71, Central City). As all research participants were living independently in communities of their choice, it is likely that many had a relatively high level of functioning and, as a consequence, had little difficulty executing their activities of daily living.
9.5.1 Home environment

The home environment formed a nexus of activity participation for older adults. It was a site of physical, social, cultural, and spiritual activity. During group discussions, older adults supported the notion of home as a central location for active ageing and identified it as particularly important for interactions with family members. Themes that emerged from qualitative analyses and which were corroborated by participants during focus group discussions included garden exercise, propagation and production, pleasure garden, productive core, home sanctuary, neighbourliness and the local aesthetic, and social isolation.

9.5.1.1 Garden exercise: my own private gymnasium

Garden exercise was identified as an important theme during the diary writing process and is defined as health-promoting physical activity undertaken in the private outdoors. Many research participants were physically active within the context of their private gardens and they considered activities undertaken within this environment to be an important contributor to their health and fitness. The garden played two important roles as a facilitator of exercise for older adults: (a) it acted as a primary location for the execution of physical activities, and (b) it provided an auxiliary context for activity performance when climatic conditions were not amenable or when other facilities were unavailable. The features of the private garden that rendered it conducive to exercise performance included accessibility, familiarity, and the opportunity to combine fitness activity with daily or seasonal chores. Evidence for the garden as a location for physical activity participation was evident in the following quotations: “I usually do my own housework and garden care…that is my gym exercise” (79, New Brighton); and “After the usual daily jobs i.e. showering, clothes washing, housework, I enjoyed trimming the edges of lawns and paths at the back of the house as I was out in the fresh air getting exercise” (71, South Hornby). Garden as an auxiliary exercise location was also reported by respondents: “The wind was too strong and cold to walk on the pier – half an hour in the garden with pruning shears helped restore some equilibrium” (77, New Brighton).

9.5.1.2 Production and propagation: the giving garden

In addition to its role as a facilitator of physical activity, the garden was also an important site of production and propagation and was a commonly photographed setting.
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during photovoice procedures. Production and propagation is defined as growing and harvesting fruit and vegetables for self or family within the home environment. This activity may be conceptualised as either physical (labour associated with maintaining or harvesting produce), civic (supplying food for family and friends) or economic (financial savings associated with home production). Notably, those older adults who were involved in the production of fruit and vegetables were living independently in community settings, rather than in retirement villages where space for productive gardens is comparatively limited. Participants expressed satisfaction and enjoyment in being able to produce food for self or others and spend time outdoors. The theme of production and propagation is also linked to the concept of garden exercise, and many respondents valued the multiple benefits afforded by working in the garden. The theme of production and propagation was supported by photovoice data.

Enjoying the garden: The climate here in Canterbury allows me to continue (at 81 years of age) enjoying maintaining an attractive and productive garden, as I have done for much of my life (81, Holmwood).

Harvesting pears: Having fruit and nut trees on my property keeps me active by harvesting the fallen crop (86, New Brighton).

The vegetable garden: We have quite a big garden and my husband likes to grow all the vegetables that we need for ourselves and our family. He likes to supply our daughters, who all have their own homes, with veggies. This keeps him and me quite busy – planting, weeding, picking, freezing etc. (71, South Hornby).

Figure 25: Photovoice depictions of production and propagation
9.5.1.3  Pleasure garden: a private haven

The garden was not only a location for exercise and food production, but also an important setting for the enjoyment of nature and the creation of aesthetically pleasing vistas. The **pleasure garden** theme is conceptualised as the maintenance and enjoyment of visually attractive plantings within the private realm. Pleasure gardens are associated with physical activity (labour associated with the upkeep or development of a garden), social activity (the enjoyment of a garden in the company of others) and spiritual activity (experiencing an intangible connection between self and nature). In contrast to the production- and exercise-related themes, which emphasise physical exertion, the pleasure garden theme has firm associations with relaxation, recuperation, and transcendence. Moreover, older adults do not require a large, outdoor area to develop and experience a pleasure garden. A potted garden is adequate in some cases. For this reason, pleasure gardens are permissible in a range of living situations, including retirement communities. Photovoice images and comments are presented below as evidence of the pleasure garden theme (figure 26).
Our garden: I enjoy gardening. This was begun when we moved six years ago and is starting to look reasonable. We like to sit outside with friends or on our own as it is pleasant. The native trees are encouraging the native birds to come, which we both enjoy (66, Ferrymead).

My potted garden: I chose to have a sealed terrace instead of lawn. Pots are easy care and bring variety as I move them about in order to have some colour outside every window for most of the year (79, New Brighton).

Autumn chores: With a small garden, shrubs have to be pruned after flowering to ensure they do not dominate the garden or swamp neighbouring plants...General gardening is a soothing and settling occupation. It equals normalcy (83, Redcliffs).

Garden by front door: One of my main pleasures is gardening – more of a passion really. I find it a very spiritual pastime (71, Central City).

Figure 26: Photovoice depictions of the pleasure garden

9.5.1.4 Productive core: the active indoors

The garden was not the only context for older adults' activity participation within the home environment. The private indoors also afforded opportunities for expressions of active ageing. The concept of the productive core describes diverse activities that provide a tangible and valued outcome in the form of food production, knowledge or skill development, home-based employment, or the creation of goods, which are undertaken within the indoor setting of
one's home. This theme describes both traditional forms of work and serious leisure engagement within the realms of civic, social, cultural, and economic activity. These activities align with the production and propagation theme as cultivated fruit and vegetables are often further prepared or preserved indoors. In several cases, the home environment was deliberately set up to provide opportunities for production with space set aside in a kitchen, study, or workshop for productive tasks. Productive activities were depicted during photovoice procedures.

**Bottling fruit:** Cooking and bottling fruit, both my own fruit and fruit sent to me, keeps me active in the kitchen (86, New Brighton).

**Two model buffs:** My husband's workshop where he handbuilds model locomotives. It is also a meeting place for like minded people. The cabinets are full of his models (40 years work) (72, Ferrymead).

**Our study:** My wife runs her underwear business from here, phoning and keeping records. Another room is used as a fitting room. (71, Papanui High Deprivation).

**Another quilt:** My hobby of patchwork quilting, some by machine and some by hand. Patchwork is very mathematical and keeps one's brain active. Also, one mixes with groups of people with the same interests (66, Ferrymead).

Figure 27: Photovoice depictions of productive core
9.5.1.5 Home sanctuary: a castle at the centre

The home sanctuary theme describes the arrangement and resourcing of the indoor realm to facilitate informal and interactive activities without the need for external engagements or obligations. Home sanctuary activities were conceptualised as keeping the mind active, relaxation, amusement, family interaction, and psychological fulfilment. These activities are consistent with cultural and social activity domains of the active ageing concept. Involvement in such endeavours reveals the importance of non-physical pursuits that are valued for their intrinsic qualities and accessibility for all older adults, including those who are frail or unwell. Respondent comments revealed that time spent within the confines of the home environment was highly valued as a facilitator of activity participation: “A day with no contact outside the property – a satisfying and full afternoon spent in the garage and laundry altering shelving, fitting a towel rail, repairing a storage cupboard damaged in the shift” (79, Papanui Low Deprivation); and “I am not a person who gets involved in civic or volunteer work, but am very family involved and enjoy home, garden and pets – my home seems to be the social centre for family gatherings” (70, North Hornby). Participants also addressed the home sanctuary theme during the photovoice exercise.
Keeping the brain active: Enjoying the challenge of puzzles, while sitting in my sun-room in the available sun keeps my brain active and alert (86, New Brighton).

Bookcase in lounge: As I have quite painful arthritis and many joint replacements, I now read a lot, which is one of life's pleasures (71, Central City).

Family time: My youngest daughter and her partner at a family dinner at my house. Seeing her and spending time with her regularly stabilises me psychologically (69, Bryndwr).

My lounge: View of lounge in unit. All double glazed and warm. Enjoy reading, doing crosswords, code crackers, scrabble etc. Also watch a lot of sport on TV (66, Central City).

Figure 28: Photovoice depictions of home sanctuary

9.5.1.6 Socio-spatial isolation: home as a prison

One of the few negative environmental influences on activity participation identified by diarists and associated with the home environment was socio-spatial isolation. This theme describes feelings of insecurity and loneliness in the home environment, reduced network participation, and difficulties interacting with others in social settings. When socially isolated, the home environment became more of a prison than a sanctuary as there were limited opportunities for outside interaction. The home environment did not appear to be a cause of social isolation for older adults, but it was the context for isolation when network participation declined or when exposed to antisocial behaviour in one's surroundings. Socio-spatial isolation was described as a constraint to social, cultural, and civic activity participation in particular. Respondents wrote about the isolating impacts of separation from a partner, the
death or illness of close friends, and the loss of mental faculties necessary for social interaction:

Had I been writing of my activities several years ago, I would have been able to report my enjoyment of musical events etc. day or night, but loss of elderly friends, mainly through deaths, has resulted in few friends able or willing to go out at night times. I miss those occasions (89, Rutland).

I don't bother a lot with other people because I forget their names after introduction and can't make much conversation accurately of recent events – that's how it is – what you see is what you've got. No civic or volunteer activities for the above reasons (81, Papanui High Deprivation).

The local environment also presented challenges that constrained activity participation beyond the home. In the example below, a respondent describes the isolating influence of criminal neighbours and her resultant feelings of insecurity:

Saw no one today. A bit down and unmotivated…My very private section used to be my haven at the end of a working day and a place of pleasure at weekends. Now it is a barrier to everyday contact with others. Interesting how things change…Young neighbours who were in prison and correction centres for drug dealing are now back home. Although they are not threatening in any shape or form, my awareness of their illegal activities makes me nervous (66, North Hornby).

9.5.1.7 Neighbourliness and the local aesthetic: engagements at the edge of empire

The boundary between the home and local environment was the context for engagement in a variety of physical, social, and civic activities among respondents. Neighbourliness and the local aesthetic refers to the contributions of older adults to the attractiveness, orderliness, and social capital – norms of reciprocity and trustworthiness arising from social connections and network participation (Putnam, 1995) – in their immediate locality at the interface between their home and the local environment. This theme is expressed through maintaining a tidy and attractive garden at the interface between the private and public realm, undertaking altruistic deeds for nearby residents, and engaging in positive interactions with neighbours. Diary data revealed how garden work in the vicinity of one's home supported the local aesthetic: “A lot of people in my street have lovely gardens, so I think it is important to keep mine as tidy as possible” (71, Hawthorndon); and “In a prize-winning garden street, the garden keeps me busy – it is large and satisfying and enjoyable”
(75, North Hornby). Respondents also commented on their positive interactions with neighbours and described how these relationships inculcated feelings of security and community: “We are a very happy neighbourhood and everyone watches each other” (82, Holmwood); and,

I feel as if I am safe in my environment and live close to a bus stop and shopping. Also am so lucky to have caring neighbours...It was a good feeling to know that so many people in our street took the time to come to the BBQ and were willing to meet each other...I met and talked to neighbours I had not met before (80, Hawthorndon).

Neighbourly behaviour and contributions to the quality of one's immediate environment were also depicted by respondents during the photovoice exercise. The images and associated comments affirm the interplay among physical, social, and civic activity.

**Figure 29: Photovoice depictions of neighbourliness and the local aesthetic**

Sweeping and tidying driveway: Having a long driveway keeps me active by sweeping and tidying on a regular basis, creating a tidy and clean image for myself and my neighbours (86, New Brighton).

Looking after my street: I love my garden and do all the work in it myself – pruning, mowing lawns etc. I also keep the street lawns and gardens trimmed for all my neighbours. (65, Papanui High Deprivation).

Meeting a neighbour: On my way to walk the dog – my neighbour is just back from work and it is a good time to have a chat (68, Holmwood).

Bins collection: Bins being taken out for east side [retirement] units to the street. I also put bins out for west side residents on the adjacent street. I normally have 20 bins in total (66, Central City).
9.5.2 Retirement communities

Retirement living communities provide examples of settings that are specifically designed to meet the residential and lifestyle needs of older adults. During focus group discussions, respondents indicated that retirement living environments were significantly different from general community settings. In particular, participants felt that there were opportunities for activity participation and social interaction in such settings that were not available in other areas. Focus group participants also noted that there was no pressure to be involved in retirement community activities and that one could freely prioritise family interactions, personal time, or engagement with organised activities. Retirement community residents who lived independently often had access to resources and activities both within and beyond the confines of their village. Two emergent themes related to older-adults' activity participation were identified in the context of retirement living communities: shared values and age-appropriateness.

9.5.2.1 Shared values: interactions with like-minded peers

One of the unique features of retirement living communities is the clustering of similar-aged individuals within a defined geographic location. In many cases, this brings together people who share similar values and lifestyles as a result of age or generational attributes. Living in such environments often reduces exposure to negative social encounters and facilitates interaction with a network of peers, which supports social activity in particular. Shared values is closely related to the theme of neighbourliness, although it emerges more by design than happenstance or individual volition in the purpose-built setting of a retirement living community. In support of this theme, diarists made the following observations: “Living in a group of units like ours, we all chat when we meet putting out bins, collecting mail, and gardening, which is nice” (72, Ferrymead); “It is very peaceful living in this nine-house community – there is no loud music or domestic violence intruding on us and we all appreciate this” (79, New Brighton); and “On Wednesday afternoons we get together for maybe a couple of hours, play [card games] sit and chat over a cup of tea…I enjoy the company of other people in the village” (80, Ferrymead). The shared values theme was also depicted by participants in their photovoice images and comments, which emphasise how

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55 In the context of the present research, retirement living communities refer to independent units within retirement villages and to community based older-adult housing. Both of these living arrangements constitute agglomerations of older adults situated in purpose-built environments for the elderly.
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proximity to similar-aged peers within a purpose-built setting facilitates social activity.

Weekly outing: My retirement village provides weekly outings to local places of interest. I appreciate the company of others. This outing was to [a rural township] (77, Papanui Low Deprivation).

Homes for the over 60s: This is a wonderful environment. We all moved into our new homes about the same time six years ago. Friendships are deepening and we watch out for one another. We enjoy one another's grand and great grand children. Have meals together at least three times yearly. And retain our individual interests (79, New Brighton).

Figure 30: Photovoice depictions of shared values

9.5.2.2 Age-appropriateness: a setting for care and independence

In addition to a positive social environment, the retirement community setting also provides varying access to diverse and age-appropriate services and facilities. Resources available in some settings include community centres, libraries, internet cafés, swimming pools, gymnasiums, tennis and pétanque courts, indoor and outdoor bowling greens, croquet lawns, golf facilities, craft rooms, bar facilities, hair salons, shops, church or worship rooms, organised social events and outings, group exercise classes, and health facilities. These facilities and services provided support for physical, social, cultural, and spiritual activities among residents. The availability of trained staff (predominantly in licensed retirement villages) was regarded as an important facilitator of activity participation as residents did not need to be overly concerned with encountering situations beyond their level of competence as assistance was always close at hand. Contributions of retirement village environments to physical and social activity are evident in the following respondent comment: “I am in a retirement village – there are plenty of exercises and other activities to join in plus a small garden, which I enjoy tending…a friend and I walked to community room for entertainment

56 There are large variations in the services and facilities provided among privately run retirement villages and older-adult housing developments in New Zealand. A majority of the research participants who lived in retirement housing were situated in the high-quality and relatively well provisioned Ngaio Marsh retirement village. This may account for older adults' overwhelmingly positive perceptions of their surroundings.
and social hour” (94, Papanui Low Deprivation). Another respondent wrote of the diversity of activities and facilities available within the context of a retirement village:

A great range of activities, amenities, and great social life in this retirement village populated with many good, bright, brave, friendly, interesting people. Great staff who set great atmosphere – fun and caring…Swim and BBQ by courtesy of the village, exercises an initiative of [the retirement village owners]. Pool and fitness class available in the village. A trained instructor takes exercises for the village residents (78, Papanui Low Deprivation).

Photovoice depictions of retirement living environments emphasise the diversity of appropriate services and facilities available to residents, which support activity participation even when physical capacity is reduced.

Figure 31: Photovoice depictions of age appropriate services and facilities

### 9.5.3 Local environment

Local environment is pretty important I think, especially for older people…the ability to be able to access the facilities you need, shops, medical centres, pharmacy, and supermarkets. If you're not close to the supermarket you have to drive, but if it is only a block or two away you can walk. If you've got all those things reasonably accessible and close to home, it makes things a lot easier (82, New Brighton).

Like the context of home, the local environment was a nexus for older adults' activity participation. The local environment influenced activity in a variety of ways, but was
consistently described as a facilitator of participation. Excluding the effects of the 2010 and 2011 earthquakes, no pre-existing constraints to activity were identified in the local environment by diarists, which stands in contrast to the findings of the phase-one observations. In particular, the local environment had a positive influence on physical, social, and civic activity. Themes identified during the research procedures included familiarity, local amenity, proximity and accessibility, walking distance and walkability, local interaction, and local activity destination.

9.5.3.1 Familiarity: the people and places I know

Familiarity with the local environment was reported as a facilitator of activity participation by respondents. This theme refers to the degree to which an individual has engaged with local people and places over time and the resultant knowledge and understanding. Familiarity incorporates not only the length of time that an individual has lived in a particular setting, but also the level of immersion in local resources and networks. This theme appeared to promote activity participation through the development of sustainable social networks, intimate knowledge and understanding of local resources, and ongoing participation and investment in community affairs. Familiarity with an area was reportedly associated with physical and social activity in particular. Respondent comments addressed the importance of familiarity for long-term residence and activity participation: “I have stayed in the general area where I knew people and shops – our family, two girls and a boy, has been in [this neighbourhood] for 40 years, although the girls moved when they got married” (72, Ferrymead); “We have both lived in the Hornby area all our lives and have belonged to social and sports clubs – we do know a lot of local people” (71, South Hornby); and,

We've lived in this locality for 9 years now, we know many people, have neighbours who are also friends. We feel understood and known in the locality. Can do all of my preferred activities on foot, or short drive. Good mix of flat, hill, and seaside for activities (75, Redcliffs).

It appears that familiarity with an area inculcates feelings of belonging, affective bonds to local people and places, and the development of in-depth knowledge that are enacted and reinforced over many years to support active ageing among long-term residents.
9.5.3.2 Local amenity: pleasant and useful settings

Respondents wrote of the importance of local amenity, which refers to the pleasant and useful aspects of the local environment that encourage activity participation and foster an affective connection between people and place. When reporting on the amenity of their local area, respondents described the pleasantness, peacefulness, and utility of their surroundings as aids to physical and social activity in particular. Natural areas (such as parks, rivers, and coastal environs) were regarded as inherently pleasant and peaceful, while local resources (such as shopping malls and public transport) were identified as useful activity supports. Describing the influence of local amenity on physical activity, respondents made the following comments: “The local pier looked so inviting in the sunlight, so I walked to the end and watched people fishing” (72, New Brighton); and “Very pleasant surroundings – good for walking, biking, and playing with grandchildren” (73, Hawthorndon). Respondents also commented on how the amenity of their local area contributed to their social activities: “A pleasant suburb for living with good surroundings, schools, and availability for easy transport to city and other areas…pleasant, busy local mall – shopped with a friend after lunch there” (89, Rutland); and “Refresh ing beach and river walks, nearby shops, interesting neighbours and chats most days – friends and family from other locations enjoy visiting me in this location for a meal and a walk in any season” (79, New Brighton). Areas with a high level of amenity appear to support activity by appealing to older adults' interests and also to their preferences for local aesthetic and sensual qualities.

9.5.3.3 Proximity and accessibility: getting to and getting in

Proximity and accessibility to local services, facilities, and social networks was reported as a facilitator of activity participation. This theme refers to both the closeness of resources as well as their usability for older adults. Proximity and accessibility was associated with physical activity, cultural activity, and social activity. Social and cultural activity participation was influenced by the proximity and accessibility of local destinations and networks, including community markets, cafés, nearby family and friends, shopping malls, libraries, and social clubs. Physical activities were supported by the accessibility and proximity of coastal environs, riparian margins, swimming pools, walking infrastructure, and shopping malls. Proximity and accessibility is closely related to the theme of familiarity as knowledge and long-term residence are likely to support understanding and utilisation of local
facilities and networks. Participants from diverse study areas, including locations with low numbers of older-adults, considered their local environment to be accessible and a facilitator of activity participation: “We are about 10 minutes from Central City and close to good schools, work, eating places, pubs, churches, and university” (67, Rutland); and “I am close to many facilities which I consider important to my daily life (library, parks, shops, and swimming pool) and this makes my life pleasant” (69, Bryndwr). Comments addressing how social activity participation was associated with accessibility and proximity included the following: “As I live quite close to the local mall, coffee shops, and working men's club, I go to these places quite often to meet friends and socialise” (71, South Hornby); and,

The monthly market is always popular, and I usually try to visit it...I needed to do some shopping and I was hoping to see some friends at the market...I live close to all the amenities, so I try to go out every day for shopping or visiting my favourite coffee shop. I usually see somebody that I know, to chat to, and I have got to know quite a few of the shop owners (72, New Brighton).

Respondent comments also supported proximity and accessibility as a facilitator of physical activity participation: “I enjoy the local women's gym and am happy to go regularly – I probably would not do this if I had to drive a long way to get to the gym” (71, South Hornby). When age-appropriate facilities and networks are close to an older adults' place of residence and can be readily used or attended, activity participation may be encouraged as a result.

9.5.3.4 Walking distance and walkability: environmental support for a preferred activity

Closely related to the notions of proximity, accessibility, and local amenity are the concepts of walking distance and walkability. Walking distance was defined as the space or time between an individual's place of residence and important local physical or social resources, which could be accessed on foot. Walking is an important activity for many older adults and is usually undertaken for the purposes of transportation, leisure, or exercise. Diarists associated walking with physical activity and social activity in particular. There was a significant diversity in individual perceptions of walking distance among focus group participants. While some considered the distance covered in 10 to 15 minutes (approximately 400 – 1000 metres) to be a manageable walk, others noted that they were comfortable walking up to five kilometres. The focus group agreed that the notion of walking distance varies in relation to health and functional ability and also with regards to the particular mode of activity.
undertaken. For example, focus group participants commented that they would walk further for exercise than they would to access local services or facilities. Associations with physical and social activity were supported by the following respondent quotations: “Hornby mall is within walking distance – a conveniently close destination for socialising, banking, and shopping opportunities” (66, North Hornby); and “We are about 4 minutes walk from a bus stop, the local mall is 10 minutes walk, and the bowling club is 15 minutes walk” (73, Hawthorndon). Walking distance is particularly important for older adults who have reduced functional capacity or have stopped driving as evidenced in the following diary comments: “A shopping mall is nearly 10 minutes away, which I can walk to as I do not have a drivers license – near to a good bus service and nice areas to walk in” (71, Hawthorndon); and “I am now two small blocks from shops and having had a stroke four and a half years ago find I can manage the distance very well with my walker” (86, New Brighton).

Walking within the local environment is also contingent upon the conditions and resources available for this activity. Walkable environments were defined by research participants as areas that support walking, afford the enjoyment of nature or attractive settings, and provide protection from traffic. Pleasant, natural surroundings were particularly valued as facilitators of walking within the local environment, which complements the local amenity theme. Commenting on how local parks encouraged walking a respondent stated, “Hagley Park is great to walk in, you can change your route everyday if needed, and the green open space so close to the centre of the city is unique” (70, Holmwood). For those in coastal areas, the beach, pier, and estuary, also provided a supportive walking environment: “Walking in this part of the city is always refreshing and relaxing…with or without company I find the beach refreshing” (79, New Brighton). Addressing the importance of perceived neighbourhood safety as a facilitator of walking behaviour, a respondent commented, “I am in a street with people of my age; it is also a flat area…a nice, safe area for walking” (74, North Hornby). In support of walking behaviour, local environments must provide ready access to valued resources as well as high-quality, attractive, and safe infrastructure that is suitable for older adults.

9.5.3.5 Local interaction: people places

The local environment was an important site for older adults' social network participation. Local interaction was described by respondents as activity undertaken within
the proximate environment due to the availability of supportive resources (clubrooms and churches) and individuals (friends, neighbours, and family). Respondents emphasised the importance of being able to regularly access network members within the confines of their own neighbourhood and to then venture forth into shared and local activities. Local interaction is closely related to the themes of familiarity and proximity and accessibility whereby the development of stable and long-term networks in one's nearby surroundings supports activity participation in later life. Local interaction was particularly associated with physical, social, and civic activities. Valued local activities included group walking or jogging, sports club participation, spending time with grandchildren at a local park, attending local markets or shopping areas, church attendance, interacting with neighbours, and visiting local libraries. Diarist comments supported local social and civic interactions: “Some of my regular interests and activities are local – church, opportunity shop, friends and neighbours provide a strong support network” (77, New Brighton); and “Great to be involved in the local church and have opportunity to be part of the pastoral care of local people in need – I do enjoy the walk to and from church only two blocks away” (79, New Brighton). Respondents also wrote about the importance of local interaction for physical activity participation:

Off to the park with the grandchildren and their bikes. They love going to the park for swings and slides, biking, and feeding the ducks. Two year old has a push along and four year old has a small two-wheeler [bicycle] and they can go like the wind, so I have to be fit to chase them (77, Papanui High Deprivation).

The importance of local network interactions to the physical and social activity repertoires of older adults was reinforced by photovoice images and comments (figure 32).
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Monthly market: It's good to support local business and craft stalls, and a chance to bump into friends (72, New Brighton).

Seniors walking group: Leaving the community centre for our first walk since the earthquake. This is the meeting place for a regular 2-3 hour walk on Tuesday (78, Redcliffs).

Half marathon runner: I have run for over 35 years with friends and have run all over Christchurch, hills etc. This photo shows my group of friends who regularly run together every Sunday morning plus one other day in the week. We run all over Christchurch as well as our local communities (65, Papanui High Deprivation).

Club tennis: Allows me to participate in a social environment with many tennis friends. Proximity of club within the same suburb allows me to cycle and not drive a car (80, Holmwood).

Figure 32: Photovoice depictions of local interaction

9.5.3.6 Local destinations: activity settings

In addition to access to a supportive and proximate social network, the local environment also provided the physical resources necessary for activity participation. The local destination theme describes appropriate infrastructure in the proximate environment that supports older adults' preferred activities. When depicting valued destinations, photovoice respondents photographed and commented on local facilities that supported physical activity and cultural activity in particular. Local destinations that facilitated activity participation included parks, coastal areas or beaches, fitness centres, sports clubs, libraries, churches, and shopping areas. Activity destinations were particularly valued for their support of walking, which is consistent with the walkability theme. A salient difference between the activity
destination and local interaction themes concerns the degree of social participation. Local destinations are valued for their capacity to support specific modes of activity rather than as gateways to social interaction. Representative images and comments supporting the local destination theme were provided by photovoice respondents (figure 33).
The pier: Our pier is lovely and it's great to be able to walk on it when the tide is in and I cannot walk on the beach (73, New Brighton).

Local community gym: Sport and exercise are a big part of my life. The gym is half a kilometre from my township and I'm participating in a programme to compete in a half marathon in February 2012. Great to support a gym in my local suburb (65, Papanui High Deprivation).

My library: This photo shows my local library which is five minutes walk from my home. I attend each week to get books plus read notice board and to keep up to speed on local activities. A great library in my local environment (65, Papanui High Deprivation).

My local environment: I have no problem walking on the streets in my area. The neighbours are friendly and most people will speak as you pass. I feel very safe while walking with a friend or by myself (80, Hawthorndon).

Seaside suburban village: I chose to live by the sea because I had breathing problems and one of my daughters lives nearby...I enjoy walking by the beach and often pick up groceries on my way home through the village shopping mall (79, New Brighton).

Figure 33: Photovoice depictions of local destinations relevant to activity participation
9.5.4  Family and peer networks

Social network participation was not always associated with a specific geographical location. Interactions with family members and peers in a variety of milieux were identified as an important source of activity for older adults. While such activities were frequently reported in the context of home or local environment, it was the interactive quality of these experiences that was associated with activity participation, rather than a particular physical setting. Emergent themes associated with family and peer interactions included shared leisure, support activity, religious fellowship, service communities, communities of interest, and social obligation.

9.5.4.1  Shared leisure: the family that plays together

One of the most common forms of family activity was shared leisure, which is defined as spending discretionary time in the company of close relatives for the purpose of recreation, bonding, or role performance. Shared leisure activities reported by respondents included attending family activities within the community, taking a trip together, sharing a meal, walking or exercising together, socialising at home, or celebrating a family birthday or milestone. Diary and photovoice evidence supported a role for shared leisure in facilitating physical and social activity in particular. Respondents made a number of comments in support of the influence of shared leisure on social activity participation: “As it is my husband's birthday next week we get together at our daughter's for a drink and a meal and lots of laughs” (71, South Hornby); and,

We are not church goers, but our second son is a doctor and also ordained minister, so we occasionally go to their church if the family is involved in the service. Enjoyed coffee and chat with this family late in the afternoon (80, Holmwood).

Photovoice images and comments also supported the concept of shared leisure as an important facilitator of social activity participation.
Table games with my grandchildren: I am so grateful to have most of my family living close by – some in this city and some on local farms. We visit frequently and my relationship with grandchildren keeps me young at heart. They all have a great sense of humour (79, New Brighton).

Family time: A catch-up over breakfast at a café with our daughter and her partner. We needed to drive across town to find a place open in April (78, Redcliffs).

Figure 34: Photovoice depictions of shared leisure

Shared leisure in the context of one's immediate family also provided support for physical activity participation. Diarists wrote about how they benefited from inclusion in physical activities with family members: “My daughter has two small dogs that enjoy walking with my dog. I enjoy the time with my daughter who works and has a family and also enjoy the exercise and time out” (70, North Hornby); and,

My daughter and her husband were going to [a rural area] for an hour of cycling. They took me with them. After a short walk, I went back to the car and read my book. Went to my grandson's home for tea...I'm glad that my daughter and husband are happy to take me with them on little excursions (80, Ferrymead).

Respondent quotations illustrate the interconnection of physical and social activities in the context of familial interactions. It was particularly notable that shared leisure was undertaken across generations with both children and grandchildren. This suggests that shared leisure is important for defining family roles and bonding. It also indicates that there is acceptance of older adults as leisure participants within the extended family unit.

9.5.4.2 Support activity: giving and receiving within the network

Familial interaction was not only undertaken in a leisure context, but was also associated with both given and received support, which appeared to influence activity participation. Support activity was defined as providing or receiving material assistance in the
context of one's immediate social network, which provided outlets for activity participation. Support was freely given, willingly received, and intrinsically rewarding, although it often incurred time or financial costs. There is a degree of reciprocity in the giving and receiving of support between older adults and other family members, which addresses the transition from carer to cared-for or the exchange of time, skills, and resources between kin. Given and received support was reported to be associated with social, physical, and civic activity.

As receivers of support, older adults accepted family assistance with daily tasks such as driving or shopping. This service was usually provided by adult children. It was also common for older adults to be hosted by other family members, which provided respite from everyday responsibilities and an opportunity to bond. Examples of received support and its impact on activity participation are evident in the following statements: “My son came to Christchurch and took me shopping at a mall then we visited my brother in another retirement home” (94, Papanui Low Deprivation); and,

My family (son, wife and three children) persuaded me to stay overnight. I enjoyed the country atmosphere and wood fire. This family has a great sense of humour all round! I love to spend time with family members, and all my grandchildren have enjoyed playing table games with me since early childhood. They are good fun and good friends and keep me young at heart…I was refreshed by my achievement and the lovely green countryside, and the warmth of hospitality from each of this family. I think it was quite a healing visit and I plan to go again over Easter (79, New Brighton).

While some older adults relied on family to assist their activity participation, many others were significant providers of support for younger family members. Older adults provided support by caring for and entertaining grandchildren, providing advice and expertise, supporting the business endeavours of adult children, assisting sick or injured relatives, and providing transportation. Regarding care for younger family members, respondents made the following comments: “I am always available to mind grandchildren and help my children (son and daughter) if needed” (81, Papanui High Deprivation); and “I looked after niece's two children ages 3 and 5 while she went to work – took them and dog to local reserve to play” (70, North Hornby). Care of younger family members was also evident in photovoice images and comments.
Grandchildren were often a focus for support and activity participation, but older adults' also provided significant assistance to adult children and siblings. Diarists commented on how their support of adult family members provided a context for the execution of valued activities: “My son's buying of his first home required my time and advice to check the house and expected repayments” (67, Rutland); and,

My sister has a spinal problem and has been in the hospital system having scans and tests and hopes to get results soon. She is in terrible pain and has trouble with mobility. I try to go to help her as often as possible (70, North Hornby).

Beyond the family context, older adults provided support to friends and community members. Respondent evidence indicated that provided support facilitated both civic and social activity participation. Within the peer network, support was often conceived as spending time, sharing a meal, or visiting an unwell friend. Exemplary comments from diarists revealed evidence of provided support and its association with activity participation: “I enjoyed spending the afternoon with an old friend from school who has been unwell, really good to catch up with her, spent all afternoon talking and laughing” (71, South Hornby); and “I invited a friend over to have a meal in the evening – he is unable to drive now so went and picked him up – had a lovely meal (cooked by me) and then delivered him back to rest home” (78, Redcliffs).
9.5.4.3 Service communities: acting together for a greater good

Service communities were defined as formal groups or informal associations, which exist solely to meet the diverse needs of others (independent of religious or political affiliation). Several research participants were involved in service communities, which provided an outlet for engagement in civic activity in particular, but also opportunities for cultural, social, and physical activities. Service community involvement included participation in Rotary Club, knitting groups, rehabilitation programmes, and working in community bookshops or information services. Involvement in formal service communities was described by diarists as follows: “Spent three hours working at a [community] bookshop – quite exhausting, but rewarding – probably makes me feel better about myself helping others to some degree” (71, Holmwood); and “I'm a member of the Rotary Club of Christchurch...a great club and organisation, very worthwhile for the community who benefit from our activities on a regular basis, and the fellowship within the club is wonderful” (70, Holmwood). Respondents also participated in informal service communities, which provided opportunities to assist others without the undesired formality. Supporting comments included the following: “We meet once a month to knit a variety of children items and also make rugs for the elderly – lovely fellowship group” (71, Papanui High Deprivation); and “I work one day a week at the Parkinson's Society helping at the physiotherapist with three exercise classes as a volunteer” (74, Hawthorndon). While the primary motive of service communities is to meet the needs of others, respondents also noted that there was an important social imperative to group involvement, which attests to the diverse and interacting benefits of participation.

9.5.4.4 Religious fellowship: coming together in the name of God

Religious fellowship was defined as spending time in the company of other people who shared similar spiritual beliefs for the purpose of collective worship, studying religious teaching, communion, or undertaking charitable deeds. The theme of religious fellowship was related to service communities through a shared motive for volunteer work and charity, although the focus was primarily within a church context. Involvement in organised religion was often associated with attendance at a Christian church, although some fellowship activities were also undertaken within the home environment. Respondent comments and images indicated that religious fellowship fulfilled spiritual, social, and civic activity needs of
research participants and provided an important connection between older adults and their communities. Religious fellowship encouraged activity participation by providing an accessible and welcoming social setting for older adults founded upon the collective expression of spiritual activity and support for voluntarism and charity. Commenting on the importance of the religious fellowship for their activity participation diarists stated, “My association with my church is long standing – I am with loyal, friendly people and enjoy fellowship and caring – I also assist with our fortnightly cup of tea after the services” (89, Rutland); “Going to church is spiritual, social, and civic activity, especially with older people” (67, Papanui High Deprivation); and, “It is great to worship with like-minded, like-believing people. I am strengthened and encouraged and inspired by this younger generation surrounding me” (79, New Brighton). Diary comments were reinforced by photovoice images and statements, which particularly highlighted an association between religious fellowship and social activity.

Figure 36: Photovoice depictions of religious fellowship

9.5.4.5 Communities of interest: a pastime shared is a pastime continued

Older adults did not always meet with others for charitable or religious purposes, but also sought the company of peers when expressing a personal interest or hobby. Communities of interest refer to formal or informal groups that exist to address the interests and aspirations of their members. Involvement in communities of interest was reported to be associated with participation in physical, social, cultural, and economic activities. Communities of interest
supported activities by providing an organisational context for the pursuit of personal interests wherein the pooled resources, skills, knowledge, or values of the group provided enhanced opportunities for participation that could not be achieved through acting alone. Diarist comments supported communities of interest as a context for activity participation: “I'm looking forward to May Probus [a club for retired professionals] bus trip to Timaru and return, the scenery, lunch, chatting, socialising, and walk through Ballantynes [department store]” (75, North Hornby); and “I desired to play bowls and associate with fellow club members plus partake of afternoon tea and later a handle [of beer]” (90, Ferrymead). Communities of interest not only exist to serve the leisure-related needs of older adults, but also function to address more serious concerns, including maintenance of network ties with fellow returned servicemen or the attainment of financial gains from collective investment:

The Brevet Club…this is a club for ex aircrew of the allied air forces. The club presents a number of social activities. We have a social afternoon every second Tuesday. It also has luncheons, dine and dance evenings, bus trips, and annually a mess night…These are all very good functions of which I take advantage (90, Ferrymead).

The old friends (males) are all ex business round-table members and we formed an investment group. We have met for a meeting and meal once a month for 40 years. Originally there were 15 of us, now only 10. I am presently secretary, and will take my turn as chairman in May (80, Holmwood).

Photovoice images and comments also supported the communities of interest theme and, in particular, reinforced the association with social activity.

Figure 37: Photovoice depictions of communities of interest
9.5.4.6 Network obligation: when close relationships become problematic

While generally a positive influence, family relationships and interactions with peers sometimes act as significant constraints to activity participation. **Network obligation** was defined as support provided to family, friends, and neighbours, either freely given or requested, that incurred an undesirable personal cost (time, discomfort, or inconvenience), which reduced opportunities for participation in preferred activities. Diarist comments indicated that familial obligations often reduced opportunities for involvement in physical, social, and cultural activities. Reported obligations that constrained activity participation included caring for the long-term unwell and responsibilities for hosting younger family members. Commenting on the demands imposed by the care required by ailing family members, respondents made the following statements: “My desire to be constantly with my wife, elderly and with mobility difficulties, does curtail other personal activities” (83, Central City); and,

My husband has dementia and needs more help. This restricts me from social and cultural activities such as library visits, art gallery visits etc. I no longer drive and photography is a hobby, so with no direct bus service I have been greatly restricted (84, Redcliffs).

Restrictive demands associated with hosting family members were also addressed in activity diary entries, and a respondent wrote of the mental and physical effort that was associated with providing for younger relatives:

Expecting family to visit at weekend, so stayed home to prepare. Should have gone to the gym, no time…Amazing how much preparation goes into hosting family – bathroom make over, tidy spare room, vacuum, dust, change spare bed, bake biscuits, prepare meals in advance…Apprehensive about deciding on dinner menu. One gets out-of-the-way of cooking for others…Pre-visitor nerves as I worked to get the beds made, house spotless etc…Slightly nervous about looking after four and five year olds without parents for two days and overnight. Will they cope? Will I? (66, North Hornby).

The quotation above suggests that family obligations, whether invited or uninvited, could be a significant source of stress and a constraint to involvement in valued activities. Such obligation, however, is always balanced against the positive aspects associated with providing support and the benefits of sharing leisure time with family.
In addition to restrictions imposed by relations with family members, peer network interactions also created unwanted obligations for some older adults, which reduced opportunities for participation in physical, social, and civic activities. Obligations reported by research participants included providing transport for friends and neighbours at an inconvenient time and burdensome volunteer work. Peer group obligations were reflected in the following respondent statements: “Cold and wet today, so tried to stay home in the warmth, but a neighbour needed some transport” (71, Central City); and “I have been doing housework for friends regularly for the past two years – sometimes it gets a bit much, but I don't like to let people down” (70, North Hornby). Peer group interactions also had more subtle ways of potentially constraining activity for some older adults. One respondent wrote of her annoyance with the social pressures to reduce her activity participation: “The peer pressure of my age group feels like I should sit back and be served, but I am not ready for that yet” (79, New Brighton).

9.5.5 Local climate

Activity diary and photovoice procedures were undertaken in early autumn 2011, which is a time of settled weather in Christchurch. Despite this, variations in temperature, rainfall, wind, and sunshine were reported as influences on daily activity participation. Unlike many of the other reported environmental influences on activity participation, the climate affects individuals simultaneously across multiple urban areas. Climatic conditions were reported as both a facilitator of and constraint to activity participation and were commonly referred to as an influence on physical activity. Regarding the role of local climatic conditions as a facilitator of activity participation, research participants made the following comments:

Such a beautiful day gives me so much more energy than a cold miserable day…Because I felt so energetic and the sun was hot, I felt like doing jobs that I had been putting off for a long time…I wish it could be sunny every day (80, Hawthorndon).

It was a beautiful day today with warm sunshine and not much wind. I can't stay in the house when it's like this, so I usually walk to the beach and sometimes meet friends on the way…when the weather is so lovely I never want to go home (72, New Brighton).

Just as warm and settled weather facilitated activity participation, adverse climatic conditions were reported to be a constraint by respondents: “Rain this afternoon curtailed some outside activities later in the day” (67, Papanui High Deprivation); and “Very hot today
and windy, gardening very tiring, so much so I had no energy to go to my favourite step [exercise] class” (66, North Hornby). Deleterious climatic conditions also prompted changes in daily routines for some older adults, particularly increases in home or indoor activity. A supporting quotation addressing weather-related activity changes included the following: “Walking in a [shopping] mall today before and after lunch as too damp and cold outside for walking” (77, Papanui High Deprivation).

9.6 Personal influences on active ageing

During activity diary procedures and focus group discussions, several personal influences on activity participation were identified, which reinforced and extended the survey results from the second research phase. Emergent personal influences on activity participation identified during the analysis included health and disability; energy, motivation, and belief; and routine and continuity.

9.6.1 Health and disability

In congruence with the findings of the phase-two survey, older adults' health was reported as both a facilitator of and constraint to activity participation during diary writing procedures. The health and disability theme describes the variable impacts on activity associated with maintenance of individual well-being, the onset or worsening of disease and disability, or a period of convalescence and recovery. Reported disease and disability associated with activity restrictions included stroke, heart disease, arthritis, muscle-wasting conditions, neurological conditions, dizziness or unsteadiness, respiratory illness, infections, and migraine. These conditions limited older adults' involvement in physical, social, civic, or economic activities by reducing physical capacity for sustained participation. Health-related activity disruptions were reported by both younger and older adults within the sample and across diverse study areas. During focus group discussions, respondents also commented on the threat posed by the speed of onset of health changes in later life. The constraining influence of health problems was reported in the following quotations:

I had plans to get more done in the garden, but my back had me taking more rests than I would want…not much balance for Tai Chi because of nerve damage in lower back after stroke in spinal cord some years back (72, Ferrymead).
Due to my [medical] condition everyday simple chores i.e. showering (seat required),
general ablutions, dressing and fitting of leg and foot braces, breakfast, tidying up etc.
can take up to three hours and uses considerable energy. I also have limited use of my
hands for activities (79, Papanui Low Deprivation).

In the quotation below, a respondent commented on the cascading and interacting effects of
defining health. In this case, a particular medical condition initially disrupted their capacity
for paid work, which in turn reduced financial resources available for participation in leisure
activities.

I have a medical condition which is very debilitating and I suffer from excess bouts of
tiredness. This condition resulted in my only being able to cope with working three
days per week for the 2007 year and finally having to give up work completely from
the beginning of the 2008 year. As a result, I was on an invalids benefit from February
2008 until June 2009 when I qualified for superannuation. My wife suffers from
arthritis in her neck and was also unable to work during this time and is now receiving
superannuation as well. This placed a considerable amount of pressure on our finances
and we are fairly restricted in the amount of leisure spending we have available (66,
Central City)

While health and disability problems were often reported as a constraint to activities,
they also forced changes in the mode or intensity of participation for some older adults who
desired to retain involvement in the face of functional declines. Representative comments
included the following:

Arthritis meant goodbye to tennis several years ago. Swimming is great alternative,
but sharing a lane with up to four others is not, so gardening and walking are the main
forms of exercise – the trouble is knowing when to stop (70, Papanui Low
Deprivation).

My stroke has left me with an unreliable hand and a leg that, unless I concentrate on it,
causes me to limp…when working in the garden my efforts are somewhat restricted,
but in spite of that I do a bit and rest frequently (86, New Brighton).

Convalescence and recovery following medical treatment or during illness also limited
activity participation for some older adults. While this was usually only a temporary
disruption, active and independent older adults found this to be a particularly frustrating
aspect of the ageing process:
Developed a cough, headache, and general stress, so I cancelled all plans for tomorrow and had a restful afternoon and an early night...a frustrating aspect of ageing is that we don't bounce back or overcome infections as easily or quickly as when younger (79, New Brighton).

Unable to do physical activities after surgery on foot...very frustrating not being able to do anything and quite tired after surgery and pain killers...also having surgery on my foot stopped me doing my usual gardening, housework, and walking the dog (70, North Hornby).

While some diarists were constrained by illness and disability, older adults also valued good health and displayed an awareness of the interrelationship between health and activity participation. Some respondents reported that their activity participation contributed positively to their health or the management of medical conditions: “I appreciate that at present I am in good health and able to take part in activities – without company reasonably often I could be feeling depressed at times” (89, Rutland); and “I am on heart and cholesterol medication and like to exercise regularly – it is relaxing and good for the mind” (70, North Hornby).

9.6.2 Energy, motivation, and belief

In addition to the influence of health and disability, older adults' activity participation was also reportedly affected by their levels of mental energy, motivation, and beliefs about the benefits and outcomes of participation. These reported influences are presented together as they collectively address potential cognitive influences on physical, social, and spiritual activity participation. Tiredness and a lack of motivation were identified as barriers to participation for some respondents. The negative influence of low levels of energy on activity are addressed in the following comments: “Feeling tired and jaded and many activities are just too much trouble...I was scattered in mind today as many requests honed in on me...I want to help, but I am overwhelmed” (79, Central City); and “Woke up feeling sleepy and a bit blue – did not wish to engage in any great works” (81, Papanui High Deprivation). Respondents also wrote of a lack of interest and motivation as influences on their activities: “I dislike repetitive exercises in [physical training] – I would avoid without participating – similarly for religious instructions or the like” (85, Redcliffs); and “Really had to motivate myself to go for a bike ride, usually do three times a week, but it's just been too hard lately” (67, Holmwood).
Cognitive influences were not always constraints, and beliefs concerning the benefits of activity participation, particularly physical and spiritual activities, were identified as a facilitator for some older adults. Supportive comments included the following: “I feel quite strongly that exercise is important for my health and well-being, so I attend the local gym regularly” (71, South Hornby); and,

The exercise on the rebounder [trampoline] is something my wife and I have both done for about 30 years. We try to do it every day, but occasionally miss. I did do it every morning. We are sure it is good for joints and muscles. It is the first thing we do as we get out of bed (80, Holmwood).

My faith in God, my heavenly father, keeps me tranquil and flexible in all circumstances. Even though my body still needs a daily siesta, and I have to release the stress of the present circumstances…I have family and friends working in other nations and I like to spend time each week in prayer support. I am greatly encouraged with reports of answered prayer (79, New Brighton).

9.6.3 Routine and continuity

In addition to the physiological and cognitive influences on activity participation, diarists also identified an important behavioural component. Maintaining a regular routine or continuity with activities undertaken throughout the life course was identified as a facilitator of activity participation. Routine and continuity describes the maintenance of activities for a prolonged duration of one's life, which are undertaken for the intrinsic or perceived benefits they afford. For many respondents, the theme of routine and continuity was associated with physical, social, and cultural activities. Research participants made statements in support of the routine and continuity theme: “I have a set daily routine centred on running our house and garden, walking the dog, shopping, and my part-time job as an editor of a leading academic journal for a UK publisher (68, Holmwood); “Thursday is my day off from local activities, it is my day at golf, and today was no exception” (78, Redcliffs);

I am a daily walker and attribute my good health and fitness at the age of 81 to this recreation. My sister is a walker too, so we enjoy this together. We managed to get a good walk today… I have noticed that friends of my age who have been inactive over the years are the first to succumb to illness and wheelchairs (81, Ferrymead).

We have been active members of a tramping club for 16 years. Wednesday is the day. Recently we have chosen to be selective about the four to five hour walks we do. Today we walked with a small group of older ex club members (80, Holmwood).
Focus group respondents commented that the continuation of activities of one's earlier life was important for the maintenance of personal identity, social network ties, and for helping to manage the transition from working life into retirement. A lack of participation in diverse activities across the life course was viewed as a threat to physical and mental health in retirement by some focus group participants.

9.7 Qualitative earthquake results

The qualitative results presented in this section build upon and provide verification for the quantitative research findings, which identified disruptions to local environmental conditions and activity participation among older adults following separate disasters in September 2010 and February 2011. This section identifies and explains the potential pathways through which the Canterbury earthquakes altered activity participation among older residents. These results are based on qualitative responses to an earthquake questionnaire administered in October 2010 and March 2011 and data obtained from activity diary and photovoice procedures.

9.7.1 Personal and environmental disruptions

The Canterbury earthquakes of 2010 and 2011 caused significant disruption to local environmental conditions and activities for many older adults. There was variation, however, in the effects of the earthquakes in different areas of the city. Central and eastern suburbs suffered considerably more disruption than northern and western locations, particularly in the aftermath of the February 2011 earthquake. Respondent comments supported this geographic demarcation, with residents from the north and west reporting comparatively minor impacts: “We are fortunate that our area has been relatively unscathed by the earthquake” (75, Papanui High Deprivation, FebEQ); and,

I have not really been affected much at all and I am still going about my daily activities the same as before, except when I only have a few grocery items to buy I have been walking to the shop as there is so much traffic it is quicker to walk than drive (71, South Hornby, FebEQ).
In contrast, respondents from central and eastern areas endured major life changes and disruptions associated with soil liquefaction\textsuperscript{57}, road closures and cordons, collapsed buildings, damaged utilities (power, water, and telecommunications), cancelled bus services, and the closure of supermarkets and community facilities. Respondent comments revealed the severity of the impacts for those living in the worst-affected areas: “The local scene is depressing: considerable liquefaction with holes in roads and driveway, blocks of nearby shops and houses demolished, other houses have been abandoned due to severe damage” (77, Holmwood, FebEQ); and “Damage to my house, but it's still habitable; several springs and artesian wells reactivated with flooding of some sections, including mine; no electricity, water, or sewage services for two weeks” (77, New Brighton, FebEQ). Scenes of damage and disruption were also captured by respondents during photovoice procedures (figure 38). The effects of the earthquakes have been ongoing since February 2011 with additional and damaging aftershocks in June and December 2011 that have slowed recovery and introduced further barriers to activity participation.

\textsuperscript{57} A mix of fine sediment and water that exudes rapidly from beneath the ground during an earthquake in coastal areas.
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9.7.2 Earthquake vulnerability: activity constraints in the aftermath of disaster

Prior to the February 22nd earthquake, I had a very active life with bowls, visiting, socialising, telephone calls…Since the earthquake, I have spent four weeks with my son and family and have since returned to my unit. My activities have been somewhat curtailed due to road and traffic problems, friends who have moved temporarily or permanently, and various organisations not operating because of problems arising from the earthquake (90, Ferrymead, FebEQ).

In the context of this research, vulnerability refers to difficulties maintaining activities and lifestyles in the aftermath of a major urban disaster as a result of deleterious effects.
environmental changes and an inability to adapt to altered circumstances. Activity disruptions were infrequently reported by research participants following the September 2010 earthquake. For the majority of older adults, this earthquake was characterised by minor to moderate damage to home and local environment and a short period of disruption to normal routines. Commensurate with the survey findings, reported activity disruptions were more pronounced following the February 2011 earthquake. Deleterious influences on activity participation included the loss of activity related venues and destinations, cancellation of meetings and events, confinement and isolation, disruption to transport networks, fragmentation of social networks, environmental hazards, and disruption to activities of daily living. Older adults often experienced these challenges simultaneously as the following quotation reveals:

 Normally, I write, teach senior students through email and phone, read in church, create cards and write letters, and mentor teachers and students. I ride a battery operated chair freely through the city, shops, and libraries visiting sick and lonely friends. Much of that was curtailed by blocked streets, people leaving Christchurch, and my home disarrayed by fallen books, bookcases, boxes, and furniture (79, Central City, FebEQ).

### 9.7.2.1 Loss of activity venues

One of the ways in which the earthquakes disrupted activity was via damage to venues frequented by older adults, including libraries, community halls, swimming pools, leisure centres, shopping areas, theatres, churches, and places of paid and volunteer work. The restriction of access or destruction of such facilities reduced opportunities for participation in activity domains. The loss of activity venues was most pronounced in central and eastern suburbs where soft underlying soils, the use of masonry construction materials, and proximity to the earthquake epicentre amplified damage to buildings and infrastructure. Following the September 2010 earthquake, older adults reported disruptions to physical and civic activities associated with the loss of venues: “Guided walks curtailed for a time, several buildings included in the city walks off limits, and part-time work in an endangered building not yet resumed” (70, Papanui Low Deprivation, SeptEQ); and,

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58 Mental and physical health problems experienced as a consequence of the earthquakes were also reported by research participants. Commonly reported ailments following the 2010 and 2011 earthquakes included depression; fear and anxiety; self-defeating behaviours; loss of appetite; insomnia, confusion, inattention and forgetfulness; feelings of extreme grief and helplessness; falls and injuries; dizziness; worsening of existing health conditions; and the onset of transient illness. As these findings are outside the scope of this thesis, however, they are to be published elsewhere.
I was a volunteer at the local community library for 22 years until Friday, September 3rd this year. The library building was damaged by the earthquake and is now closed. There has been no information about the damage or if and when the 100-year-old brick building will be opened. I was expecting and hoping to be a volunteer there for another few more years (86, Ferrymead, SeptEQ).

Following the February 2011 earthquake, respondents reported major disruptions to physical, cultural, social, civic, and economic activities. Disruption to physical activities were associated with the closure of swimming pools, gyms, and community halls. Respondents commented, “My gym is very badly damaged; it may be open in three months, but will probably never reopen” (65, Papanui High Deprivation, FebEQ); and “[My local swimming pool] is out of order and I have to explore other possibilities – I'm not sure I have the courage yet – quick to use the excuse of too cold to postpone aqua jogging” (79, New Brighton, FebEQ).

Cultural and social activities were disrupted following the February 2011 earthquake as a result of damage to libraries, art galleries, museums, theatres, and shopping areas. Respondents commented, “We normally make use, quite a lot, of the central public library (walk there and back), but the earthquake damage of 22nd Feb has stopped that – some difficulty now in finding reading material” (80, Holmwood, FebEQ); and “Earthquake aftermath has stopped access to the city and library… I would have gone to a [University of the Third Age] lecture at the art gallery this morning, but the earthquakes cancelled services” (81, Papanui High Deprivation, FebEQ).

Civic and economic activities were curtailed as a result of damage to historic buildings and churches and the closure of workplaces within the Central Business District. Commenting on disruptions to civic activity participation a respondent stated, “We have not been able to do our usual voluntary activities as [a local historic village] has been closed due to a lack of water and damage to buildings and contents” (66, Ferrymead, FebEQ). The earthquakes were also a significant constraint for older adults who were in paid employment prior to the 2011 earthquake:

Teaching inside Christchurch is on hold until at least June due to a lack of venues. This has a major impact on my income. I am therefore seeking clinic work, teaching, speaking presentations outside of Christchurch… Lots of thinking; lots of surrender (70, North Hornby, FebEQ).
9.7.2.2 Cancellation of events and meetings

Closely associated with a loss of activity venues, was the cancellation of group events and meetings, which were often undertaken within community facilities. The cancellation of events and meetings reduced opportunities for participation in physical, social, civic, cultural, and spiritual activities undertaken in the company of others. Disruptions were reported after both the 2010 and 2011 earthquakes. In the aftermath of the September 2010 earthquake, one respondent commented, “Most group activities were cancelled for three to four weeks” (73, Hawthorndon, SeptEQ). In February 2011 disruptions were reported to a variety of activities. Respondents commented, “A picnic at Little River was cancelled, a three-day event was cancelled because of damage to croquet lawns, a committee meeting was cancelled, and half day event which I manage also cancelled” (77, Papanui Low Deprivation, FebEQ); and,

I play the piano for an entertainment group...The rest homes love us! Last week we had two bookings and both were cancelled – very disappointing. My four friends sing and dance and we really enjoy doing it. We all hope to get back into it when things settle down (66, North Hornby, FebEQ).

Disruptions to spiritual gatherings were also reported, although many older adults attempted to continue their religious activity in the face of significant adversity and damage to facilities. One respondent wrote of the challenges of spiritual practice in the absence of community:

Our small prayer group is also in abeyance with three of the five members staying elsewhere until lack of water, sewerage, and power is remedied. We have become great friends over the years, are not at all pious, enjoy all manner of jokes and afternoon tea (70, Papanui Low Deprivation, FebEQ).

The cancellation of group meetings and events was closely tied to damage suffered by venues for activity participation and the displacement of friends and associates. The loss of contact with social networks in the weeks following the earthquakes was reported as a particularly acute constraint to activity.

9.7.2.3 Escape, relocation, and the fragmentation of social networks

In the immediate aftermath of the February 2011 earthquake, one of the distinctive themes to emerge was escape, relocation, and the fragmentation of social networks. This theme was not evident following the September 2010 earthquake, which may be due to the
comparatively lower levels of disruption reported. Escape, relocation, and the fragmentation of social networks refers to departure from one's place of residence, either temporarily or permanently, due to damage to a primary dwelling, disruption to utilities, fear of aftershocks, a desire to be reunited with family members, or a need for respite. Tens of thousands of residents (up to 10% of the total metropolitan population) left the city following the February earthquake (Hueber, 2011). Being away from familiar environments created disruptions to everyday activities and routines, reduced opportunities for social network participation, and imposed new environmental barriers on evacuees. Those who remained in Christchurch experienced further disruption to their activities as community life was affected by the departure of friends, neighbours, and family members. Respondents who vacated Christchurch following the earthquake reported diverse disruptions to their activities: “I had to leave Christchurch for two weeks as I could not sleep and felt extremely vulnerable – sudden noise or movement still affects me, and I could not concentrate or get on with ordinary household chores (72, Papanui Low Deprivation, SeptEQ)” ; and,

I am usually involved in many things outside the home, but due to the February 22nd earthquake many things were cancelled and I took off to Golden Bay [at the top of the South Island] for some respite from the shaking (77, Papanui Low Deprivation, FebEQ).

Spending time away from Christchurch brought its own challenges, however, and evacuees reported experiences of social isolation, guilt, and difficulties coping with the everyday demands of an unfamiliar environment. The following quotations identify some of the specific challenges faced by older adults who vacated their homes following the earthquakes:

I had to relocate to my daughter's in Spreydon as I had no power or water and a few of my friends had moved also, so I couldn't even speak to them on the phone – very frustrating and isolating. I was away for three and a half weeks, and felt a bit guilty leaving other people in my street who had to fend for themselves (72, New Brighton, FebEQ).

As I had no water or sewerage, I had to relocate to one of my daughters out-of-town. My sleep was, and still is, very fragmented. My daughter's house is multi-storey and this posed some problems with stairs as all bathrooms upstairs (71, Central City, FebEQ).

Disruptions to social activities were also experienced by research participants who stayed in Christchurch following the February 2011 earthquake as a consequence of the
fragmentation of local social networks: “The earthquake has disrupted community life in Redcliffs and many folk have left the area: some temporarily, others permanently…the local community has disintegrated because of the earthquake and many activities have been curtailed, including visiting friends across town” (84, Redcliffs, FebEQ). For some respondents, the earthquakes prompted a permanent move away from Christchurch, which led to an atypical pattern of activity associated with relocation. The respondent quoted below is an interesting case as he elected to move from a retirement village back into the community in a different town in order to avoid the aftershocks and associated disruptions:

My wife and I had decided that due to the earthquakes and the unknown future quake activity, to relocate to Ashburton. Since that time, my various activities have become associated with the sale of our [retirement] village town house, looking for and eventually purchasing an independent town house away from Christchurch. Since leaving Christchurch on 11/3/11 we have been staying with relatives in Ashburton and Alexandra [in the lower South Island] where my various activities have continued. We take possession of our new residence on 1/4/11 (79, Papanui Low Deprivation, FebEQ).

Closely associated with disruptions to social networks, was the threat from social isolation for older adults who remained in their homes, had difficulty maintaining contact with family and peers, or were apprehensive about venturing into an unfamiliar or hazardous environment.

9.7.2.4 Confinement and isolation

Confinement and isolation was experienced by many older adults in the days and weeks following the 2010 and 2011 earthquakes. This theme refers to self-imposed or officially directed containment within the context of home and local environment associated with earthquake-related damage to physical surroundings, fear of injury or aftershocks, or social network disruptions. Confinement and isolation was experienced as both a negative and positive consequence of the earthquakes, with reported impacts on physical, social, and cultural activities.

In the aftermath of the 2010 earthquake, some residents reported confinement to local environment: “[Since the earthquake,] I have shopped only at a local centre…I only visit family if they pick me up to go to the other side of town” (80, Ferrymead, SeptEQ). Spatial constraints to activity were more commonly reported following the February 2011 earthquake,
however, due to the increased level of disruption to the physical and social environment. The level of confinement was extreme in some cases, with individuals afraid to leave their homes: “Since the earthquake in February, I do not feel like going out as much as I used to – I feel unsafe in [shopping] malls and buildings” (72, Papanui Low Deprivation, FebEQ); and “As for activities, no one really wants to venture out these days…for walking, the footpaths are cracked and dangerous – home is the safest place to be” (82, Holmwood, FebEQ). The following quotation reveals significant disruption to social activities that resulted from the 2011 earthquake and the associated feelings of loss:

Not able to catch up with friend who has just returned from Switzerland because of road blockages…I would like to point out that since the earthquake life has changed somewhat. Visiting friend on the other side of town is too difficult just now and also not being able to go to town, and I feel a great sense of loss because I was born in Christchurch and loved living most of my life here (80, Hawthorndon, FebEQ).

While confinement and isolation was predominantly reported as a negative influence on activity participation, some individuals welcomed the opportunity to spend more time at home. For those who were usually active in their home environment, a period of enforced confinement was unproblematic and some considered it to be a welcome respite from the responsibilities of daily life:

I'm realising I'm about to enjoy a real holiday in my own home and surroundings. The activities of daily living are being attended to. Out and about is limited really due to the quake…The quake has been a petrol saver. Has reduced trips to shops and further afield. Ringing more, about the earthquake, to see how friends are feeling and managing (75, North Hornby, FebEQ).

Confinement and isolation was often associated with difficulties accessing public transport services, navigating damaged or blocked roads, or a lack of confidence or competence driving in an altered environment.

9.7.2.5 Damage to transport networks

The February 2011 earthquake caused significant damage to transportation networks throughout the city. Reported disruptions included cracked and buckled streets, road closures, pot holes, soil liquefaction, damage to bridges, barriers imposed by road repair, the cancellation and re-routing of bus services, and directives from officials to avoid unnecessary
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travel. These problems created significant barriers to mobility and potentially compounded experiences of isolation, which reduced opportunities for participation in social and physical activity for some older adults. Commenting on mobility problems in the weeks after the 2011 earthquake, a respondent observed, “Christchurch is virtually in lock-down and travel about the city is not encouraged” (73, Hawthorndon, FebEQ). Addressing transport-related disruptions to social activities, respondents made the following comments: “Because of road damage and liquefaction, travel out of New Brighton is challenging, even traumatic, for us older drivers…regular visits to and from friends and some family members living in other suburbs is too difficult” (79, New Brighton, FebEQ); and,

It will be good to see the bus service get back to normality. It is difficult for friends to visit or me to visit them when we have to rely on public transport. My friend has a long walk to access a bus to my house. The roads are still badly damaged in some parts of the suburb (72, New Brighton, FebEQ).

Another respondent wrote of disruption to physical activities: “I did not go for an outing with the walking group as driving to the other side of town is too difficult and takes too long” (75, Redcliffs, FebEQ). Other participants commented about changes to their daily routines and general activity disruptions associated with reduced accessibility of the local environment:

Everything was contingent on the 22nd Feb earthquake: I do not drive now and there are no buses, so I am limited to how far I can walk – one quarter to half an hour… There are no buses running and the centre of town is sealed off – I often used to go by bus to the central library (73, Hawthorndon, FebEQ).

Impassable transport networks and changes to bus services forced some older adults to stay home rather than venture out, reduced visits from friends in other parts of Christchurch, and restricted the sphere of activity to walking distance. Hazards arising from the earthquakes also affected transport infrastructure and potentially constrained personal mobility and activity participation.

9.7.2.6 Hazards in the local environment

The 2010 and 2011 earthquakes created significant local hazards, which restricted activity participation for older adults in the worst-affected areas. The local hazards theme refers to constraints to activity participation imposed by damage to the physical environment,
which created risks to personal health and limited mobility. Hazards identified by participants included fissures and pot holes in walking surfaces and contaminated soil and water in coastal and riparian environs. The existence of such barriers potentially contributed to experiences of confinement and transport disruptions. Earthquake hazards were particularly disruptive to physical activities undertaken in the local environment, such as walking and cycling. Commenting on the contamination hazard a respondent stated, “We go out to the beach regularly for our walks, but this is curtailed until it is safe and we are permitted to travel out of this area” (66, Central City, FebEQ). Other respondents wrote of the challenges associated with trip hazards: “More attention required to damage noted while walking on footpaths… I need to be more alert to danger of tripping” (89, Rutland, FebEQ); and “Post-earthquake, extra vigilance required in cycling due to cracked roads and potholes” (65, Bryndwr, FebEQ). In the quotation below, a respondent details their experience of multiple environmental hazards resulting from earthquake damage:

The lawyers building in Ferry Road is unsafe – the tower could fall. There is a barricade around the building. To pass along the road I have to walk along the cycle track by the cars. Don't feel like walking around here generally at present, prefer to stay home (84, Ferrymead, SeptEQ).

In the weeks following the February 2011 earthquake, participant photovoice images and comments were generated that depicted local hazards.
Aftermath of the earthquake: We were advised not to walk on the beach, so that's why the pier is so handy if you want to walk. It is quite long and there is a spot for fishermen to use at the end, so it is interesting to see the catch of the day (72, New Brighton, FebEQ).

Walking hazards: The changed environment after earthquake has restricted some areas where we have enjoyed walking and created hazards requiring attention (80, Holmwood, FebEQ).

Figure 39: Photovoice depictions of post-earthquake hazards

During focus group discussions, research participants corroborated that local hazards; including contamination, trip hazards, and unsafe infrastructure and buildings; remained barriers to activity participation months after the earthquakes. The continuation of aftershocks throughout 2011 and 2012 created additional hazards and caused delays in addressing existing problems. The progression of aftershocks since 2010 have likely created their own cascade of health effects on older adults and other populations. It is also possible that effects of the aftershocks (such as ongoing stress and reduced motivation for activity) may be compounding and have physical and mental health impacts many months or years after the main earthquake activity has ceased.

9.7.2.7 Disruptions to activities of daily living

The pervasive impact of the February 2011 earthquake was highlighted by disruptions to activities of daily living. This theme describes the alteration to or curtailment of daily routines and ways of living imposed by the effects of earthquakes or the disaster response. Damage to home, utilities, infrastructure, and community services led to significant reductions in discretionary time available for participation in meaningful activities and
increased time spent on daily chores. In particular, routines associated with toileting or bathing, washing clothes or dishes, tending gardens, shopping for necessities, and accessing local services were disrupted for many people. Respondents reported particular difficulties undertaking physical activities associated with the performance of everyday tasks. Participation in some undesirable activities increased as a consequence of requirements for manual labour associated with the loss of power and water. The quotations below reveal the everyday challenges encountered following the earthquakes:

No water, no toilet, no electric power for a long week. Water had to be boiled. Even washing lettuce from the garden needed to be done in boiled water and the only method of boiling water was on an auxiliary gas camping flame…Much of what one does is forced on us by effect of earthquake i.e. collecting water, boiling water… Effects of earthquakes are all pervasive (83, Redcliffs, FebEQ).

No water so I had to have a shower at my daughter's this afternoon…I had a chemical toilet delivered as the sewage system in Christchurch is, by all accounts, on the verge of collapse. I don't relish having to empty it as for one thing it is heavy to be carrying around the streets. They need to be used, however, so I will just have to get on with it (72, New Brighton, FebEQ).

Disruption and discontinuity were underlying themes of the earthquakes; however, there was also evidence for significant resilience among many older adults who continued or adapted their activities in the face of significant environmental problems.

9.7.3 Expressions of resilience: coping with calamity

Apart from sleepless nights, chaotic house, phone calls, arthritis, I have kept my assignments: assessing story telling, adjudicating senior speech and drama, attending a conference, preparing and delivering a seminar, and an 85th birthday (79, Central City, SeptEQ).

While the earthquakes of 2010 and 2011 created significant disruption to the active ageing trajectories of many older adults, there were also examples of resilience arising in response to the disasters. In the context of this research, resilience is defined as the capacity to cope with and recover from significant stress and disruption by drawing on personal or environmental resources. Examples of resilience associated with activity participation included participation in earthquake recovery activities, employing disaster preparedness strategies, being adaptable and flexible, caring for others, and accessing networks of support.
9.7.3.1 *Earthquake recovery activities*

Although the earthquakes were a major disruption for many forms of activity, they also led to new modes of activity participation for some older adults. *Earthquake recovery activities* are conceptualised as endeavours undertaken in the aftermath of a disaster for the purpose of restoring order, repairing damage, or cleaning house or property. Unlike disruptions to activities of daily living, which were conceived as a negative or undesirable influence, recovery activities were reported as a positive response to the earthquakes that allowed individuals to put their existing skills and knowledge to use. Activities reported by research participants in support of this theme included clearing liquefaction and debris, undertaking or organising home repair, and managing a house and garden without power or water supplies. Recovery activities were associated with physical activities in particular: “More garden work required to clear liquefaction” (81, Holmwood, FebEQ); “Restoring order: quake-proofing cupboards, bookshelves, pictures, TV…only after two weeks of snoozing, laughing, crying, and socialising with neighbours – plus finding places to walk where we were not confronted with tragedy” (79, New Brighton, FebEQ); and,

Sorting out the house damage assessment and having two kids off school makes it very difficult to do my job…I will project manage the house repairs and this will be a big task taking up a significant percentage of my time (68, Holmwood, FebEQ).

These respondents could have waited for insurance assessments and claims approval before enlisting professional help to restore order in their home or property. Many older adults, however, took it upon themselves to undertake repair work to hasten the recovery process and facilitate a return to normality. Photovoice data also depicted participation in recovery activities following the February earthquake and revealed how older adults took charge of remediation in their own environment, even when it involved significant exertion.
Results and discussion three: pathways to active ageing

Figure 40: Photovoice depiction of recovery activity

Focus group respondents commented that participation in recovery activities was often borne of necessity as there were few available tradespeople or services to call on in the days and weeks following the disaster. Moreover, home care services, volunteer organisations, and church groups that would normally aid older adults who live independently were overwhelmed by the scale of the disaster and the tremendous community need. Focus group respondents noted that many older adults had trade skills and experiences of self-sufficiency that prompted them to undertake their own repairs. The ongoing seismic sequence in Canterbury also prompted some older residents to take measures beyond the immediate imperative of recovery to improve their preparedness for future disasters.

9.7.3.2 Disaster preparedness

In the context of this research, disaster preparedness is defined as the act of accessing knowledge and information or developing and maintaining a cache of supplies for the purpose of survival and coping in a disaster. This activity was undertaken both before and after the earthquakes of 2010 and 2011 and had important consequences for the maintenance of everyday activities and routines. Research participants made several comments following the 2010 earthquake in support of the preparedness theme: “No adverse effects [from the earthquake] – pleased we heeded advice to be self-sufficient for several days in any emergency” (86, Papanui Low Deprivation, SeptEQ); and,
A lady from civil defence spoke to a meeting of residents and showed us what emergency supplies we should have, so we had torches and radios when the power went off and a small gas burner to heat water to make tea and coffee for neighbours, also a cell phone to reassure family and friends that we are okay (88, Papanui Low Deprivation, SeptEQ).

The earthquake of February 2011 also prompted research participants to engage in disaster preparations as a mode of post-disaster activity: “We discussed today the location of an emergency kit for all documents and our personal information in the event of having to leave our home” (71 Papanui High Deprivation, FebEQ); and “Earthquake disaster kit idea was prompted by news including brother's relocation off the hill into another house with limited loads…we had a real thinking day about the possibility of another earthquake emergency and preparing for it” (67, Papanui High Deprivation, FebEQ). Engaging in disaster preparations allowed older adults to exert some control over a series of unpredictable disasters and afforded them a measure of reassurance in their ability to cope. The ongoing series of earthquakes and intermittent disruptions also meant that disaster preparations and plans were often enacted multiple times in the months following September 2010. In addition to home repair and disaster preparation, respondents also coped in the aftermath of the earthquakes by turning their attention to meeting the needs of family, friends, and community.

9.7.3.3 Care of others: older adults as a recovery resource

Care of others was identified as an important research theme in the aftermath of the 2010 and 2011 earthquakes and is defined as attending to the psychological and material needs of family, friends, and community. Respondent comments suggested that caring for others during the crisis provided a release from stress and anxiety, strengthened and renewed social ties, provided a practical outlet for faith or personal beliefs, and opportunities to help others who were suffering. Care of others was most commonly associated with participation in civic and social activities. Following the 2010 earthquake, respondents wrote of how they assisted family members: “Our own home was undamaged, but son's place was damaged, so we have been supporting them” (77, Papanui High Deprivation, SeptEQ), and “We are being vigilant to ease fears in young grandchildren by being positive and encouraging, and explaining what has happened” (74, Redcliffs, SeptEQ). As a consequence of the severe and widespread impact of the subsequent February 2011 earthquake, older adults were often called on to support family who had suffered major material disruptions: “Granddaughter and
flatmate lost their house in the earthquake, so now live with us and our living pattern has changed” (84, Redcliffs, FebEQ); and,

From living alone, I now have my sister, her husband and nephew with me as their house is totally destroyed…I just tried to support my family as well as volunteer in the earthquake recovery on a small scale i.e. shovelling silt and liquefaction in New Brighton area (65, Papanui High Deprivation, FebEQ).

Older adults also played an important role supporting friends and neighbours who were struggling to cope in the aftermath of both earthquakes. In 2010, many older adults were involved in checking and counselling distraught friends and neighbours: “Socially I have helped elderly neighbours to remain calm; we have become closer through it all” (79, New Brighton, SeptEQ); and “Feeling the shakes, but putting in action faith and keep calm and help neighbours in their time of need” (76, Hawthorndon, SeptEQ).

Following the February earthquake, providing support within the context of one's social network took on added significance as a result of major disruptions to local services and utilities and personal losses suffered by many. Respondent comments and photographs reflected the significant support provided in a social network context:

We were fully influenced by the current earthquake disaster and try to be supportive for our neighbours in the [retirement] complex…I feel that I care for others and wish to support our neighbours, some of whom are quite elderly and are significantly affected by the earthquake and aftershocks (66, Central City, FebEQ).

I live in one of nine units where half of the residents are over 80. My single daughter moved in with me (temporarily) ten days before the earthquake. She and I have been able to encourage closer bonding and daily care and communication among the residents. Some moved to other cities or suburbs where power and water were flowing, but four households chose to remain in a familiar environment, daily chatting, laughing, sharing supplies and anxieties, and encouraging those in need to seek medical help offered freely (79, New Brighton, FebEQ).
Results and discussion three: pathways to active ageing

Socialising with friends: My friends are very important to me and I am blessed to have a wide cross section of friends around me…Two of these couples had their homes destroyed in the February 22nd earthquake…A brunch to console, support, and have a break from earthquake problems. (65, Papanui High Deprivation, FebEQ).

Funeral: Setting up for the funeral of a catholic man killed in the earthquake at [a local] rugby hall. I taught his four sons at college. The college supplies the gear for the mass (67, Rutland, FebEQ).

Figure 41: Photovoice depictions of the care of others

Beyond the immediate social context of family, friends, and neighbours, older adults also provided significant support to their communities in the aftermath of the earthquakes. Comments from research participants following the 2010 earthquake showed that older adults took an active role in supporting their communities and were an important recovery resource: “I have increased my contact with people in the community to ensure continuity of their activities e.g. voluntary libraries, sports facilities etc.” (71, Redcliffs, SeptEQ). Following the 2011 earthquake, older adults were also active in helping their communities to recover from an increased level of disruption. Community support activities included setting up an information centre for local residents, organising a temporary community library, providing rooms for displaced residents or schools, assisting community members and local organisations to move out of damaged homes and premises, supporting relief workers and other volunteers with baking or deliveries, and counselling community members who were suffering. Respondent comments and photographs attest to the significant level of support provided following the 2011 earthquake: “Because of the recent earthquake, my Citizens Advice [a volunteer community information service] duty was very important as it has been extremely busy with calls from a lot of people wanting help with a variety of things in their lives” (71, South Hornby, FebEQ); and “Biked through the park to see state of the area and spoke to soldiers manning cordons, which motivated me to cook muffins tomorrow as the weather looks bad and take them around to them” (67, Holmwood, FebEQ).
Focus group participants noted that many older adults were able to adapt quickly to the changed environment created by the earthquakes as a result of previous life experiences of dealing with emergency situations and reduced work and childcare responsibilities. This left many free to help others who were badly affected by the disasters. Focus group participants also commented that older adults had a range of skills developed over the course of their lives (some had been nurses, police officers, or trades people prior to retirement) and they were able to draw on their experiences to help others in the community. Evidence of resilience and coping among older adults was not only associated with the provision of support. Accessing social networks as a dependent was also an important aspect of the coping process for more vulnerable individuals.

9.7.3.4 Accessing networks of support: care as coping

Although many research participants were providers of support for family, friends, and community, accessing and receiving support in the context of a social network was also an effective strategy for coping in the aftermath of the earthquake and maintaining participation in social activities. Accessing networks of support was defined as engagement with one's
proximate social network for the purposes of receiving psychological or material assistance in the aftermath of a natural disaster. This theme was dependant upon older adults' ability to maintain and access supportive social networks in the midst of calamity, which required some effort in the context of disruptions to communication, transportation, and community services.

In the aftermath of the September 2010 earthquake, a research participant commented, “I have tried to be strong during the last few weeks, but living alone has not been easy – I am lucky to have a wonderful, helpful, and caring family and great neighbours” (82, Holmwood, SeptEQ). Levels of support provided by a social network were often relatively incidental, but afforded significant comfort for those who were struggling to come to terms with the earthquake: “A neighbour with a camp stove made me a cup of tea four hours after the quake – I realised how much I needed that, shock I suppose – I was shaken and couldn't get warm” (72, Papanui High Deprivation, SeptEQ). Some respondents reported that they coped well in the immediate aftermath of the earthquake, but as time passed and the aftershocks continued it was necessary for them to access supportive networks:

At first I coped well, but as the weeks went on and the only subject of conversation with people was the earthquake as well as the saturation of coverage by the media, I became very stressed and weepy and shaky. I realised it was probably delayed shock and just tried to relax with my friends and it eventually improved (73, New Brighton, SeptEQ).

Following the 2011 earthquake, older adults again accessed their networks of support in order to cope and maintain social activities. Research participants reported that they sought contact with friends and neighbours after the earthquake for reassurance and companionship. Respondents made the following comments: “People are meeting together for mutual support; this has been very important for everyone” (66, Ferrymead, FebEQ); and,

I had mixed emotions after spending time with women in my age bracket who live in suburbs less affected. There is a comfort in being here with the mutual non-verbal sensitivity, companionship…Without power, water, and working sewers in our homes we have proved the vital need of human contact every day. This is continuing now we have the facilities (79, New Brighton, FebEQ).

The support of family also played an important role in helping older adults to overcome difficulties following the 2011 earthquake: “Because we haven't easy access to a supermarket due to earthquake damage, had to get daughter-in-law to take me grocery shopping across town in Fendalton” (84, Redcliffs, FebEQ); and “At my age, I cannot live in
my home until it is fixed...I am grateful that [North Island] cousins are taking me to their place to stay with them” (85, Redcliffs, FebEQ).

By maintaining and accessing supportive social networks in the aftermath of the earthquakes in 2010 and 2011, older adults were able to receive necessary assistance to allow them to maintain their routines and social activities. Focus group respondents reported that social contact and support has been of central importance since September 2010 and noted a general improvement in community relations as people interact more with family, friends, and community members. Resilience was more than a social phenomenon, however, and older adults were often forced to draw upon their physical and psychological resources to make changes to the mode and setting of their activities in order to continue participation.

9.7.3.5 Adaptation and flexibility: adjusting to a new normal

In the aftermath of the 2011 earthquake, many older adults displayed considerable adaptation and flexibility. This theme describes changes made by individuals to the mode or setting of their activities, which allowed them to maintain participation and overcome problems associated with a lack of access to activity destinations or disruptions to local services. The loss of facilities and damage to transportation infrastructure, in particular, created barriers to activity participation for many older adults. Instead of reducing participation, however, some older adults found ways to alter their activities to suit a changed environment. Adaptation and flexibility was associated with physical activity, social activity, spiritual activity, and economic activity, which were often undertaken in the home or local environment.

Respondents made the following comments in support of the adaptation and flexibility in the home environment: “I walked to [a local shop] and bought a DVD of Tai Chi, so we can do it at home now that our group meeting venue has been damaged” (77, Papanui High Deprivation, FebEQ); and “I usually read a great deal, but as the libraries are closed due to the earthquake I've taken the opportunity to sort through documents and notes, which I've been trying to thin out for a long time” (78, Papanui Low Deprivation, FebEQ). Respondents also commented on the utility of their local environment as a context of adaptation and flexibility: “Our local area is a major location for our activities due to helping and clearing up after earthquake” (67, Papanui High Deprivation, FebEQ); and “We confine our walks at present to
local ones rather than driving to start walks elsewhere” (75, Redcliffs, FebEQ). Respondents revealed a remarkable determination to continue with an active lifestyle even when their preferred activities were no longer available to them:

Since the earthquake things have been very different for me. I would go to the cinema regularly and go into the [Central Business District] on the bus…or go to the other side of town, but I have not done this since last September. I have stayed at home either reading, doing housework, or gardening. I have also spent more time watching TV. Hopefully the quakes will settle and I can get back to my old life! I keep walking and going to the gym and try to keep as active as possible (72, Papanui Low Deprivation, FebEQ).

Another respondent commented on the disruption caused by the earthquakes to their employment and wrote of how they were forced to undertake major replanning in order to maintain their business:

Life very flexible at this time. A great deal of planning and changing of previous planned activities. Major adaptation and planning required for all aspects of my full-time practice. New venue to be found or alternative venue arrangements being considered for elsewhere in New Zealand due to earthquake damage (70, North Hornby, FebEQ).

The theme of adaptation and flexibility was supported by photovoice data, which revealed the continuation of spiritual and physical activity in the context of a significantly disrupted environment.

![Image](image1.png)

Figure 43: Photovoice depictions of adaptation and flexibility

59 Faces are obscured in this image as written consent could not be gained from photograph subjects as they were not contactable by the photographer.
During focus group discussions, respondents were not surprised by the adaptability of older adults. It was asserted that many older adults had experienced material and psychological hardships across the course of their lives, particularly as children and young adults, which had engendered a flexibility and self-sufficiency within the group. For example, some respondents reported childhood experiences of living without power, running water, and telecommunications, which was similar to conditions resulting from the 2010 and 2011 earthquakes.

9.8 Summary and discussion of phase-three results

9.8.1 Summary diagram of phase-three results

The third research phase explored the pathways to active ageing by examining the emplaced activity experiences of older adults at a time of significant environmental change arising from destructive earthquakes in 2010 and 2011. The findings from the third research phase are summarised in the diagram below (figure 44). The diagram highlights components of older adults' activity participation, including prevailing settings, modes, and outcomes, and identifies reasons for residential location. The figure depicts the emergent environmental and personal themes, potential interactions between themes, and the direction of influence in relation to commonly reported physical, social, and cultural activities. The diagram also shows the earthquake-related influences on activity participation. Themes omitted from the analysis due to limited evidence and following discussions with respondents are also included. In the diagram, each of the salient environments is shown with links to the emergent themes (both facilitators and constraints). Red arrows between themes indicate a potential relationship. Each of the themes link to one or more of the most commonly reported activities (physical, social, or cultural). The link between each theme and an activity passes through the earthquake vulnerability box to indicate potential challenges that had to be overcome for activity to take place. Main activities are shown as nested within particular settings and in the context of participant decisions about where to reside within the city. To the right of the main activities, are a list of ways that older adults expressed their resilience in their post-earthquake activity. Finally, particular modes of activity reported in diary and photovoice activities are outlined to show specific expressions of active ageing.
Figure 44: Diagrammatic representation of phase-three results showing qualitative pathways from environmental settings to main activity domains, inclusive of earthquake constraints and facilitators.
9.8.2 Discussion of phase-three results

The objectives of the third research phase were to explore the emplaced activity experiences of independently living older adults who reside in diverse urban areas in Christchurch and to explore the potential impacts of the Canterbury earthquakes on environmental conditions and activity participation. The results validate and extend findings from the first and second research phases and potentially delineate specific personal and environmental pathways to active ageing. The results of 14-day activity diaries, photovoice procedures, focus group discussions, and qualitative responses to two earthquake surveys supported a significant influence of diverse environmental conditions on the activity participation experiences of older adults. Personal influences were also reported consistent with the results of the second research phase.

In this discussion section, the main research findings are considered in relation to the reviewed literature from chapters two and three. Firstly, the agency of older adults is highlighted with reference to the selection of a residential dwelling location. Secondly, the reported composition and context of older-adult activity is discussed and compared to findings from the second research phase. Thirdly, the role of the home, retirement living communities, local environment, social network, and climate are discussed in relation to older-adult activity. Subsequently, the role of personal influences on activity is considered. An examination of the earthquake-related impacts on environment and activity follows. In the next section, the limitations of the research methods are outlined. Finally, the PAR process undertaken as part of the third research phase is reflected upon.

9.8.3 Agency in the selection of a residential dwelling

As a prelude to an in-depth consideration of the potential environmental and personal influences on active ageing, it was necessary to conceptualise how older adults from diverse urban areas came to live in their current location. These investigations were concerned with elucidating whether residential location was the result of reasoned decision making or happenstance. Five themes identified from diary responses indicated that older adults from a range of study areas made careful residential selections based on cues from their surroundings or personal circumstances, which provided evidence of significant personal agency among the sample. Themes addressing residential selection included environmental pull, environmental
push, decisions to age in place, changes in health or mobility status, and downsizing to a more manageable property. Few respondents indicated that they had little or no choice in their residential location or were trapped in their current circumstances by health or financial constraints.

Few of the studies that explored environmental influences on the health and activity participation of older adults considered how study participants came to reside in their present location. There is often an underlying assumption on the part of researchers that residential location is the consequence of personal or structural factors over which individuals have little control, including health and financial status, government housing policy, land zoning, and area-level poverty or affluence (Ball et al., 2006; Macintyre et al., 1993). For this reason, the influences on residential location are seldom considered in the international literature. Several researchers have recognised this omission and recommended that research be conducted to explain why individuals choose to remain in particular environments or undertake residential transitions in later life (Patterson & Chapman, 2004; Yao & Robert, 2008).

Within the assessed literature, four studies were identified that examined the rationale for residential location among older adults. In a study of the experience of retirement village living in New Zealand, Grant (2007) observed that many individuals make informed choices about their post-retirement living situation. Grant noted, however, that the growing diversity of environmental conditions for older adults, particularly the proliferation of age-segregated housing, has made the choice of a dwelling location increasingly complex. An international study that examined transitions within the community and from community to aged-care settings reported that poorer health, older age, and living with a spouse or child were the main correlates of residential transitions in later life (Wilmoth, 2000). Wilmoth also reported that transitions within the community decline with age, while the risk of transitions to institutions increase. In a study assessing the importance of neighbourhood design for walking behaviour, Michael and associates (2006) reported that some older adults chose their residential location to support activity participation; however, the majority of respondents moved for pragmatic reasons, including housing affordability. Decisions to remain in a particular area (ageing in place) were reportedly associated with support for preferred activities (Michael et al., 2006). In a New Zealand study that explored the well-being and place attachment of older people, Wiles et al. (2009) identified preferences for ageing in place in the context of the highly changeable urban environment. In parallel with other studies, choice of residential location
was reportedly associated with practical considerations, including the cost of housing, topography, availability of a garden, the view, familiarity with an area, location relative to family and local amenities, and reduced maintenance associated with a smaller home (Wiles et al., 2009).

The small number of studies that explored the reasons for older adults' residential location offer support for themes identified in the present research and reinforce the agency of older adults in determining their post-retirement living circumstances in urban areas. In particular, attraction to the physical and social attributes of an area (environmental pull), moving to a smaller and more manageable home (downsizing), changes in health and mobility, and ageing in place were all supported as reasons for residential location among older people (Michael et al., 2006; Wiles et al., 2009; Wilmoth, 1998). The only theme not supported by the assessed literature was negative environmental push. The lack of support for the environmental push theme may reflect a desire among older adults to focus on the positive aspects of moving to a new location in later life, and report these to researchers, rather than reflecting on negative factors that may have prompted a residential transition. While there was little support in the literature for an environmental push as a rationale for residential location, there was support for the identified environmental conditions that were regarded as deleterious influences on the lives and activities of older adults. Environmental push factors included unmanageable distance to necessary services, poor access to appropriate care, social isolation, stress or grief associated with a place, air and noise pollution, lack of neighbourhood support, lack of security, unhealthy living conditions, steep topography, and inclement weather. Many of these factors have previously been identified as having a negative influence on older-adult health and activity participation in the assessed literature (Fernandez-Ballesteros, 2001; Knipsheer et al., 2000; Kowal & Fortier, 2007). It is likely, therefore, that older adults in unsupportive areas recognised the deleterious impacts of such environments on their health and activities and decided to move to a more supportive area in later life as a result. It is also possible that environmental pull and push factors work in synergy with each other. That is, a residential transition may be prompted by simultaneous experiences of environmental pull and push.

Several previously identified influences on residential location were not supported by the findings of the present research, including cost of housing and living situation (living with a spouse or children) (Wiles et al., 2009; Wilmoth, 2000). While older adults recognised that
the cost of housing was an obstacle to choice of residential location, they felt that there were
enough opportunities within the Christchurch housing market to facilitate the selection of a
preferred dwelling location. The perception of high levels of choice in the housing market is
potentially a function of living in a relatively large city. Towns and small cities may have
comparatively less choice for older-adult residents. It is difficult to speculate on whether
choice of a residential dwelling location may be different in other places without additional
data. Future research may delve further into this issue and potentially examine whether the
competitiveness of the housing market or availability of retirement living units, for example,
play a role in the selection of a residential dwelling location for older adults. The advent of
the 2010 and 2011 earthquakes has considerably altered the residential environment by
damaging or destroying thousands of private dwellings. This has resulted in unplanned
residential transitions for some older adults within a severely diminished housing market. It is
unclear what this will mean for the residential location of older adults in the coming years, but
further research is surely warranted to examine whether individual agency can be maintained
in these circumstances. If older adults are forced to move into non-preferred environments or
to leave their current dwelling before they are ready as a direct result of the earthquakes, there
may be significant implications for their activity participation and health.

The present research suggests that older adults exercise their personal agency in the
selection of residential areas prior to and beyond age 65 years. Agency in residential
selections is supported by several research studies, although this research also adds the
concept of environmental push as a rationale for movement away from an unsupportive
location. These findings are important in the context of this research because they suggest self
selection into diverse urban areas based on environmental and personal factors. The concepts
of environmental push, environmental pull, and ageing in place provide evidence for the
important role that physical and social environments play in older adults' selection of a
dwelling location. Self selection into more favourable environments may be regarded as a
limitation of this research when considering that study areas were selected, in part, by the
proportions of older adults in each location. The findings for self selection into diverse
neighbourhoods, however, suggest that in Christchurch there is no archetypal supportive
environment and that all residential circumstances are likely to present a mix of facilitators
and constraints to activity participation, which supports the findings for an environmental

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60 As data from this study were collected in the weeks following the 2010 and 2011 earthquakes, it was not
possible to assess longer-term implications of the disasters.
continuum from the first research phase and the concept of particularity from the second phase. Moreover, it is likely that independently living older adults have diverse needs and interests, which are addressed in varying degrees by different neighbourhood configurations.

### 9.8.4 Modalities of participation: expressions of active ageing

As part of diary procedures, respondents were asked to keep a daily record of the mode and setting for their activities over a period of 14 days in 2011. These data were captured to provide validation and elaboration for the phase-two survey findings and to better understand the everyday experience of active ageing in urban areas during an unfolding sequence of natural disasters. In support of the survey results, the most commonly reported activities were in the physical, social, and cultural domains, with comparatively lower levels of civic, spiritual, and economic activity. Activity participation was most commonly reported in the home and local environment.

Most gerontological studies have focussed specifically on physical activity due to established preferences for this domain in later life and the well-known health benefits associated with regular participation (Chodzko-Zajko et al., 2009; U.S. Department of Health and Human Services, 1996). Older adults' physical activity is also routinely assessed by government organisations seeking to gauge the progress of policies aimed at creating a more active and healthful society (Sport and Recreation New Zealand, 2001, 2008). In the rationale for and findings of gerontological studies, investigators commonly report that physical activity participation constitutes a major portion of the activities undertaken by older adults, which parallels the results of the present research (Annear et al., 2009; Lian et al., 1999; Lim & Taylor, 2005). When specific physical activities were reported by diarists in this study, frequently undertaken endeavours included walking, gardening, swimming, sports and exercise class participation, which were consistent with the findings of other studies (Lian et al., 1999; Sport and Recreation New Zealand, 2008). This study also adds new findings concerning the importance of home repair and maintenance, rehabilitation and physical therapy, and disaster recovery activities, which became important modes of participation in the aftermath of the 2010 and 2011 Canterbury earthquakes.

The social dimensions of participation are beginning to be recognised as an important sphere of older-adult activity, although far less research has been conducted in this domain.
When researchers have focussed on social activity as the subject of gerontological research, they have reported it to be a generally positive influence on activity and health in later life (Richard et al., 2008; Smits et al., 1995; Walker & Hiller, 2007). Activities commonly reported by diarists included interactions with family and friends and participation in social and interest groups. These activities were consistent with the findings of other studies, which have reported on older adults' activity preferences (Haak et al., 2008; Richard et al., 2008; Walker & Hiller, 2007). The importance of everyday community interactions (visiting a hairdresser or salon for example) and the use of communication technology (such as email services) were also reported by diarists; however, these were not highlighted as important modes of activity participation in the assessed literature. It is acknowledged that there are likely to be studies that focus specifically on the everyday activities and interactions of older adults in feminist literature and social gerontology. This research was not concerned with the incidental acts of the everyday experiences, but rather self-described meaningful engagements that contributed to health and well-being in line with the conceptualisation of active ageing. Community interactions possibly took on a greater significance following the 2010 and 2011 earthquakes when communication with other residents and family became an important mechanism for coping. This research reinforces findings for the importance of social activity in the everyday lives of older adults and contributes to an increased understanding of preferred and evolving social activities in later life.

Cultural activity participation was seldom reported in the assessed research literature. This is potentially due to a poor understanding of the relationship between cultural activities and a holistic conceptualisation of health, a lack of consistent definition of the concept of cultural activity, or a tendency for such endeavours to be regarded as incidental or taken-for-granted by researchers and respondents. When reported in research, cultural activity is usually conceptualised as practices or traditions associated with a particular ethnic group, such as Māori (Koopman-Boyden & Waldegrave, 2009). The present study widens this definition to include learning or education and expressing personal skills and interests, which may account for a lack of comparability with other studies. This research is potentially among the first gerontological studies to highlight cultural activity (broadly defined) as a centrally important component of active ageing. When reporting their cultural activity, older adults commonly wrote about the importance of home entertainment (television, radio, and reading), mentally stimulating activities (crosswords, memory games, and puzzles), hobbies (knitting and model making), and productive and creative endeavours (baking, preserving, and studying). The lack
of diversity within the sample and older-adult population of Christchurch possibly accounted for the relatively infrequent reporting of expressions of ethnic or cultural identity.

In addition to confirming preferences for physical, social, and cultural activity participation, the dairy data also reinforced the important settings of active ageing. In particular, home and local environment were identified as primary locations for older adults' activity participation in the diary data congruent with the survey findings from the second research phase. Comparatively little activity was undertaken beyond these settings. This may be partly due to environmental disruptions caused by the 2010 and 2011 earthquakes. It is possible that some older adults were disinclined to venture beyond their home or local environment when streets were in a state of disrepair, curfews and cordons were imposed, and large aftershocks continued to affect the region. Studies of the effects of earthquakes on older adults, including the results of the present research, have indicated that confinement, isolation, and geographic constriction affect some individuals in the aftermath of a disaster and reduce opportunities for activity participation (Ardalan et al., 2011). While the earthquake effects cannot be ruled out, the assessed gerontological literature supports a general geographical constriction of activities in later life. Researchers have previously reported that older adults tend to focus their activities on home and local environment as a result of their familiarity with these environments, accessibility of resources and facilities, and reduced social network size and interactions (Annear et al., 2009; Smith, 2009).

The findings of the present study for preferences for physical, social, and cultural activities add to the gerontological literature by highlighting the domains of activity that are likely to be most important for the everyday participation of older adults. These domains are potentially a target for interventions. The results lend support to the notion of active ageing as a two-tiered concept: physical, social, and cultural activities dominate the spheres of activity for many older adults (tier one activities that are most often performed), while spiritual, civic, and economic activities constitute meaningful, but infrequently performed activities (tier two activities that are performed comparatively less often). This is not to say that spiritual, civic, and economic activities are unimportant, but rather that such pursuits do not reflect the quantum of older-adult activity. Of course, it is possible that older adults desire to have more involvement in these activities, but are constrained by personal or environmental circumstances, although evidence for this perspective was not identified in the present study. The results of the third research phase also support the concept of a socio-spatial core that was
identified in the second research phase, which describes preferences for proximate physical
and social contexts in the performance of activities. Within the context of a socio-spatial core,
support was also identified for multiple realms within particular settings. Home and local
environment provide a diversity of resources for older adults' activity participation, which
facilitate significant choice with regard to passive or active, formal or informal, and
productive or reflective activities. There appears to be a divergence between physical space
and usefulness that occurs in later life whereby the smallness or intimacy of home,
neighbourhood, and network does not always limit how these areas are used and experienced
by older adults. Resource provision needs to take into account not only the availability of
environmental attributes, but also the diverse ways in which they might be utilised by older
adults.

9.8.5 Environmental influences on active ageing

Environmental influences on active ageing were commonly reported in diary,
photovoice, and focus group procedures during the third research phase. The assessed
literature provided overwhelming support for interactions among ageing, environment, health,
and activity participation. However, relatively little evidence has been provided in the
gerontological literature to describe how environmental conditions potentially influence the
broad concept of active ageing. In contrast to many other gerontological studies, very few
environmental constraints to activity participation were reported by independently living older
adults. Indeed, when the impacts of the 2010 and 2011 earthquakes are excluded, no physical
environmental conditions were reported as barriers to activity participation in the third
research phase. The only reported barriers of consequence were isolation and social
responsibilities and obligations. Both international and domestic studies have previously
reported numerous physical environmental barriers to activity participation, particularly
within the built environment (Annear et al., 2009; Michael et al., 2006). The lack of reported
physical environmental barriers in this study suggests that older adults who live independently
in communities of their choice have a high capacity or tolerance for overcoming existing
constraints. The results of the area observations in the first research phase clearly showed that
all urban areas included in the study presented a range of potential environmental constraints
to activity. Older adults tended to view their environmental conditions as settings of
opportunity, however, which facilitated activity participation even in the midst of identifiable
barriers. Positive engagement in difficult circumstances can be conceptualised as
environmental concordance. Environmental barriers were overcome, ignored, or avoided by many older adults. Even in the context of significant earthquake disruptions, many respondents maintained or adapted their activities. It should be noted, however, that adaptation to difficult environments may not reflect optimal activity participation or outcomes.

9.8.6 The home environment

The home environment was identified as a predominantly positive influence on activity participation for many older adults. It provided multiple opportunities and settings for involvement in diverse activities. Valued activity settings included the garden, indoor spaces, the interface between the private and public realm, and retirement living environments. The home environment could also be a barrier to participation, however, if an individual experienced increasing social isolation or held fears about negative interpersonal confrontations. The value of the home as a centre of activity participation is consistent with the results from both the first and second research phases. In the context of an often unsupportive urban environment, home can provide a refuge from potentially deleterious physical and social conditions beyond the front gate. Several gerontological studies were located within the reviewed literature that identified the home environment as an important location for older-adult health and activity participation (Barnett et al., 2007; Connell & Wolf, 1997; Niva & Skar, 2006; Vik et al., 2007; Walker & Hiller, 2007). Home becomes increasingly important with advancing age, and indoor settings often dominate activity as illness or disability take hold for some (Haak et al., 2008; Vik et al., 2007). In the following section, each of the potential home-based influences on activity participation identified in the third research phase are discussed in relation to the assessed literature to identify areas of inconsistency, congruence, or potential additions to the gerontological knowledge base. One of the important findings of this study is that the home is a highly heterogeneous setting that provides diverse activity options both indoors and outdoors. Among individuals, the home environment varies considerably in terms of size of indoor or outdoor area and the amenity or utility of available resources. It was identified, however, that older adults make considered selections about where they live beyond the age of 65 (including choices to stay where they are for as long as possible), which often take into consideration how a particular dwelling supports or constrains activity preferences. For example, a retirement living environment might offer less opportunity for gardening, but more opportunities for socialising and indoor
leisure in a context of care and support, representing a trade-off to accommodate changing personal circumstances. Overarching characteristics of the home environment that support activity participation in later life are encapsulated in the concepts of malleable space and abstract accessibility. Malleable spaces refer to environments that can be readily altered by older adults to suit their activity needs and preferences. They must be large enough to accommodate change or adaptation and should also have a variety of indoor and outdoor resources to facilitate activity choices. When a space is not malleable to the changing needs of older adults, a transition to a new environment is likely to occur (such as a retirement village or smaller accommodation). The home environment is also likely to be more malleable when it is owned rather than rented. Home is also an accessible environment for adults of all ages. Abstract accessibility refers to the proximity and usability of resources and relationships from which older adults seek the fulfilment of activity needs and preferences.

9.8.6.1 The private garden

Within the home environment, the garden provided a setting for exercise, food production, plant propagation, and pleasurable and transcendent experiences that supported participation in physical, social, spiritual, civic, and economic activities. Diary and photovoice data revealed the diversity of ways in which older adults were active in their gardens, which included the performance of informal physical activity often undertaken as household chores, growing fruit or vegetables for self or family, maintaining ornamental plantings, and relaxing in a peaceful and nature-rich setting. Gardens have long been important to urban-living New Zealand adults, and there is a rich history of dwelling on what is colloquially termed the quarter-acre pavlova paradise (Mitchell, 1972) – a satirical reference to the common suburban plot size of the 20th century. The role of the home garden as a potential influence on older adults' activity was seldom addressed in the assessed literature. Researchers have noted, however, that as the home is made more accessible and usable older adults tend to be more active in their private outdoors (Niva & Skar, 2006). Researchers also reported that when accessing outdoor environments takes too much energy or time older adults are less likely to be active (Niva & Skar, 2006). Other researchers reported that older-adult activity tends to revolve less around outdoor environments with advancing age, particularly after the age of 80 (Vik et al., 2007). In the present study, older participants were identified as relatively healthy and active and they had potentially few personal barriers to participation in the context of a home garden. No studies were identified
among the assessed literature, which reported on the potential role played by garden settings in relation to exercise performance or productive endeavours. A tillable garden with fruiting trees and vegetables encourages activity via the necessity for regular maintenance and harvest. The ability to provide for self and others offers an incentive for participation and reward for personal effort. Concerning the potential reflective and transcendent character of the home garden, researchers have previously reported that experiences in natural settings (bird watching, gardening, and viewing the night sky, for example) support the health and well-being of older adults and provide motivation for outdoor activities at home and further afield (Jansen & von Sadovszky, 2004). The maintenance or development of an attractive garden provides opportunities to experience an intangible connection with nature and the emotional and therapeutic benefits of cultivating a relaxing and reflective space. Outdoor activity in the home environment is often conceptualised as a singular behavioural category in international studies, but the present research showed that there are diverse ways in which older adults are active in the context of their private gardens. Importantly, the garden attains utility through its accessibility and the capacity for older adults to utilise and alter the setting to suit their preferences. The home garden was not conducive to all forms of activity, however, and those who lived in retirement villages were usually restricted to the maintenance of ornamental plantings with little opportunity for significant outdoor exercise or the production of fruit or vegetables. In garden settings large and small, however, older adults were able to experience the intangible benefits of relaxation and transcendence that come from contact with nature. This study is potentially among the first to reveal the importance of the home garden as a facilitator of exercise and productive activities. It also reinforces existing findings for the transcendent and reflective qualities of such settings.

9.8.6.2 The private indoors

The private indoors provided opportunities for engagement in a variety of productive and creative endeavours as well as the experience of sanctuary (being secure and engaged away from the concerns of the outside world), which supported participation in civic, social, cultural, and economic activities. Diary and photovoice data revealed that indoor spaces facilitated such activities as food preserving or baking, studying or writing, entertainment (alone or in the company of family), hobby participation, and employment. Indoor spaces have been identified as an important location for activity participation and an influence on health in several studies. The private indoors is viewed as an accessible environment for older
adults, which becomes an increasingly important context for the performance of activities with advancing age and declining health (Haak et al., 2008; Vik et al., 2007). As older adults become more frail, however, the indoor environment can also present challenges. The home environment was identified as a potential barrier to activity participation in at least one international study, and new hazards can emerge if individuals experience sudden changes in health or mobility (Connell & Wolf, 1997). Housing adaptation has been shown to prolong independence and encourage higher levels of home-based activity (Niva & Skar, 2006). The home environment has also previously been identified as an important site of safety and security, particularly for older women, where activities can be undertaken without fear of negative social interactions or victimisation (Barnett et al., 2007). Such findings are commensurate with the notion of home as a sanctuary. The home provides protection against hazards and antisocial behaviour, while also providing access to a familiar suite of valued activities that are intrinsically satisfying and which require no external engagement and limited exertion. These characteristics suggest that older adults have a strong attachment to place. Rubinstein and Parmelee (1992) have theorised that as people age in a familiar setting, their living spaces become imbued with personal significance and meaning, which creates a strong sense of attachment to these locations. In their work on the social spaces of older adults, Wiles et al. (2009) also identified that adults aged 75 years or older in a large New Zealand city experienced an increasingly intense sense of attachment to their home environments, which is related, in part, to their shrinking social and geographical worlds. Wiles et al. found that attachment to home was related to appropriate locations for surveying the wider neighbourhood, experiencing the warmth of the sun, residing in a location for a long period of time (and the associated feelings of familiarity and intimacy), and feelings of comfort and pride associated with the completion of garden projects and renovations in the home environment. It has been acknowledged, however, that there is a fine line between feeling secure and becoming isolated and fearful of leaving one's property (Barnett et al., 2007). No studies were located among the assessed literature that reported on the potential role of indoor settings in supporting productive and creative endeavours. These activities are potentially very important for maintaining involvement in a variety of non-physical pursuits that promote the maintenance and enhancement of knowledge and skills in later life. In the present research, the indoor environment was primarily viewed as a facilitator of activity participation, which is possibly explained by observation that the sample group were generally healthy, active, and living in dwellings of their choice. This study is potentially among the first to conceptualise how the indoor environment functions to support activity
participation among independently living older adults. This research shows that for healthy and active older adults, the home is a centre for participation in a diversity of meaningful and productive activities and a context of security that affords the opportunity for freedom of expression.

9.8.6.3 The interface between the public and private realm

Interactions and behaviours at the interface between home and local environment contributed to neighbourhood social capital and attractiveness and provided opportunities for participation in physical, social, and civic activities. In the context of the present research, older adults were active at the boundary between their home and the local environment in several ways. Examples from the diary and photovoice data included keeping one's home and garden in a presentable state commensurate with street character; maintaining a shared garden, grass berm, or driveway; taking out rubbish for residents of a housing complex; participating in formal or informal community watch; or sharing a conversation or meal with neighbours. A small number of articles were identified from the literature review, which suggested that there were health and activity benefits associated with positive interactions at the interface between home and neighbourhood. Studies have previously reported associations between trusting and reciprocal relationships with neighbours, local social cohesion, and higher levels of physical and social activity (Annear et al., 2009; Fisher et al., 2004; Walker & Hiller, 2007). It has been reported that experiences of neighbourliness, social cohesion, and social capital, may encourage activity by promoting greater community cooperation and increasing social support and contact (Fisher et al., 2004; Walker & Hiller, 2007). Experiences of neighbourliness were also shown to be independently associated with better physical health and functioning among older adults (Bowling et al., 2006). The present study is potentially among the first to conceptualise specific behaviours and experiences that constitute activity participation at the interface between home and local environment at older ages. This study also shows that direct human contact is not necessary in order to contribute to the neighbourhood social environment. Older adults can, and do, act on their own in diverse ways (such as tending a common garden area or taking out rubbish for neighbours) that contribute to the social and physical character of their local environment.
9.8.6.4 The retirement living environment

Retirement living environments\(^{61}\) constitute tailored residential settings for older adults. These locations were identified by respondents as facilitators of physical, social, cultural, and spiritual activities via the sharing of values and lifestyles with same-aged peers or the availability of age-appropriate services and facilities. Importantly, the benefits of living in such settings are not commonly experienced by older adults who reside in other community locations. Retirement villages offer expanded activity opportunities in the context of care and supervision, which facilitate participation without fear of the consequences of injury or overexertion. Specific activities reported in the context of diary and photovoice entries included informal daily interactions with other residents, sharing a meal, undertaking leisure activities together, going on group outings, attending an organised social event, taking a group exercise class, swimming, or walking village grounds. A small number of studies were located during the systematic review that addressed activity and health in the context of retirement living environments (Grant, 2007; Kubzansky et al., 2005; Subramanian et al., 2006; Wiles et al., 2009). Researchers in the United States have previously reported that older adults display better mental and physical health outcomes when residing in environments with significantly higher concentrations of older adults, which are analogous with the conditions provided within retirement living environments (Kubzansky et al., 2005; Subramanian et al., 2006). In a study of older adults and their social spaces in New Zealand, Wiles and associates (2009) reported that retirement villages often provide increased opportunities for social interaction and more options for group activities and provided examples of how a small number of residents experienced improved interaction as a result of a transition into such a setting. In another study of retirement village life in New Zealand, Grant (2007) reported that while residents have to adhere to certain rules and negotiate a tension between individualism and community life, they often relish the opportunity to reignite and engage in an array of activities provided in such settings. Increasingly, the image of the retirement living environment is changing from a location of managed decline to one that supports active ageing, rejuvenation, and renegotiation of personal aspirations and identity (Grant, 2007). The present research supports the findings of Wiles et al. (2009) and Grant (2007) and depicts the experience of living independently in a retirement community as one of enhanced opportunities for active ageing across several domains.

\(^{61}\) Inclusive of retirement villages and older persons’ housing estates.
9.8.6.5 Social isolation

While the home environment was usually supportive of active ageing for those who live independently, it was also sometimes a site of isolation and activity constraint. In particular, reduced network participation and location in an unsupportive or threatening environment restricted some older adults to home-based activity and limited social, cultural, and civic activities. For older adults whose activities had previously revolved around a diverse social network, reductions in interpersonal contacts in later life (as a consequence of declining physical or mental health, the death or illness of friends, or loss or separation from a partner or spouse) potentially turned the home environment into a prison where individuals experienced increasing isolation and loneliness. With increasing frailty, some older adults also expressed concerns about the risks of potential victimisation within their local environment associated with negative interactions with neighbours or other community members, which potentially dissuaded activity in the private outdoors or local environment. Several studies were identified from the literature review, which examined the experiences and consequences of social isolation in later life. Studies from the United States and Spain reported that older adults who were socially isolated or confronted with negative social interactions tended to have reduced cognitive functioning and higher rates of depression (Dean et al., 1992; Zunzunegui et al., 2003). In an Australian study, fear of neighbours or anti-social interactions among vulnerable and independently living older women was identified as a barrier to participation in diverse activities, particularly social and civic endeavours undertaken in the local environment (Barnett et al., 2007). Barnett et al. reported that negative social interactions, either experienced or perceived, reduced activity by increasing feelings of fear and detachment in relation to one's surroundings and creating a closer, and potentially unhealthy, bond with home. The results of the present study support the findings of other researchers by revealing how reduced social network interactions and a threatening environment conspire to decrease participation in diverse modes of activity for some older adults. This study also adds the understanding that social isolation can be experienced among a relatively active and healthy population in urban New Zealand. While expressions of social isolation among independently living older adults were relatively limited within the context of the sample, this condition is likely to have a significant impact on those affected. As the sample was identified as both healthy and active, it is also possible that there is an unrecognised population of frail and socially isolated older adults who live independently who chose not to participate in the research. Gerontologists have previously reported
difficulties in making contact with more vulnerable older adults who reside in community settings (Kowal & Fortier, 2007; Victor, 2010). Social isolation, therefore, is potentially a significant and insidious constraint to activity participation for a silent collective of older adults. If the world beyond an individual's front door or gate is seen as threatening or a challenge to someone with limited mobility it may act to limit environmental engagement. In his seminal gerontological work *Prisoners of Space*, Rowles (1978) wrote of how older adults experience increasingly constricted geographical worlds and growing confinement to their home, but use tools such as memory and fantasy to obtain a sense of space and expansiveness in their lives. Wiles et al. (2009) identified that some older adults feel increasingly isolated in urban areas as a consequence of a rapid turnover of residents in their neighbourhood, an increase in the number of ethnic minorities who may not speak English as a first language, and friends and associates becoming unwell, moving into aged care facilities, or dying. Such factors can conspire to make older adults feel disconnected from the community beyond their front gate. This can be particularly difficult for older adults who have lived in their present location for many years and previously enjoyed positive interactions with friends and neighbours and a sense of community integration.

9.8.7 The local environment

In the present research, the local environment was reported solely as a facilitator of activity participation (excluding the impacts of the 2010 and 2011 earthquakes). The local environment provides a variety of physical settings and access to proximate networks that support activity for many older adults. Facilitators of activity participation that were identified within the local environment included familiarity, local amenity, proximity and accessibility, walking distance and walkability, local interaction, and local activity destination. The findings for overwhelmingly positive experiences of the local environment contrast with the results of the phase-one assessment of study areas where a high level of constraint to participation was observed by older adults across diverse urban areas. These findings, however, do support the phase-two survey results, which indicated that local environment was a nexus of activity participation for older adults and that positive perceptions of one's surroundings were associated with higher levels of activity. It is possible that independently living older adults reside in fundamentally constraining urban environments, but have the physical capacity, agency, motivation, or adaptability to overcome antecedent barriers and make the most of the limited resources that are available to them. It is also possible, however, that a divergence
with the findings of the first research phase reflects differences between observed and reported experiences of urban areas. The assessed literature was equivocal in its support for local environmental influences on the health and activity participation of older adults. A majority of assessed studies identified elements of the local environment as either facilitators or constraints to older adults' activity participation (Annear et al., 2009; Gallagher et al., 2010; Michael et al., 2006; Salvador et al., 2009). Other researchers, however, argued that personal influences, such as mobility and gender, are more important determinants or that environmental influences relate to the particular population groups or modes of activity (Anaby et al., 2009; Bird et al., 2009; Levasseur et al., 2008; Mota et al., 2007). Despite growing evidence, there is still conjecture concerning the prominence of environmental conditions in the relationship among ageing, health, and activity participation. The present research suggests that the physical and social environment play a central role in the facilitation or constraint of activities in later life, which has potential downstream implications for health and well-being. The overarching concepts to emerge from the third research phase with regard to the local environment include *abstract accessibility* and *abstract amenity*. In congruence with the home setting, when the local environment is accessible (with resources and networks close, usable, and familiar) older adults are more likely to be active. Similarly, when a setting provides high levels of amenity (characterised by pleasantness, utility, and age-appropriateness) opportunities for active ageing abound.

### 9.8.7.1 Familiarity

Having lived in one's surroundings for a significant period and become cognizant of the particular challenges, opportunities, resources, and networks available, older adults are well placed to make informed decisions about their participation, which supports physical and social activities in later life. The concept of familiarity encapsulates both length of time spent within a particular location and the degree to which that setting is understood by older residents. Within the international literature that was assessed as part of a systematic review, relatively little was written about the concept of familiarity. A study from Auckland, New Zealand, reported that long-term residence in a stable urban environment was regarded as a facilitator of well-being among older adults, while residence in an area of rapid change was perceived negatively (Wiles et al., 2009). Conversely, a study of the relationship between physical functioning and environmental conditions conducted in the United States found no association between length of residence and health status among a sample of older Americans.
(Balfour & Kaplan, 2002). A study of leisure time physical activity among older adults in Christchurch found no relationship between years of area residence and participation (Annear et al., 2009). While there are mixed findings for the potential influence of length of area residence on activity and health in later life, few studies have explored the importance of knowledge and understanding of local surroundings. It seems clear that length of residence alone does not guarantee that an individual will have an understanding of their surroundings and be more active or healthy as a result. In support of the work of Annear et al. (2009), the findings from the second research phase revealed no significant interaction between length of residence and activity participation in a nested analysis. It is possible that length of residence also requires an intimate understanding and knowledge of a location in order to facilitate activity participation. The findings of the third research phase build on the work of Wiles et al. (2009) and add to the gerontological literature the idea that a combination of length of residence and understanding of local conditions and resources, collectively referred to as familiarity, are a potential important influence on activity participation within the local environment.

9.8.7.2 Local amenity

Residing in an environment that is perceived as both visually attractive and providing opportunities for involvement in preferred and appropriate activities was regarded facilitator of participation in urban areas. Local amenity reflects a combination of aesthetics and utility, which was regarded as supportive of physical and social activity in particular. Local amenity is highly subjective and is best assessed and defined by older adults themselves. Indeed, it may not be possible for those from outside the group to accurately determine which local resources are most appealing and appropriate for older adults' activity. In support of the present findings, researchers have previously reported that attractive and age-appropriate attributes in the local environment support both the health and activity participation of older adults (Bowling et al., 2006; Parra et al., 2010). Amenable environmental attributes that have been reported as facilitators of activity include neighbourhood parks and natural areas, clean and high-quality facilities, situated experiences of peacefulness and safety, and historical or consistent urban form (Annear et al., 2009; Bowling et al., 2006; Day, 2008; Gallagher et al., 2010; Jansen & von Sadovszky, 2004; King et al., 2005; Kowal & Fortier, 2007; Michael et

62 The theme of local amenity that emerged from the data differs slightly from the theoretical concept of abstract amenity, which is a broader abstraction encompassing multiple themes.
al., 2006; Parra et al., 2010). Alternately, it has been reported that when environments are unattractive and provide inappropriate resources that older adults are likely to be less healthy and active as a result (Annear et al., 2009; Bowling et al., 2006; King et al., 2000). While several studies were located that identified amenable local features commensurate with the results of the third research phase, none attempted to refine the diverse influences on activity into an overarching theme that recognised the importance of both attractiveness and utility. This study, therefore, provides new evidence for the influence of the amenity of local resources as a support for active ageing in urban areas.

9.8.7.3 Proximity and accessibility

When activity related resources and networks are a short physical distance from an individual's place of residence and accessible to older adults in varying personal circumstances, participation in physical, social, and cultural endeavours is likely to be supported. The ability to access resources for activity involves getting to, getting in, and getting on: getting to the physical or social resource, getting into the facility or group, and getting on equipment or taking part in activities. A small number of studies were identified in the literature review, which reported positive associations between accessibility, usually conceptualised solely as proximity, to local resources and older adults' health and activity participation. Previous studies have reported that when older adults live near supportive and appropriate resources they are more likely to be active and healthy as a result (Annear et al., 2009; Booth et al., 2000; Fernandez-Ballesteros, 2001; Richard et al., 2008; Walker & Hiller, 2007). Conversely, those who lack access to appropriate resources appear to have a comparatively greater risk of inactivity and poor health (Annear et al., 2009). A single study was also located that reported no association between neighbourhood service density and older adult's health, which indicates that proximity alone may not be effective for supporting active ageing (Subramanian et al., 2006). The present study also recognises the importance of being able to get into and use relevant resources in addition to living near to facilities or networks. Haak et al. (2008, p. 83) previously stated that the combination of, “accessibility and usability problems in the neighbourhood increase the risk of exclusion from important domains of participation for older people”.

63 The theme of accessibility that emerged from the data differs slightly from the theoretical concept of abstract accessibility, which is a broader abstraction encompassing multiple themes.
9.8.7.4 *Walkability and walking distance*

Closely related to notions of proximity and accessibility, were the concepts of walkability and walking distance. When the pedestrian environment is supportive and local resources available on foot, participation in physical and social activities are likely to proceed unhindered. As many older adults choose not to drive, no longer have a license, or have reduced functional capacity, a supportive walking environment becomes particularly important for accessing local services and facilities. The capacity of the environment to support walking became more significant following the 2010 and 2011 Canterbury earthquakes when many roads were badly damaged and non-essential vehicular travel was discouraged by local officials. Considering the popularity of walking for transportation and leisure in later life, several researchers have investigated the potential environmental influences on this behaviour. Walkable environments have previously been linked to better mental health and reduced mortality among older adults (Berke et al., 2007; Takano et al., 2002). Researchers have reported that environments can be considered walkable when they provide access to parks and green spaces; safety from crime, traffic, and uncontrolled animals; attractive footpaths and dedicated walking trails; the presence of other people on the street; and are a short distance from age-appropriate facilities and businesses (Annear et al., 2009; Booth et al., 2000; Gallagher et al., 2010; King et al., 2005; Michael et al., 2006; Takano et al., 2002). Walkable environments are generally associated with higher levels of physical activity among older residents as they provide an age-appropriate setting that encourages active forms of transport and leisure (Annear et al., 2009; Gallagher et al., 2010; Michael et al., 2006). Increased walking within the local environment also appears to facilitate social activity, which may be achieved by increasing opportunities for incidental community interactions and supporting access to local networks. Mixed findings have been reported in at least one study, however, which found that objectively measured characteristics of the built environment were not associated with walking among a population of older adults in the United States (Nagel et al., 2008). In the same study, the authors reported that built environment characteristics, including proximity to businesses and safety from traffic, were correlates of walking only for members of the sample who were regularly active (Nagel et al., 2008). Such results indicate that environment matters for those who are already active, but may be of little consequence for those who are inactive. It is possible, therefore, that local environmental conditions are more important for the maintenance of activity rather than its initiation.
9.8.7.5 Local interaction

Social interaction is an important component of activity participation in later life and is often associated with particular places or groups. As shown in the present research, the accessibility of supportive networks and meeting locations within the local environment is likely to promote participation in physical, social, and civic activities. The local interaction theme suggests that a proximate physical location is necessary for the fulfilment of emplaced social engagements. The international literature concurs that network interaction is an important facilitator of health and activity participation for older adults. Proximate social interactions that have been identified as supportive of older-adult health and activity include reciprocal and trusting relationships with neighbours, a positive social climate, and the presence of active older people in the neighbourhood (Bowling et al., 2006; Fernandez-Ballesteros, 2001; Kubzansky et al., 2005; Walker & Hiller, 2007). Walker and Hiller (2007) noted that, “where [older] women described relationships with neighbours and those in the community as close and trusting, concurrent descriptions of the physical environment as ‘nice and liveable’ might reflect the safe and comfortable social climate within which they live” (p. 1162). Such observations suggest that positive interactions within local surroundings can improve perceptions of general environmental conditions, which potentially facilitates further health and activity gains. While several studies have reported that social interaction plays a role in the activity participation of older adults, it is often conceived as a relationship that is independent of physical geography. That is, social interactions do not require supportive spaces to proceed. Contrary to such assumptions, this research highlights the importance of local network access in addition to interactions within a wider social setting.

9.8.7.6 Local activity destination

Of particular importance to older adults is access to local destinations that facilitate participation in preferred activities, including parks, coastal areas or beaches, fitness centres, sports clubs, libraries, churches, and shopping areas. It is the closeness and age-appropriateness of such resources that appears to stimulate participation in physical and cultural activities in particular. Within the international literature, several studies were identified, which concurred that local destinations support the activity participation of older adults. Destinations that were identified as facilitators of health and activity participation, particularly physical activity, included sports courts, health clinics, churches, gyms, shops,
and public spaces (Kemperman & Timmermans, 2009; Michael et al., 2006; Salvador et al., 2009). Local access to preferred activity resources was identified as particularly supportive of walking behaviour as such locations often provide an incentive for active transport (Kemperman & Timmermans, 2009). Areas with a higher number of relevant destinations were also found to be more supportive of activity participation in later life (Gauvin et al., 2008). These findings are reinforced by the results from the first and second research phases. For example, across both phases the Central City was identified as an area of high activity and superior access to resources. While the identification of resource availability was purely descriptive, it did suggest that access to a greater number of appropriate resources potentially supports activity participation in this location. The results of the present study strengthen the international evidence and provide a New Zealand perspective on the importance of local and age-appropriate resources as facilitators of activity participation in later life. The present research also moves beyond a consideration of physical activity and suggests that participation in cultural activities is potentially increased by the availability of appropriate activity destinations within the local environment.

9.8.8 The macro-environment

Beyond the confines of the home and local environment, climate also appeared to influence older adults' activity participation. Climate is considered a macro-environmental influence because it affects most people in the same manner and at the same time within a defined area. Moderate and warm weather conditions were identified as a positive influence on physical and social activity participation, while inclement or extreme conditions (cold, heat, wind, and rain) conspired to restrict or alter participation. Climatic conditions potentially influence physical and social activity by creating barriers to access (reducing energy levels and rendering outdoor activity uncomfortable) or providing incentives to participation (experiencing the sun or seeing other people engaging in outdoor activity). Within the international literature, only one study was located that addressed the potential influence of climate on activity participation. Gallagher et al. (2010) previously reported that exposure to fresh and clean air promotes physical activity participation, while cold, rain, and the presence of ice were constraints among a population of older African Americans. The lack of literature support suggests that climate may be a relatively taken-for-granted influence on the activity and health of older adults. With increasing risks of frailty and decreased immunity with age, exposure to deleterious climatic conditions potentially reduces opportunities for activity and
threatens health and mobility. Moreover, the growing threat of climate change suggests it is likely that extreme weather may become a more significant influence on the activity participation of older people in the years to come. Potential interactions among climate change, population ageing, and urbanisation are likely to be an area of research ripe for future investigations. Other macro-environmental influences on activity participation and health that were reported in the international literature included rural versus urban living and topographical features (such as residing on hill country or plains) (Dwyer et al., 1994; Hough et al., 2008; King et al., 2000; Lee et al., 2006; Lim & Taylor, 2005; Marcellini et al., 2007; Wilcox et al., 2000). Neither degree of rurality nor topography were identified as influences on activity in the context of the present research because rural locations were not selected for inclusion in the study and all urban areas were located on the relatively flat Canterbury plains. It is possible that degree of rurality or topography may influence activity participation in Christchurch, although comparative research is required to verify this. This study adds weight to the negligible international evidence for climatic effects on older-adult activity participation and supports a potential influence on social activity. It is conceivable that climate may be part of a macro-environmental threshold, which constitutes a universal influence on activity across urban areas that must be navigated prior to the initiation of particular behaviours.

9.8.9 Social networks

The social network, inclusive of interactions with family and peers, was often reported as a promoter of activity by respondents. It provided a context for sharing leisure pursuits, hobbies or interests, religious fellowship, and giving or receiving support. The social network could also act as a constraint to activity participation, however, if family, friends, or neighbours loaded older adults with significant and unwanted obligations and responsibilities. The findings for important relationships between social network and modalities of activity were consistent with the results of the second research phase, which showed that older adults were frequently active in the company of one or more companions. Several international studies have reported that access to a supportive social network has positive associations with mental and physical health and activity participation (Maier & Klumb, 2005; Smits et al.,

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64 Topography was identified as an influence of residential location for older adults who reported motivations to downsize to a smaller and more manageable dwelling.

65 A large area of alluvial deposits associated with significant river systems that are characterised by flat and fan-shaped geographical features.
1995; Unger et al., 1997). Others have reported, however, that network interaction is correlated with declines in health and activity at advanced ages, although this is thought to be indicative of a declining independence and the onset of serious disease or disability that requires increased family or institutional care (Avlund et al., 2004). One study was also located, which reported that social contact and support are unrelated to the health and functioning of older adults living in the United Kingdom (Bowling et al., 2006). Bowling and associates noted that such findings were contentious and also reported that self-efficacy, perceptions of local conditions, and neighbourliness were significant correlates of health in later life. It is possible that alternative findings represent qualitative differences between populations living in different countries or cultures. Social network connections reported by respondents in the present study gave rise to two concepts that contribute to the development of the theory of navigated environmental performance: social support and social constraint. In the context of this research, social support refers to the network interactions (family leisure, religious fellowship, service communities and others) that potentially facilitate participation in a variety of active ageing behaviours, while social constraint refers to unwanted responsibilities or obligations arising within the same networks that can create barriers to involvement in preferred activities. The concepts of social support and constraint are finely balanced, and over time a once valued and supportive form of social interaction (looking after grandchildren or preparing a meal for relatives for example) can become burdensome if an individual experiences reductions in health, mobility, or vitality.

9.8.9.1 Shared leisure

One of the important ways in which social networks potentially facilitate participation is through sharing leisure pursuits with close family members, which supports involvement in physical and social activities. Shared leisure activities reported by respondents included attending family activities within the community, taking a trip together, sharing a meal, walking or exercising together, socialising at home, or celebrating family birthday or milestone. In the context of the assessed literature, a small number of studies were identified that considered the role of familial engagement as an influence on health and activity participation. A study of restorative experiences undertaken in the United States found that activity in the context of the family can be supportive of older adults' physical and mental well-being, but may also be demanding and tiring if inconsistent with the desires and capabilities of the participant (Jansen & von Sadovszky, 2004). Higher rates of physical
activity, in particular, have been found to be associated with contact with family members who are regularly active and encourage older adults to participate (among other influential variables) (Booth et al., 2000; Lian et al., 1999). Respondent quotations and photographs were congruent with these findings and indicated that family encouragement and inclusion was associated with not only physical activity, but also social engagement. As contact with work colleagues diminish following retirement and interactions with friends potentially decline as a consequence of death or illness, contact with family is likely to be one of the most enduring settings for interaction and activity participation, particularly for the very old. Maintaining regular contact with supportive and active family members may, therefore, be one of the most significant factors for ensuring ongoing participation in later life.

9.8.9.2 Support activity

Giving or receiving support in the context of family and peers provides opportunities for meaningful interaction and participation in physical, social, and civic activities. When support is given, it can either be a positive experience for an older adult that involves them in a preferred mode of activity or an onerous responsibility that diminishes their reserves and impinges upon discretionary time. Several studies were identified during the course of the systematic review that considered the impacts of social support on older adults' health and activity participation. Regular access to a supportive social network has been identified as a positive influence on the mental and physical health of older adults (Brown et al., 2009; Holtzman et al., 2001; Knipsheer et al., 2000; Levasseur et al., 2004). In other studies, it was found that received instrumental support, particularly from close family, was associated with the onset of disability and transitions to institutions (Seeman et al., 1996; Wilmoth, 2000). It was argued that receiving significant support from family could indicate growing reliance on others due to the progression of illness or disability (Seeman et al., 1996). The international literature also provided evidence that access to a supportive social network can facilitate physical activity via emotional and instrumental support and benefits associated with group membership (Helbostad et al., 2004; Salvador et al., 2009; Seeman et al., 1995; Wilcox et al., 2000). One study was identified in the literature review that reported social support as a positive influence on a general concept of participation for older adults who were undergoing home-based rehabilitation (Vik et al., 2007). Consistent with other international findings, the present research found that support was often conceptualised as a positive influence on the activity participation of older adults. The present research differs from published results,
however, by identifying a potential relationship between social support and social and civic activity participation. Notably, older adults were also identified as the providers of support in many cases, which afforded additional opportunities for participation in activities beyond the physical domain, such as looking after grandchildren or supporting unwell friends. These support roles took on added significance following the 2010 and 2011 Canterbury earthquakes.

9.8.9.3 Service communities

Membership within a formal or informal volunteer group or organisation may provide opportunities for older adults to engage in civic, social, physical, and cultural activities. Service communities are a crucible for a variety of activities in later life due to their focus on inclusion (notions of brotherhood and sisterhood prevail in many such organisations) and an orientation towards working for the benefit of others. Multiple activity outcomes can be realised from participation in such activities as membership of a charitable organisation, for example, provides a context for civic activity in the company of like-minded peers. Very few studies were identified that explored older adults’ involvement in civic or volunteer groups and how such activity influences health or activity participation. When volunteering was explored as a behavioural domain, it was often conceptualised as an individual altruistic activity, rather than as a group endeavour (Jansen & von Sadovszky, 2004). Involvement in volunteer activities has been identified as positively correlated with both physical and mental health among older adults (Greenfield & Marks, 2004; Jirovec, 2005), although no studies were located that examined potential associations with activity participation. This research is potentially among the first studies to highlight the activity related benefits of involvement in service groups for older adults.

9.8.9.4 Religious fellowship

Belonging to and interacting with a community of individuals who share similar religious beliefs potentially facilitates engagement in social, civic, and spiritual activities. In congruence with the service communities theme, religious fellowship supports involvement in a range of activities by catering to diverse motives for participation. For example, an older adult may choose to attend a church service to meet friends, worship, support their community, or a combination of these motives. Religious fellowship is often undertaken in the
formal setting of a church, but can also occur in other settings, so it is not necessarily wedded to a particular physical environment. This understanding was reinforced following the 2010 and 2011 Canterbury earthquakes when many older adults continued with their collective religious activities in spite of the destruction of places of worship. A small number of studies were located during the literature review that considered the potential influence of religious fellowship on the health and activity participation of older adults. Involvement in a religious group has previously been reported to be a protective of health for individuals living in lower-quality environments (Krause, 1998). Religious participation was also identified as a fundamentally restorative activity, which promotes improved mental health and psychological recovery from stress (Jansen & von Sadovszky, 2004). Concerning activity participation, access to churches has been reported as a facilitator of leisure time physical activities among older women in Brazil (Salvador et al., 2009). In contrast to the findings of Salvador et al., interaction with a religious group was not identified as an influence on physical activity participation in the present study, although other activity outcomes were noted. While there is an obvious association between spiritual activity and religious fellowship, this research also identifies an important influence on social and civic activity participation. It is likely that church attendance, for example, provides a context for positive engagements with a network of individuals who share similar beliefs and values. Religious concepts of altruism and service also potentially play a role in perpetuating civic activities in support of community and parishioners.

9.8.9.5 Communities of interest

Being part of a formal or informal group who meet to share hobbies and interests may provide an outlet for physical, social, cultural, and economic activities among older adults. Diary and photovoice data indicated that older adults had diverse interests and sought companionship in activities ranging from outdoor bowls to financial investment. Access to such groups provides opportunities for diverse and inherently pleasurable endeavours, which find their expression in the company of others and support the continuity of activities of early life into retirement. Few researchers have considered participation in hobby or interest groups as a potential vehicle for older adults' activity participation or health. It is conceivable, however, that communities of interest act in similar ways to religious fellowship or service communities by providing for the shared experience of preferred modes of activity. Among the assessed literature, only one study was located that considered the potential influence on
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communities of interest. Hough et al. (2008) reported that club membership, among other influences, was associated with improved mobility among older women in a North American state. Hough and colleagues suggested that mobility was improved via better access to a supportive network, which functioned to encourage and directly facilitate travel behaviour and participation. No other studies were located that considered the potential influence of hobby and interest groups on the activity participation of older adults. The present research is potentially among the first to highlight the importance of communities of interest as a facilitator of diverse activities in later life.

9.8.9.6 Obligation and responsibility

While the social environment was often considered to be a facilitator of activity for older adults, some were faced with negative social interactions that had deleterious consequences for participation. Unwanted obligations and responsibilities arising in the context of family and peer interactions reportedly reduced time and energy available for physical, social, and cultural activities. Studies of older-adult health have begun to explore this issue. In a large-scale and longitudinal study undertaken in Taiwan, excessive demands by friends and family were reported as a negative influence on the future health of older adults (Beckett et al., 2002). It has also been reported that in North American neighbourhoods with social and physical problems older adults who provide support to others can experience negative mental health outcomes (Schieman & Meersman, 2004). Researchers surmised that helping others when individuals have their own problems or becoming invested in the tangled emotional issues of others may be injurious to health and well-being (Schieman & Meersman, 2004). No studies were located that reported an association between negative social interactions and activity participation. The lack of literature support for the findings of the present research is potentially indicative of assumptions that social interactions in later life essentially operate as facilitators of health and activity participation in most cases. Even when social interactions are associated with reported health declines, such relationships are often explained by a need for increased care at the end of life (Wilmoth, 2000). While there is evidence that a supportive and active social network encourages participation, there is relatively little consideration of how interactions with others act as a potential constraint to activity. The present research, therefore, potentially provides new evidence for the negative consequences of some forms of interaction in relation to activity participation in later life. An implication of this finding is that simply promoting increased social contacts among older
people may be insufficient to support activity participation if the interactions involve unreasonable demands.

9.8.10 Earthquake disasters: unanticipated environmental influences

In addition to general physical and social environmental influences, the subjective impacts of the 2010 and 2011 earthquakes on older adults' activity participation were explored during the third research phase. Participant comments and images revealed a dichotomy between vulnerable and resilient subgroups within the group of independently living older adults. More vulnerable older adults faced disruptions to their activities as a result of the loss of venues, cancellation of group meetings and events, the fragmentation of social networks, confinement and isolation, the presence of local hazards, transport network problems, and disruptions to activities of daily living. More resilient older adults, on the other hand, found ways to maintain or alter their activities in the face of significant calamity. Evidence of post-earthquake resilience included participation in recovery activities; involvement in disaster preparedness; caring for family, friends, or community; accessing networks of support; and displays of adaptability and flexibility. The findings for vulnerability and resilience within the respondent population support the concept of a disaster dichotomy, which describes variations in individual coping or susceptibility to environmental problems that are inherent within a sample of urban-living older adults. Reported differences in earthquake disruptions by those living in different areas of the city (central and eastern suburbs were particularly affected) reinforced the results of the second research phase and provided further evidence for the concept of differential impacts. Finally, the resilience displayed by many older adults and maintenance of activities in the face of significant environmental disruption is indicative of personal agency and resourcefulness.

9.8.10.1 Earthquake vulnerabilities: how earthquakes disrupt activity participation

Following the 2010 and 2011 Canterbury earthquakes, independently living older adults were faced with an array of new barriers and the exaggeration of existing constraints to activity participation within their homes, local environments, and social networks. These changes constituted an unplanned environmental change with compounding effects over time as a result of ongoing aftershocks and disaster remediation, including resurfacing of roads and building repairs. The loss of local facilities as a consequence of earthquake damage removed
access to important destinations for older adults and caused disruptions to physical, social, civic, cultural, and economic activities. With the loss of local facilities, many community meetings and events were also cancelled, which reduced opportunities for network interaction and curtailed physical, social, civic, cultural, and spiritual activities that were usually undertaken in the company of others. The scale of the disasters led to many older adults being confined to home and local environment for days or weeks as a result of damage to local surroundings and the presence of hazards, fear of injury or aftershocks, or social network disruptions, which led to reduced opportunities for physical, social, and cultural activities. Other residents undertook transitions to new surroundings to escape aftershocks and earthquake damage, which often removed them from their regular social network and limited opportunities for social activity in particular. The emergence of new hazards (such as liquefaction) or the amplification of existing environmental problems (such as fissures and pot holes in walking infrastructure) following the earthquakes created barriers to physical activities undertaken within the local environment. Finally, the earthquakes curtailed or altered daily routines and physical activities for some older adults as a result of damage to home, utilities, infrastructure, and community resources, which necessitated major changes to established ways of living (boiling water, using a portable toilet, recycling household water for gardening, and shopping on foot). There is limited support in the international literature for these themes and considerably greater scholarship in research areas more closely aligned to physical and mental health in a disaster context.

The international literature indicated that older adults who lived close to the epicentre of a major earthquake were likely to suffer greater physical and psychological discord than those in other areas. Specifically, older earthquake survivors appear to be susceptible to an increased incidence of injury, ulcers, stroke, heart disease, post-traumatic stress disorder, anxiety, depression, and other maladies (Ardalan et al., 2011; Kario & Ohashi, 1997; Salioglu et al., 2003; Yazgan et al., 2006). A comparatively smaller body of literature has investigated the potential influence of natural disasters on the activities and routines of older adults. When the effects of natural disasters on the activity participation of older adults were considered, researchers reported that earthquakes were particularly disruptive as a consequence of individual difficulties coping with changed environmental circumstances and psychological trauma (Carr et al., 1995; Ticehurst et al., 1996; Toyabe et al., 2006). Notably, however, those who were most negatively impacted by disasters were often reported to suffer from pre-existing physical and psychological problems or have experienced major personal
losses in the event (such as the loss of a home or family member) (Shenk et al., 2010; Toyabe et al., 2006). Other covariates of reported earthquake disruptions among older adults included female gender, living alone, lacking financial resources, and living in temporary or poor-quality accommodation (Ardalan et al., 2011; Shenk et al., 2010; Tyler, 2006; Yang et al., 2003). There is support in the international literature for earthquakes as negative influences on the health and activity participation of older adults, but it is less clear how the moderating effects of covariates may impact upon adaptation to a changed environment.

With regard to the particular challenges identified in the present research, several were reinforced by the available literature, while others provided new insights into how earthquakes potentially disrupt activity participation for older adults. The literature supports generally negative impacts on activity and quality of life among older adults associated with constraints in the physical environment in particular (Lin et al., 2002; Tuohy & Stephens, 2012). In a repeated measures study of 268 older-adult survivors of a Taiwanese earthquake, Lin et al. (2002) reported that those who experienced the direct effects had significantly lower quality of life measures (particularly in relation to physical capacity, psychological well-being, and environment) in the 12 months following the earthquake compared to pre-disaster survey scores. Lin and associates also found that individuals who had lost their homes in the disaster reported significantly better quality of life in social domains, which may reflect increased social contact and support for these individuals in the aftermath of the earthquake. A commissioned study of the experiences of rest home workers and residents undertaken at the same time as the present research in Christchurch revealed that earthquake-related disruption to activities and quality of life in care settings was associated with damage to facilities, the necessity of a residential transition, the presence of new environmental hazards, and disruptions to normal ways of living (Carswell, 2011). Carswell noted that the anxiety levels among residents increased and levels of dependence and frailty in the immediate aftermath of the disasters were observably higher. Resident outings to shops, cafés, and picture theatres were also curtailed for months after the disasters, which significantly reduced pleasurable experiences and quality of life for many. Some of the very old, compared the earthquakes to their experiences of World War Two, particularly the blitz on London (Carswell, 2011).

Findings from a Peruvian study of older earthquake survivors indicated that respondents experienced massive disruptions to their daily activities and routines associated with the loss of everyday activity settings, such as places of work, leisure, and domestic affairs (Shenk et al., 2010). Shenk et al. found that experiences of disruption were highly gendered with older
women more likely to discuss emotional and practical problems associated with the loss of access to home and the curtailment of domestic duties (an important element of identity for some respondents). Men, on the other hand, were more likely to experience problems associated with the loss of work or projects and an inability to repair heavily damaged structures, such as a home. Both older males and females reported increased physical and mental health complaints in the aftermath of the earthquake and indicated that their general quality of life had been significantly reduced by the disaster (Shenk et al., 2010). These results are consistent with the findings of the third research phase for activity disruptions associated with a loss of venues and changes to activities of daily living. None of the assessed studies identified negative and activity related consequences associated with reduced access to a social network or the threat of increasing isolation. Considering that older adults are frequently active in the company of others, the loss of contact with a social network in the aftermath of a disaster is potentially one of the biggest threats to participation. The present study also suggests that disruptions to transportation infrastructure acts to constrain activity participation for independently living older adults, which has not previously been reported in the literature. Transportation difficulties arising from damaged infrastructure potentially compound problems accessing social networks and facilities by creating physical barriers to engagement. In general, there was a dearth of literature that reported on the barriers to activity participation faced by older adults in the aftermath of an earthquake or other disaster. A paucity of literature in this area may be explained by the relative infrequency and unpredictability of natural disasters, difficulties undertaking research and obtaining ethical approval in relation to vulnerable individuals or victims of a disaster, and a focus on addressing the immediate health concerns of survivors (physical and mental trauma) rather than needs associated with activity, lifestyle, and general well-being.

9.8.10.2 Earthquake resilience: how older adults overcame earthquake constraints

While some research participants were vulnerable to activity disruptions as a consequence of changes in the physical and social environment arising from the 2010 and 2011 Canterbury earthquakes, others found ways to continue to be active. Older adults maintained participation in physical activities when they used their skills and experiences to repair damage or restore order in their homes. They maintained or increased participation in social and civic activities by providing or receiving material and psychological support in the context of family, friends, and community. By developing and maintaining a cache of disaster
supplies or using the earthquakes as a catalyst for further preparations, some individuals were able to ensure the continuation of their everyday routines and activities during difficult circumstances. Finally, through being flexible with the venue and mode of their regular activities, some older adults were able to adapt to altered environmental conditions and maintain involvement with physical, social, spiritual, and economic activities as a result. The ability to cope with the effects of a large earthquake and continue with one's activities is clearly complex and likely to involve interactions among level of exposure, pre-existing earthquake vulnerability, personal resources, and individual capacity or agency for overcoming constraints. In congruence with the preceding discussion concerning earthquake vulnerability, there is a relative paucity of research that directly addresses individual capacity and the mechanisms through which older adults sustain, alter, or increase their activity participation following an earthquake. Perhaps unsurprisingly, more research has been undertaken to investigate psychological coping, although this likely to have an interaction with older-adult resilience in relation to post-disaster activity. For example, an individual who is in a positive psychological state may be better prepared to respond to an altered environment and overcome emerging barriers to participation.

Specific findings in the domain of health identify that certain populations of older adults may have a better psychological recovery than younger adults in the aftermath of a natural disaster. Kato et al. (1996) interviewed a population of adult earthquake survivors three weeks and eight weeks after a large earthquake. The authors reported that all adults reported a range of psychological problems (hypersensitivity, sleep disturbances, depression, irritability, and others) at the first assessment. During the second assessment, however, older adults showed a significant decrease in eight out of ten recorded symptoms. Kato et al. surmised that older survivors may be more resilient than younger adults, have experiences of coping with previous disasters, or have more supportive social networks. More recently, Suzuki et al. (2011) interviewed 496 older adults following a sequence of large earthquakes in Japan (a situation reminiscent of Christchurch). During a three-year disaster sequence, less than 6 percent of men and women received a diagnosis of major depression and no cases of post-traumatic stress disorder were identified. Suzuki et al. reported that the resilience shown by older adults was higher than had been identified in other studies, although they also concluded that there may have been a greater burden of sub-clinical mental health disorder among the sample. These studies show that even in major disasters, older adults can display high levels of psychological resilience, which may ultimately affect activity participation in
The gerontological literature provides contrasting evidence for vulnerability and resilience in later life associated with the experience of a natural disaster. Researchers have also found examples of resilience among older adults who are confronted with a natural disaster. Some researchers have reported that older adults may actually cope better in the aftermath of a disaster than younger age cohorts as a result of emotional maturity, previous life experiences, or a comparable lack of responsibilities for paid employment and child rearing (Knight et al., 2000; Norris & Murrell, 1988; Thompson et al., 1993). For example, Knight has previously reported that there are age effects in response to a natural disaster, and among general populations older adults appear to show lower levels of emotional distress than younger adults following an earthquake. It has also previously been found that some older adults are capable of using the experience of a natural disaster to affirm their identity as resilient individuals who are capable of overcoming significant life challenges (Tuohy & Stephens, 2012). Through qualitative interviews with nine older survivors, Tuohy and Stephens determined that these individuals were physically and psychologically vulnerable to the effects of the flooding and sometimes faced hardships associated with property damage and relocation. However, most respondents also found ways to use their experiences to reinforce their sense of identity as resilient and adaptable individuals who are able to accept help and care when they recognised that they could not cope alone.

Several studies were identified from the assessed literature, which addressed the specific influences on activity participation associated with older people's resilience in the aftermath of a disaster. Three studies reported improved and increased social contact among older adults who live in areas that have been affected by disasters (Ardalan et al., 2011; Lin et al., 2002; Tyler, 2006). Ardalan et al. (2011) previously stated that the collective experience of a disaster provides opportunities for strengthening social ties and coming together as a community to overcome challenges and facilitate rebuilding and renewal. Improved social relationships following a disaster have also been explained as the result of the necessity for providing or receiving support within the context of one's proximate network, particularly the family (Lin et al., 2002). Ardalan et al. (2011) argued that positive social interactions represent an important psycho-social coping strategy for communities and older survivors. These results are consistent with the findings of the present research for the provision or receipt of network support and the corresponding positive outcomes for activity participation.
and interaction. Other researchers reported that in the aftermath of a disaster, some older adults increased their participation in activities associated with the care of others and home repair, which also support findings of the present research (Shenk et al., 2010). In particular, Shenk and associates reported that older women played an active role in taking care of family members and attending church following a damaging earthquake, while older men occupied themselves by repairing damage to a residential dwelling and interacting more with peers (Shenk et al., 2010). Literature support was not found, however, for the themes of disaster preparedness or flexibility and adaptability. This research, therefore, potentially provides new evidence, which suggests that by maintaining or developing a preparedness kit or plan and having an attitude of flexibility and adaptability in the aftermath of a disaster older adults may be able to maintain their activity participation even in the context of major environmental disruption.

9.8.11 Personal influences on active ageing: foundations of participation

The results of the third research phase highlight the importance of physical and social environments as influences on active ageing in urban areas. In congruence with the second research phase, the results also identified a foundational role for personal attributes. Personal influences on activity participation reported in the study included being in good health; having appropriate energy, motivation, and beliefs in regard to activity participation; and maintaining routines and continuity with pursuits of one's earlier life. The finding that activity participation was associated with health among respondents was consistent with the results of the second research phase. The results of the second phase also showed that those who were older tended to have lower activity participation than those who were younger. Age was not identified as an influence on activity in the third research phase. It is possible, however, that individuals were more inclined to consider their health as an overarching influence on activity, which had an inherent and potentially unreported relationship to the age of respondents. Findings for the influence of energy, motivation, and belief and routine and continuity are specific to the third research phase and relatively novel in the context of the assessed literature. The results of the third research phase support the concept of a personal threshold of biological, cognitive, and behavioural factors, which must be overcome before activity participation can proceed.
9.8.11.1 Health and functional capacity

Poor health and reduced functional capacity appears to constrain physical, social, civic, and economic activities, while better health supports participation. As previously noted, these results are consistent with findings of the second research phase, which indicates that health may be one of the most pervasive influences on activity participation in later life. Findings from phase three also expand the results of the second phase to suggest that health may play a role in social, civic, and economic activity domains. In previous research undertaken in Christchurch, health was found to be a universal influence leisure time physical activity among older adults from neighbourhoods with contrasting socio-economic status (Annear et al., 2009). International studies also support significant associations between health and physical activity (better physical and mental health is usually correlated with higher levels of activity) (Bird et al., 2009; Hough et al., 2008; Kowal & Fortier, 2007; Lian et al., 1999; Lim & Taylor, 2005). Bird et al. (2009) reported that poor health can act as a barrier to the uptake or continuation of physical activity and may be associated with fears of further damage to health or reduced physical capacity. Lim and Taylor (2005) stated that health is commonly reported as the most prevalent influence on physical activity in later life, and mental well-being also plays an important, though often unrecognised, role in determining participation or disengagement. Relatively few studies, however, have considered how health potentially acts to facilitate or constrain other modes of activity. Only one Canadian study was located, which found that physical and cognitive ability was associated with a general concept of activity participation (defined as involvement in everyday life situations) among 200 individuals aged 65 and older (Anaby et al., 2009). No studies were located among the assessed literature that indicated a relationship between health and activity participation contrary to the present findings. The present research, therefore, reinforces the growing evidence for a central role for health as an influence on physical activity participation. This study also adds new understanding that health may be linked to social, civic, and economic activities in later life.

9.8.11.2 Energy, motivation, and belief

Beyond the corporeal forces of health and functional ability, the cognitive attributes of energy, motivation, and belief were also identified as potential influences on physical, social, and spiritual activity. Research undertaken in Christchurch has previously reported that
uninterest and apathy are associated with reduced physical activity among older adults (Annear et al., 2009). Similar findings have also been reported in international studies, which have shown links between low levels of energy and motivation and reduced physical activity participation (Bird et al., 2009; King et al., 2000; Kowal & Fortier, 2007). A single Singaporean study was also located, which identified that awareness of the benefits of exercise, which is arguably commensurate with beliefs about activity, was associated with higher levels of physical activity among older adults (Lian et al., 1999). The present study, therefore, reinforces existing evidence for cognitive influences on physical activity and adds new findings that suggest social and spiritual endeavours may also be affected. Notably, little evidence was found for self-efficacy as either a facilitator of or constraint to activity participation. Several international studies have reported that self-efficacy (assuredness in one's capabilities to perform a particular action) is one of the most important influences on activity participation among adults (Fisher et al., 2004; Hough et al., 2008). It is also a major component of the social cognitive model of health behaviour (Bandura, 1986, 1997). While no standard measures of self-efficacy were used in the study, participants were free to write about or photograph all aspects of their life, both personal or environmental, that they felt were important in relation to their activity participation. The findings of the present research, therefore, contrast with the international literature with regard to self-efficacy and potentially reveal local differences in personal influences on activity participation.

9.8.11.3 Routine and continuity

In addition to physiological and cognitive attributes, behavioural factors were also identified as important influences on activity participation for some older adults. In particular, maintaining connection with physical, social, and cultural activities that have been a part of an individual's life course appears to support continued participation at older ages. For those who have cultivated a diverse repertoire of activities independent of their paid employment, it is likely to be much easier to transition into an active older age. Focus group participants argued that the sudden retirement of an individual who had few productive, creative, or meaningful pastimes created conditions for declines in health and quality of life. Few studies were identified, however, which considered the importance of routine and continuity for maintaining or increasing activity participation in later life. In one previous study from the United States, physical performance was found to be positively correlated with exercise history such that older individuals who had been active throughout their lives were found to
be both more active and higher functioning than others in their group (Seeman et al., 1995). Beyond the influence on physical activity, the present research adds new data that suggests that engagement in diverse pursuits across the life course supports the continuation of social and cultural activities in later life. An implication of this finding is that if older adults have not cultivated diverse interests throughout their life, then they may fall into inactivity and potential health decline following retirement.

9.8.12 Environment and personal influences not identified as influences on activity

During the systematic literature review, other environmental and personal influences on activity participation were also identified that were not supported by evidence in the present research. These factors relate specifically to physical activity and health. Reported personal influences on physical activity and functioning that were identified in the literature, but not supported in the present research, included individual socio-economic status, marital status, health locus of control, education level, ability to travel independently, discretionary time, and self efficacy (Kaplan et al., 1993; King et al., 2000; Lim & Taylor, 2005; Subramanian et al., 2006). Environmental influences on activity participation that were not identified in the present research included living in a rural area, topography, and residential stability (Hough et al., 2008; Lim & Taylor, 2005; Subramanian et al., 2006; Wilcox et al., 2000). It is notable that only three environmental attributes were identified as influences on older-adult activity in the international literature that were not supported in the present research. The absence of evidence for the influence of rural settings and topography is potentially explained by the fact that rural areas were not included in the sample and because study areas were all situated on a river plain. Furthermore, residential stability may not have been influential in the context of the present research as the 2010 and 2011 earthquakes created significant upheaval across the city and resulted in the temporary or permanent migration of thousands of residents. In this sense, residential stability may have been disrupted throughout Christchurch, which could have made it difficult to detect differences across areas. The small number of explainable deviations between the present study and the literature suggests there was good coverage of potential environmental influences on activity participation among an older-adult population.
9.8.13 Potential limitations of the phase-three research methods

The main limitations associated with the third research phase included potential problems with the application of activity diary and photovoice procedures. Measures were undertaken to mitigate these limitations, however, and in practice older adults were highly competent contributors in the production of qualitative data.

There are several potential limitations associated with the use of activity diaries in research. Diaries can be difficult to complete for those with limited literary skills, failing eyesight, reduced cognitive functioning, or impairments that affect motor skills, which can lead to biases in favour of higher-functioning or more articulate individuals (Milligan et al., 2005). As diary participation was preceded by the completion of a postal survey, however, it is likely that those who opted into the qualitative, third research phase had the mental and physical capacity to complete the exercise. Because diaries are usually completed over a number of weeks, response fatigue can also be a limiting factor influencing the quality and comprehensiveness of diary entries (Verbrugge, 1980). To address this, a 14-day time frame was employed in order to promote diary completion. A period of 14 days was deemed to be an appropriate length of time by reference group members during pilot testing. Other challenges that potentially affected the diary process include possible self-censorship and the wide variety of response styles between respondents (Milligan et al., 2005). It has been observed, however, that initial self-consciousness associated with reporting generally diminishes over the diary period, reducing the impact of self-censorship (Blair & Minkler, 2009).

The photovoice procedures were also subject to potential limitations. Photovoice is a time- and resource-intensive process, which risks respondent fatigue and withdrawal if participants consider the process to be overly burdensome or impractical (Latham, 2003; Wang et al., 1998). The cost of disposable cameras and film processing make withdrawal a significant threat to the research process (Lykes, 2006). Use of camera equipment requires basic photography skills, which some older adults do not possess if they have not previously owned or operated a camera. Cameras are also prone to technical failure and the inaccurate rendering of images due to overexposure or underexposure associated with the use of low-cost devices that are often used for research purposes. Finally, ethical or personal safety issues may arise from covert representation or observation of non-consenting individuals in public or private settings. In order to mitigate the potential limitations, several strategies were
employed. Participant involvement was negotiated prior to the administration of photovoice procedures, so older adults understood the time requirements in advance of research commencement. Moreover, as the project aims, design, and methods were developed in collaboration with the older adults, there was an incentive for participants to fully commit to the research process. Additionally, cameras were only provided to volunteers who were familiar with their operation. Instructions were provided to research participants concerning the ethical use of cameras, which included directives for seeking verbal consent before photographing other people or private property. Finally, participants were given basic instructions concerning the process for taking a good photograph, which included such imperatives as ensuring the flash was turned on when inside or in shaded areas.

9.8.14 Reflection and learning from the third research phase

The third research phase constituted the main period of qualitative data collection. The challenges associated with the PAR process in the third research phase included engaging in significant negotiation with reference group members and research participants concerning the interpretation and inclusion of the emergent themes and maintaining project momentum and participant involvement following the February 2011 earthquake.

It was evident during focus group discussions in 2011 that older adults were reluctant to remove or combine qualitative themes abstracted from the data following initial coding and memoing procedures. Preliminary themes often concurred with individual data and the subjective experiences of focus group participants. As a result, most of the preliminary themes were regarded as unique and valid instances of the subjective interpretation of environmental influence. Because of this, more themes were retained in the thesis than may otherwise have been included if the analysis had been undertaken solely by the researcher. Themes that were removed from the analysis due to a substantive lack of evidence and after consultation with older adults included transitions to retirement, personal intimacy, self confidence (potentially analogous with self-efficacy), and redistribution of residents within Christchurch (associated with the 2010 and 2011 earthquakes). The implication here is that researchers may have a tendency to cut or consolidate qualitative themes to a greater extent than research participants during data analysis. This suggests that respondents potentially place greater weight on the

66 Informed, written consent was sought from photographic subjects before the final publication of images in this thesis and associated journal articles and presentations.
coherence and significance of their data than researchers do. Therefore, it is possible that when older adults are involved in studies as collaborators that the results are potentially more detailed than if there was no respondent participation.

As previously stated, activity diaries and photovoice materials (cameras and instructions) were mailed to 97 volunteers three days prior to the February 22, 2011, earthquake. This created a major threat to the participatory research process and possibly contributed to a lower than expected response rate for diary and photovoice procedures. In the context of the present research, 11 (31%) cameras and 32 (33%) of diaries were either incomplete or not returned by respondents. The February 2011 earthquake caused major disruptions to the lives and environments of many older adults and led to the permanent or temporary evacuation of thousands of residents. In this context, it could be considered fortunate that two-thirds of respondents chose to continue with their participation in the third research phase. In fact, it is likely that the routine collaboration and personal interactions of the study acted as an incentive for continued involvement for some older adults. As part of earthquake mitigation procedures, the researcher attempted to contact all volunteer participants in days following the February 2011 earthquake. Those who were contacted were given the options to continue with diary and photovoice procedures as planned, postpone participation for one month, or withdraw from the study. In the months following the earthquake, three focus group discussions were also held with respondents to verify (or refute) the research findings and consider the potential influences of the disaster on the research process. The PAR process, therefore, proved to be a useful tool for maintaining engagement with older adults during a period of unprecedented environmental upheaval.

During the third research phase, participant and reference group feedback highlighted problems and strengths with the analysis and provided a rationale for the use of a PAR approach. Suggestions from older adults during the third research phase included the observation that health can change quickly in later life, which creates a significant threat to activity and independence and often necessitates periods of rehabilitation or respite. Respondents also emphasised the important distinction between participation and meaning. That is, because an activity is infrequently performed does not imply that it is of lesser significance for older adults. While it was practical to focus particularly on those activities that were most frequently undertaken by older adults, this was undertaken with the agreed caveat that older adults can be limited in their activity preferences by diverse environmental
and personal constraints. Older adults were also central in identifying probable health, education, and activity differences between respondents and the wider population of independently living older adults in Christchurch. Importantly, respondents verified the impacts of the 2010 and 2011 earthquakes and provided personal examples during discussions to reinforce emergent themes. These and other feedback from participants reveal that independently living older adults have tremendous capacity for interpreting qualitative research findings and making valuable contributions to the final results.
10 Discussion and synthesis of results from three research phases

10.1 Chapter introduction and organisation

This chapter marks the transition into the combined and synthesising discussion that pulls together the findings and concepts from three research phases (reflected in the preceding results and discussion chapters) to address the main research question: how, if at all, do the environmental conditions of urban areas influence active ageing among independently living older adults? The integration of results from three research phases is achieved through the development of a new model of active ageing, the theory of navigated environmental performance, which is composed of concepts abstracted from the research and elements of existing theories of ageing, place, and health behaviour. The theory has also been critiqued by study respondents as part of the PAR process.

The first section of this chapter summarises the main results and abstracted concepts from the three research phases and highlights the potential contributions of this study to the gerontological literature. In the second section, abstracted concepts are considered in relation to existing theoretical perspectives, and differences and similarities are identified. In the third section, the theory of navigated environmental performance is presented in full, including a consideration of the strengths and weaknesses of the model. In the fourth section, reflection is undertaken in relation to the challenges and benefits of using a PAR approach in gerontological studies and in the aftermath of an urban disaster. In the fifth section, the limitations and strengths of the research design are presented. Finally, recommendations and implications of the study are offered based on discussions with older adults and interpretations of the theory of navigated environmental performance.

10.2 Summary of results, concepts, and potential contributions to the literature

10.2.1 Research phase one: examining urban contexts

The objective of the first phase of the research was to identify diverse geographic areas within urban Christchurch inhabited by larger populations of older adults, which
potentially influence active ageing. In order to address this objective, GIS analyses were undertaken, observations of 12 potential study areas were conducted with older adults, and focus group discussions were held with reference group members. This stage of the research was conceived as the moment of entering the research field in order to obtain a rich understanding of study environments.

Despite a diversity of physical and social resources, apparent constraints to activity participation were ubiquitous across all urban areas and no locations were identified as completely supportive of active ageing by older observers. Physical and social environmental constraints to activity participation that were observed included lack of access to activity resources, heavy traffic, inappropriate pedestrian infrastructure, unattractive surroundings, an absence of people in public areas, poor integration of land uses, and lack of public transport infrastructure. Unexpectedly, urban environmental conditions appeared to be more supportive of activity participation in some higher-deprivation areas.

A GIS analysis of resource availability within 400 metres of study areas provided further evidence for a continuum of activity constraints and a general poverty of access to community facilities across the urban environment. Poorer access was evident in relation to community halls, recreation centres, swimming pools, and libraries. Better access was identified in relation to public green space, health centres, shopping areas, and churches across most study locations. The GIS analysis of resource availability also supported generally better access to activity related resources in higher-deprivation areas. Concepts abstracted from the first research phase are summarised in the following table.

### Table 22: Concepts abstracted from the first research phase (chapter seven)

<table>
<thead>
<tr>
<th>Theoretical concepts</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubiquitous constraint</td>
<td>A general lack of support for active ageing and overarching physical and social environmental barriers across urban areas.</td>
</tr>
<tr>
<td>Requisite capacity</td>
<td>The implicit individual capacity required to overcome ubiquitous environmental demands to engage in activities.</td>
</tr>
<tr>
<td>Environmental continuum</td>
<td>Variation in activity resource availability and quality across urban areas and within a setting of ubiquitous constraint.</td>
</tr>
<tr>
<td>Opportunity paradox</td>
<td>Generally better activity resource availability in higher-deprivation areas.</td>
</tr>
</tbody>
</table>
10.2.2 Research phase two: composition, context, and correlates

The objective of the second research phase was to explore the composition, context, and potential correlates of active ageing among independently living older adults, including an examination of the potential influences of the 2010 and 2011 earthquakes. In order to address this objective and the associated hypotheses, a quantitative survey and an earthquake addendum were administered to 355 older adults from within the 12 urban areas that were assessed and selected during the first research phase.

Across all areas, respondents reported that they were generally healthy and active in the aftermath of the September 2010 earthquake. The composition of older-adult activity was inclined towards physical, social, and cultural modes, with comparatively lower levels of spiritual, civic, and economic activities reported. The context of older-adult activity varied, but the most commonly reported settings for participation included home, local environment, and social network. Few respondents were active on their own or beyond their local environment.

Both environmental and personal correlates of activity participation were identified in the second research phase. Environmental correlates of activity participation included perceptions of local environmental conditions and area of residence (nested within a particular deprivation profile). Respondents who had positive perceptions of their local environment were more likely to report higher levels of social activity, while those who had negative perceptions reported lower participation. On average, individuals from the Holmwood study area (nested in a lower-deprivation setting) reported significantly higher levels of social activity participation than respondents from other areas. Individuals from the Central City (nested in a higher-deprivation setting) reported significantly higher levels of cultural and total activity participation than respondents from other areas. The personal variables of health and age were also correlated with activity participation. Respondents with better reported health were more likely to have higher levels of physical and total activity, while those who reported worse health had reduced participation. Younger members of the sample reported significantly higher levels of physical activity, while older members of the group reported lower levels of participation.

The effects of two earthquakes on local environment and activity participation were
gauged using repeated surveys following separate disasters in September 2010 and February 2011. After both earthquakes, individuals who reported higher levels of disruption to their local environment also reported significantly lower levels of activity participation. The February 2011 earthquake was significantly more disruptive to environmental conditions and activity participation than the September 2010 earthquake. The data also suggested that those living in central and eastern suburbs, women, and ethnic minorities suffered higher levels of disruption to activity participation. Concepts abstracted from the second research phase are summarised in the following table.

<table>
<thead>
<tr>
<th>Theoretical concepts</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-tiered active ageing</td>
<td>Active ageing has primary and secondary expressions. The first tier consists of physical, social, and cultural activities, while the second tier includes civic, spiritual, and economic activities.</td>
</tr>
<tr>
<td>Socio-spatial core</td>
<td>Older-adult activity revolves around a core of proximate locations and networks.</td>
</tr>
<tr>
<td>Personal threshold</td>
<td>Individual (biological) attributes support or constrain activity initiation in later life.</td>
</tr>
<tr>
<td>Deprivation moderation</td>
<td>Area deprivation acts only as a moderator of activity for older adults in certain locations, rather than as an independent influence.</td>
</tr>
<tr>
<td>Particularity</td>
<td>Unique attributes of certain urban areas facilitate active ageing, which potentially include specific geographical, historical, or compositional attributes.</td>
</tr>
<tr>
<td>Domain specificity</td>
<td>Particular personal and environmental attributes are associated with specific active ageing behaviours.</td>
</tr>
<tr>
<td>Latent resilience</td>
<td>Older adults have a reserve of physical and mental capacity to cope with environmental disruption and maintain activity participation across urban areas.</td>
</tr>
<tr>
<td>Disaster threshold</td>
<td>Earthquakes must reach a nominal level of disruption before older-adult activity is significantly affected across urban areas.</td>
</tr>
<tr>
<td>Differential impacts</td>
<td>Earthquakes are more disruptive for particular population groups and those living in certain geographic areas.</td>
</tr>
</tbody>
</table>

10.2.3 Research phase three: exploring pathways to active ageing

The third research phase sought to explore the emplaced experiences of independently living older adults, discern fine-grained pathways to activity participation, and examine the subjective impacts of the Canterbury earthquakes on local environment and activity. In order to address these objectives, activity diaries, photovoice procedures, focus group discussions, and open-ended questions in an earthquake addendum were employed with 66 volunteers from 12 urban areas.

At the outset of the third research phase, respondents were asked to report the rationale for their residential location in order to assess the extent to which, in choosing to live in a

67 The February 2011 survey sample was composed of a subgroup of volunteers from the larger September 2010 sample group.
Discussion and synthesis of results from three research phases

particular area, they were constrained by personal or environmental circumstances. Across all study areas, older adults reported that they had chosen to live in their present location on the basis of five criteria: environmental pull, environmental push, health change, intentions to downsize, or decisions to age in familiar surrounds. Most respondents had resided in a neighbourhood of their choice for several years prior to study participation.

Respondents were also asked to report the type and location of their main activities over 14 days to validate the findings from the phase-two survey. Consistent with the survey results, physical, social, and cultural activities were frequently reported, and home and local environment were identified as prevailing centres of participation. A range of specific activities were also identified by respondents as part of routine diary entries, which helped to delineate the particular expressions of active ageing for older adults in Christchurch.

Environmental influences on active ageing were prevalent across urban areas, and older adults reported generally positive experiences and perceptions of their physical and social surroundings, which were frequently viewed as supportive of activity. Categories of environmental influence on active ageing included the home, local environment, social network, and climate. The experience of large earthquakes in 2010 and 2011 was also identified as an influence on activity participation with variations in vulnerability and resilience expressed across the sample.

The home environment was identified as both a facilitator of and constraint to activity. Home environment facilitated activity through the availability of a private garden for exercise, food production, and relaxing and transcendent experiences; access to indoor spaces for entertainment, creative endeavours, and formal or informal work; opportunities for interactions with neighbours and contributions to neighbourhood social capital; and experiences of age-appropriate facilities and shared values in the context of retirement living communities. The home environment also acted as a potential constraint to activity by becoming the location for increasing social isolation in later life (a feature potentially exaggerated by the earthquakes).

The local environment was reported solely as a facilitator of activity participation by older adults, which contrasted with the observed conditions of urban areas from the first research phase. Facilitators to activity participation included familiarity with one's
surroundings (incorporating both length of residence and understanding), proximity and accessibility of local resources, walking distance and walkability, and the availability of appropriate networks and destinations.

Interactions with social networks were reported as both facilitators of and constraints to activity. Facilitators of activity included spending leisure time with family members, giving and receiving support, involvement in a religious community, participation in a charitable group, and engagement with clubs and associations. The social network could also constrain activity, however, through the imposition of unwanted responsibilities and obligations.

Climate was the only macro-environmental factor identified as a potential influence on activity participation. A warm and settled climate was regarded as a facilitator of activity participation, while extremes of heat, cold, wind, or rain were identified as constraints or modifiers of participation. Climate arguably influences urban areas in the same way and at the same time and could be regarded as an omnipresent influence on activity in later life.

Personal influences on activity participation were also identified by respondents in the third research phase, which constituted biological, cognitive, and behavioural factors. Consistent with the phase-two results, older adults who reported better health were more active than those who reported poorer health. Mental energy, motivation, and beliefs about activity were identified as both facilitators of and constraints to participation. Finally, individuals who maintained continuity with activities and routines of their earlier life reported that they were more likely to be active than those with a comparatively limited repertoire of engagements.

The third research phase also illustrated how the earthquakes of September 2010 and February 2011 potentially constrained or altered activities among older adults. Across the city, central and eastern areas reported higher levels of environmental disruption commensurate with descriptive data from the second research phase. Reported disruptions to activity participation indicated variations in personal vulnerability associated with the loss of venues, cancellation of meetings and events, confinement and isolation, fragmentation of social networks, local hazards, and disruptions to activities of daily living. For more resilient individuals, participation was often continued or altered through involvement in recovery activities, caring for others, being adaptable and flexible, accessing networks of support, and
undertaking disaster preparations. Concepts abstracted from the third research phase are summarised in the following table.

Table 24: Concepts abstracted from the third research phase (chapter nine)

<table>
<thead>
<tr>
<th>Theoretical concepts</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concepts from the second research phase supported in the third phase</strong></td>
<td></td>
</tr>
<tr>
<td>Two-tiered active ageing</td>
<td>Active ageing has primary and secondary expressions. The first tier consists of physical, social, and cultural activities, while the second tier includes civic, spiritual, and economic activities.</td>
</tr>
<tr>
<td>Socio-spatial core</td>
<td>Older-adult activity revolves around a core of proximate locations and networks.</td>
</tr>
<tr>
<td>Personal threshold</td>
<td>Individual (biological, cognitive, and behavioural) attributes support or constrain activity initiation in later life.</td>
</tr>
<tr>
<td>Domain specificity</td>
<td>Particular personal and environmental attributes are associated with specific active ageing behaviours.</td>
</tr>
<tr>
<td>Latent resilience</td>
<td>Older adults have a reserve of physical and mental capacity to cope with environmental disruption and maintain activity participation across urban areas.</td>
</tr>
<tr>
<td>Differential impacts</td>
<td>Earthquakes are more disruptive for particular population groups and those living in certain geographic areas.</td>
</tr>
<tr>
<td><strong>New theoretical concepts from the third research phase</strong></td>
<td></td>
</tr>
<tr>
<td>Environmental concordance</td>
<td>Active older adults tend to view their surroundings positively and continue participation (where possible) even in the presence of identified constraints.</td>
</tr>
<tr>
<td>Multiple realms</td>
<td>Home and local environment provide a diversity of resources for older adults' activity participation, which facilitates significant choice in these settings.</td>
</tr>
<tr>
<td>Malleable space</td>
<td>Private indoor and outdoor settings that can be adapted and altered to suit the needs and preferences of older adults support activity participation.</td>
</tr>
<tr>
<td>Abstract accessibility</td>
<td>Familiarity and closeness of activity related resources and networks and the ability to use these resources effectively supports activity participation in later life.</td>
</tr>
<tr>
<td>Abstract amenity</td>
<td>Attractiveness and age-appropriateness of local resources supports activity participation in later life.</td>
</tr>
<tr>
<td>Social support</td>
<td>Positive network interactions facilitate participation in active ageing behaviours.</td>
</tr>
<tr>
<td>Social constraint</td>
<td>Unwanted responsibilities or obligations arising within networks create barriers to participation in preferred activities.</td>
</tr>
<tr>
<td>Disaster dichotomy</td>
<td>Expressions of both vulnerability and resilience are evident within the older-adult group in relation to post-disaster activity participation.</td>
</tr>
<tr>
<td>Personal agency</td>
<td>Independently living older adults exhibit the capacity for independent action and autonomous decision making in the context of changing personal and environmental circumstances.</td>
</tr>
<tr>
<td>Macro-environmental threshold</td>
<td>Climatic influences on activity are an omnipresent influence within a geographic area that potentially affect the initiation or mode of activity participation among older adults.</td>
</tr>
</tbody>
</table>

10.2.4 Summary of contribution and consistency with published research

The findings from three research phases both corroborate published results and constitute potential contributions to the field of environmental gerontology. In table 24, the key findings of the research are presented and indications are made to show whether they support existing research or constitute a potentially new contribution. The extensive and systematic literature reviews undertaken in chapters two and three of this thesis lend credence to claims for unique contributions. Some of these identified contributions can be considered unique because they relate to activities that arose in response to the earthquake disasters.
Table 25: Potential research contributions and consistency with published studies

<table>
<thead>
<tr>
<th>Potential influence</th>
<th>Consistent with published research</th>
<th>Potential contribution to the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjective and self-reported influences on residential location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental pull (positive)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Environmental push (negative)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health change</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Downsizing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Ageing in place</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Mode and setting of activity participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferences for physical and social activities among older adults</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>- Home repair and maintenance (potential earthquake link)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Rehabilitation exercises (potential earthquake link)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Daily community interactions (potential earthquake link)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Use of communications technology (potential earthquake link)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferences for cultural activities</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Preferences for home, local environment, and social network</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Multiple uses for proximate activity settings</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Objective and observed influences on activity participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variations in resource availability and quality among urban areas</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Urban environmental barriers to active ageing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>- Poor integration of diverse land uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Better activity resource access in higher-deprivation areas</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Significant constraints to activity participation across all urban areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Empirical and self-reported influences on activity participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area of residence (nested in deprivation level)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>- Deprivation as moderator of activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of local environment</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Health status</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Earthquake influences</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>- Level of disruption experienced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased disruption following a large aftershock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gender (women affected more than men)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>- Ethnicity (minorities affected more than European New Zealanders)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion and synthesis of results from three research phases

<table>
<thead>
<tr>
<th>Potential influence</th>
<th>Consistent with published research</th>
<th>Potential contribution to the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjective and self-reported influences on activity participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden as a site for exercise performance</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Garden as a setting for production and propagation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden as site for reflection, relaxation, and transcendence</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Private indoors as a setting for productive and creative activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private indoors as a sanctuary</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Interactions at the interface between home and local environment</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>   Independent contributions to social capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retirement living environments as settings for sharing values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retirement living environments as providers of age-appropriate resources</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Social isolation as a threat to activity participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Familiarity with local resources and networks</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Local amenity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity and accessibility</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>   Usability of resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walkability and walking distance</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Local interaction (social interaction wedded to the local environment)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Local activity destination</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared leisure</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Support activity</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>   Older adults as providers of support</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Service communities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious fellowship</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Communities of interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social obligation and responsibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Energy, motivation, and belief</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Routine and continuity</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Subjective and self-reported influences on activity associated with the 2010 and 2011 earthquakes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of venues and destinations</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Cancellation of meetings and events</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Escape, relocation, and the fragmentation of social networks</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>   Network fragmentation</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Confinement and isolation</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Damage to transport networks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazards in the local environment</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Disruptions to activities of daily living</td>
<td>✓</td>
<td></td>
</tr>
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<td>Earthquake recovery activities</td>
<td>✓</td>
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<td>Disaster preparedness</td>
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<td>Care of others</td>
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<td>Accessing networks of support</td>
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<td>Adaptation and flexibility</td>
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10.3 Synthesis of theoretical literature with abstracted concepts

In chapter four, theoretical perspectives were identified that attempt to explain and predict interactions among ageing, health, activity, and environment. These perspectives were categorised as theories of ageing, place, and health behaviour. These three areas of thought have influenced hypothesis generation, research problem formulation, and intervention development within environmental gerontology. A small number of disaster-related theories relevant to older adults' responses to urban disasters were also identified. Many of these theories were reflected in different ways in the results of the present research and have been incorporated into a new model of active ageing: the theory of navigated environmental performance. In this section, each of the relevant theories is summarised, relevant evidence from the present research is presented, and the manner in which the theory or its concepts is reflected in the resultant model is outlined.

10.3.1 Theories of ageing

The theories of ageing are among the most influential perspectives governing gerontological research. They address the biological, psychosocial, and ecological influences on human ageing. The biological theories of ageing are relevant to the present research findings as they predict limits to and eventual reductions in health and physical capacity among older adults. Such perspectives include evolutionary senescence, rate of living, random mutation, Hayflick's limit and others (Gravilov & Gravilova, 2006; Hayflick & Moorhead, 1961; Kirkwood, 2002; Sohal & Weindruch, 1996). As this thesis was conceived as social research, the evidence does not identify specific biological mechanisms underlying health and activity participation. Nevertheless, the data suggest that biological changes in later life have the potential to alter the activity participation of older adults. Both survey and the activity diary respondents reported that poor health was a constraint to activity participation, while better health and maintained physical capabilities supported engagement. The underlying influence of biological processes are reflected in the theory of navigated environmental performance as a component of a personal threshold, which must be overcome in order for activity to proceed. Biological limits are also accounted for in the concept of health change, which can occur either rapidly or over time in later life and which may lead to reductions in activity participation irrespective of environmental conditions. A health change in a more supportive environment is identified as less of a threat to participation than a health change in
Psychosocial theories of ageing are also relevant to the findings of the present research and offer explanation for cognitive and social influences on the behaviour of older adults. Relevant perspectives include activity theory, continuity theory, the selective optimisation with compensation theory, socio-emotional selectivity theory, gerotranscendence, and age-stratification theory.

The activity theory of ageing suggests that it is beneficial for older adults to maintain or increase participation in meaningful pursuits in later life to facilitate well-being and adjustment to ageing (Burgess, 1960; Neugarten, 1964). While this perspective has largely been overtaken by more flexible models that recognise the diversity within the older-adult group, the present research sample were identified as a relatively active group who displayed a high level of engagement across a range of behavioural domains and in difficult environmental circumstances, including a sequence of earthquakes. In the context of the model of navigated environmental performance, the activity theory is reflected as higher activity thresholds across a range of functional capacities. Independently living older adults may be expected to exhibit a high level of participation across a range of domains, in a variety of environmental circumstances, and in the context of varying states of health. High levels of activity are also indicative of latent resilience within the group.

In addition to higher levels of activity, respondents also reported their intentions to maintain participation in a variety of activities over time. Maintaining continuity with activities of one's earlier life is consistent with the continuity theory of ageing, which asserts that individuals create and endeavour to maintain stable patterns of activity across their life course (Atchley, 1989). The concept of continuity is reflected in the theory of active ageing as the intention to preserve activity participation across a variety of more and less supportive environmental conditions and in the context of a series of disruptive earthquakes. Maintaining one's activity participation in a variety of environmental circumstances is considered to be an example of successful navigation.

A final psychosocial theory of ageing that is relevant to the results of the research is age stratification theory, which suggests that every age group exhibits particular characteristics, which influence the health and behaviour of group members (Riley, 1971). In
the context of the present research, the relatively high level of activity observed in the aftermath of a sequence of earthquake disasters is potentially indicative of a group-wide level of resilience. It is possible that collective experiences of previous disasters or generational values for self-reliance and resourcefulness helped older adults to maintain composure and continue their participation in the midst of environmental disruption (Koopman-Boyden, 1993b). This interpretation is closely related to the inoculation and maturation theories that describe older-adult coping following a disaster (Knight et al., 2000; Norris & Murrell, 1988). In the theory of navigated environmental performance, this apparent activity resilience is referred to as latent capacity and is depicted as a gap between the personal threshold and higher reported levels of participation.

Among the most relevant perspectives related to the present research are the ecological theories of ageing, which predict both personal and environmental influences on ageing processes and behaviours. In particular, concepts from the convoy theory of social relations, the life-course model, the disablement model, and the environmental competence-press model are supported in the theory of navigated environmental performance.

The convoy theory of social relations (Antonucci et al., 2009) suggests that individuals forge social ties over the course of their lives and that these relationships, particularly those with family and close friends, play a crucial role in supporting and directing activity and health in later life. The research data indicated that older adults are routinely active in the company of other people. It was also found that access to a supportive social network facilitated activity participation, while unsupportive networks or diminished social interactions reduced opportunities for participation in later life. The influence of social ties is shown in the theory of navigated environmental performance as preferences for social activities, the facilitation of activity via supportive networks, and threats to activity participation posed by social constraints (unsupportive networks or isolation).

The disablement model (Verbrugge & Jette, 1994) predicts that individuals become disabled when there is an insurmountable gap between their functional ability and environmental demands. The level of environmental support is the critical factor that determines whether or not a person becomes disabled by their changing health or functional capacity. While functional limitations are intrinsic to individuals, disabilities relate to the interactions with the physical and social environment (Alley & Crimmins, 2010). In both the
second and third research phases, respondents reported that health declines were a significant constraint to activity participation. The onset of arthritis or a stroke, for example, often meant that individuals had to significantly reduce activity participation. Changes in health and functioning were also identified as an influence on residential transitions to more supportive settings. These findings suggest that in many circumstances a change in health and functioning requires either a reduction in activity or a change of environment in order to maintain well-being and participation. The disablement process is reflected in the theory of navigated environmental performance as a health change that is closely related to the degree of support provided by an urban environment. When the urban environment is relatively unsupportive, a change in health can lead to a reduction in activity participation or a complete withdrawal – constituting unsuccessful navigation and potential disablement. As environmental support increases beyond an environmental support threshold, however, a change in health can potentially be accommodated such that an individual may continue to be active, albeit with a reduced or altered routine.

Closely related to the disablement perspective is the World Health Organisation life-course model (World Health Organization, 2008), which predicts that as functional ability declines beyond a critical point, a disability threshold, an ageing individual will no longer be able to sustain their normal behaviours and routines. The life-course model also recognises the range of health and functioning evident within the older-adult group (World Health Organisation, 2002a). The findings of the present research indicated a spectrum of health and participation within the context of a relatively active sample consistent with the predictions of the life course model. The findings also showed that activity participation was constrained for some older adults by poor health. Elements of the life-course model are reflected in the theory of navigated environmental performance in terms of a disability threshold. When health or functional capacity declines beyond a critical point, activity participation is no longer possible and there is a presumed interaction between the level of environmental support and the likelihood of becoming inactive. The World Health Organisation life-course model is also reflected in the range of function or fitness gap that was evident within the sample of active adults.

Among the perspectives that relate to the present findings, the environmental competence-press model (Lawton & Nahemow, 1973) is potentially the most closely aligned. This theory suggests that behaviour (activity participation) is a function of personal factors,
environmental conditions, and the interaction between person and environment. A key component of the environmental competence-press model is the concept of adaptation. Lawton and associates argued that adapting to and overcoming manageable barriers was desirable, but that some environments were innately constraining for older adults who often had a lower level of competence and a narrow adaptive range (Nahemow, 2000). The competence-press model also suggests that there may be no such thing as a perfect environment (it may even be counterproductive), but that a perfect adaptation is a possibility where there is an appropriate mix of personal agency, competence, and sufficient environmental support. In the present research, individual competence (health and functional ability) was identified as both a facilitator of and constraint to activity participation. Environmental conditions were also identified as influences on activities, and a continuum of more and less supportive environments were observed across urban areas. Several concepts from the competence-press model are incorporated into the theory of navigated environmental performance. Adaptation level is depicted as an environmental support threshold, which is conceived as a point where environmental conditions become manifestly facilitative of activity participation. Zones of maximum comfort and performance potential (or the adaptive range) are reflected in the potential for increased participation that occurs in more supportive environments (reflecting elements of malleability, particularity, accessibility, amenity, and social support). The theory of navigated environmental performance also depicts a continuum of environmental support and a stronger and weaker environmental press within urban areas.

10.3.2 Theories of place

The theories of place consider the subjective and emotional transactions between individuals and their surroundings. Perspectives that are relevant to the research findings and contribute to the development of the theory of navigated environmental performance include the theory of place attachment, the theory of therapeutic landscapes, and theories of environmental overload or stress.

The theory of place attachment (Rubinstein & Parmelee, 1992) describes a symbiotic relationship whereby an individual imbues a place with meaning and significance and, in turn, the place provides a familiar setting for daily activities, psychological and emotional fulfilment, and contributions to the formation and maintenance of personal identity. Feelings of place attachment are often directed specifically at the home and local environment where
there is near perpetual interaction (Peace et al., 2007). Findings from both the second and third research phases indicated that older adults had preferences for activities that were centred on home and local environment. While there were diverse reasons given for these locations for activity participation, including the potentially restrictive influence of the 2010 and 2011 earthquakes, it is likely that many older adults had affective bonds to their proximate physical and social surroundings, which facilitated activity participation. Emergent themes associated with home and local environment that reflected emotional bonds between people and places included pleasure garden, home sanctuary, and familiarity. The theory of place attachment is evidenced in the model of navigated environmental performance as preferences for activities undertaken in the context of home and local environment and as potentially higher levels of activity in more supportive settings where emotional connections to place are interwoven in such concepts as amenity and accessibility.

Study findings were also consistent with the theory of therapeutic landscapes (Gesler, 1992), which describes physical environments that are perceived to promote or support health and health-related behaviours in later life. The results of the third research phase indicated that some older adults believed that spending time in particular settings is innately health-promoting and supportive of their preferred activities. In particular, the themes of pleasure garden, home sanctuary, and age-appropriateness (retirement living communities) revealed how activities undertaken in certain places were perceived as facilitators of situated experiences of well-being. The theory of therapeutic landscapes is reflected in the theory of navigated environmental performance as preferences for home and local environments and as increased activity in more supportive environments. In fact, the concept of supportive environments (incorporating malleability, particularity, accessibility, amenity, and social support) could be considered to be an activity related analogue of therapeutic landscapes.

The findings of the present research were consistent with the theories of environmental overload or stress (Bell et al., 2001; Glass & Singer, 1972), which suggest that exposure to stressful physical and social conditions in urban areas potentially trigger health problems and behavioural constraints if an individual is unable to adequately cope with environmental challenges. In difficult circumstances, successful coping leads to adaptation, psychological well-being, and adherence to behaviours, while an inability to cope with environmental stress can lead to poor health, exhaustion, and reduced participation (Glanz & Shwartz, 2008). The phase-three results indicated that living in less supportive environments,
characterised by a variety of potential environmental stressors, was associated with a nominal level of activity participation that was potentially indicative of older-adult resilience against a backdrop of antecedent constraints. Potential environmental stressors identified during the research included negative perceptions of local environment, extreme climatic conditions, social isolation, social obligation, and the effects of natural disasters. Theories of environmental overload or stress are reflected in the model of navigated environmental performance as potentially lower levels of activity participation in less supportive environments. Coping in the face of environmental difficulties is reflected in the maintenance of activity in the aftermath of a major disasters and the capacity for participation shown by older adults across a range of circumstances.

10.3.3 Theories of health behaviour

The final set of perspectives that are relevant to the results of the present research and which make contributions to the model of navigated environmental performance are the theories of health behaviour. The theories of health behaviour address actions taken by individuals in support of well-being (Glanz et al., 2008). Theoretical perspectives relevant to the present results include the health belief model, protection-motivation theory, the theory of reasoned action, the theory of planned behaviour, social-cognitive theory, and the social-ecological model.

Beliefs about the benefits of activity were identified by diarists as a facilitator of participation in the third research phase. When individuals believed that involvement in certain activities would lead to positive outcomes, they were likely to report participation, particularly within the physical and social domains. Theoretical perspectives that predict the influence of beliefs on health and activity participation include the health belief model (Rosenstock, 1974) and protection motivation theory (Rogers, 1975). Both of these perspectives argue that individuals will be active when they perceive that by engaging in a particular behaviour they will maintain or restore health. Beliefs in the benefits of activity participation are considered in the theory of navigated performance as a component of a personal threshold, which must be overcome before activity participation can be initiated. The model predicts that holding positive beliefs about the benefits of activities is an important prerequisite of participation for many older adults, although perceived benefits need not be health-related. For example, a respondent from the third research phase engaged in regular
spiritual activity believing that her faith and prayers helped to overcome stress and benefit overseas family members.

The research findings also suggested that older adults required a level of motivation or an intention to be active prior to initiating participation. Respondents in the third research phase avoided activities that they disliked and participated in those that were commensurate with their interests, skills, and physical capacity. The theories of reasoned action (Fishbein & Ajzen, 1975) and planned behaviour (Ajzen, 1991) both contend that rationally motivated intention underlies health behaviour, which is in turn thought to be influenced by subjective norms, attitudes towards the behaviour, and perceived control. In parallel with the health belief and protection motivation perspectives, the theories of reasoned action and planned behaviour are reflected in the model of navigated environmental performance as components of a personal activity threshold. The model predicts that interest and motivation are necessary precursors of activity participation for many older adults.

In addition to personal factors, potential environmental influences on activity were also identified across all research phases. The identification of both personal and environmental influences on activity participation is consistent with the ecological theories of health behaviour. Like the ecological models of ageing, these perspectives suggest that there are interacting and multi-layered influences on health and behaviour at all ages (McLeroy et al., 1988). Perspectives that are relevant to the present results include social cognitive theory and the social ecological model (Bandura, 1999; Stokols, 1996).

Social cognitive theory (Bandura, 1986) emphasises the prevailing influence of personal attributes (particularly psychological traits) on health, the capacity of older adults to define their own behaviours within a particular setting (agency), and the power of the environment to moderate expressions of activity in later life. In the present research, the personal agency of older adults was evident in the selection of residential dwelling locations, diverse activity preferences, and resilience and adaptability shown during the earthquakes of 2010 and 2011. In contrast to the present results, social cognitive theory prioritises personal influences, particularly self-efficacy and outcome expectations, above the role of the environment when considering the factors underlying action (Bandura, 1999; McAlister et al., 2008). While self-efficacy was not directly investigated in the survey, older adults were free to comment about the diverse personal influences on their activity participation in diary and
Discussion and synthesis of results from three research phases

Photovoice procedures during the third research phase. Despite the freedom of response given to participants, self-efficacy did not emerge as a reported influence on activity participation. Self-confidence, which is closely related to self-efficacy, was removed as a potential theme during qualitative data analysis due to a lack of evidence. In the context of the present research, personal influences on activity participation were reported considerably less often within activity diaries compared to reported environmental influences. This may be due to the focus of the research on environmental influences on active ageing, which was made explicit to research participants from the outset of the study. However, respondents were encouraged to report all influences on their activity participation. Social cognitive theory is reflected in the theory of navigated environmental performance in the concept of navigation, which expresses older adults' capacity for autonomous action within an uncertain and often unsupportive environment. The concept of outcome expectations from social cognitive theory is reflected as part of the personal threshold commensurate with the concept of belief.

The findings for personal and environmental influences on active ageing behaviours are also consistent with social ecological theory. Social ecological theory is not as well defined as social cognitive theory or the competence-press model, but it does predict that diverse personal and environmental factors are associated with health and health-related behaviour (McLeroy et al., 1988; Stokols, 1996). The social ecological model also suggests that the interaction between environmental conditions and personal circumstances is complex and that influences on activity tend to vary by individual, population, or behavioural outcomes (Stokols, 1996). In the present research, a diversity of environmental influences were reported by older adults consistent with the social ecological model, including residential location, perception of local conditions, home environment characteristics, local environmental conditions, social network interactions, and climate. Consistent with predictions for multi-layered influences, personal factors were also identified, including health; age; routine and continuity; and energy, motivation, and belief. The results also supported the assertion that the influences on activity vary by the outcome being measured (domain specificity), although most of the identified influences acted across multiple domains. Tenets of social ecological theory are reflected in the model of navigated environmental performance via the integration of diverse personal and environmental influences on activity, including macro-environmental, personal, and environmental support thresholds.
10.3.4 Disaster-related theories

The earthquakes of 2010 and 2011 necessitated consideration of disaster-related theories relevant to older adults' activity. Perspectives that were most relevant to the present research include the inoculation theory and maturation theory (Knight et al., 2000; Norris & Murrell, 1988). The inoculation hypothesis suggests that prior experiences of hardship or natural disasters prepares older adults to face and overcome future challenges (Norris & Murrell, 1988). Maturation theory predicts that as individuals age they experience emotional and psychological growth and the refinement of coping styles, which makes them more competent at overcoming challenges in later life (Knight et al., 2000). These theoretical perspectives potentially explain the high level of resilience that was evident among older adults following both the September 2010 and February 2011 earthquakes. Examples of resilience evident in the data included adapting one's activities, caring for others who were affected by the earthquakes, assisting in community recovery, and putting disaster preparedness strategies into action. Within the context of the theory of navigated environmental performance, resilience following an urban disaster is depicted as a spectrum of activity participation in response to a negative environmental change. The range of possible activity responses includes maintained or altered activities (successful navigation and an indicator of resilience) as well as overall reductions in activity participation commensurate with insurmountable environmental barriers (unsuccessful navigation and an increasing threat of potential disablement).

10.3.5 Non-contributing theoretical perspectives

Perspectives relevant to interactions among ageing, health, activity, and environment that were identified in the theoretical literature, but not supported by the research results include the disengagement theory of ageing (Cumming & Henry, 1961), attention restoration theory (Kaplan & Kaplan, 1989), the states of change theory (Prochaska et al., 1992), the theory of structured dependency (Townsend, 1981), and the burden hypothesis (earthquake-related theory) (Thompson et al., 1993). While these perspectives offer explanations for older-adult health and activity outcomes in diverse circumstances, they were not consistent with the present research findings and have not been incorporated into the theory of navigated environmental performance due to a lack of evidence. It should be noted, however, that both states of change and the burden hypothesis could not be effectively tested in the present
Discussion and synthesis of results from three research phases

research as individual behaviour was not charted over time and data for different age cohorts were not available for comparison. The disengagement theory of ageing has long been outmoded in gerontological research, and a lack of evidence for this perspective is consistent with current theoretical understanding (Atchley, 1989; Baltes & Carstensen, 1996). The theory of structured dependency was not reflected in the analysis of results and the resultant theory of navigated environmental performance as this perspective tends to relate to the political, economic, and institutional aspects of the interaction between environment and individual (Townsend, 1981). In contrast, this study was conceived as having a pragmatic focus on physical and social environments due to the regularity of interaction in these settings. It was unexpected that evidence for attention restoration theory was not identified during the research. This is possibly because restorative experiences often occur in unfamiliar or novel environmental settings, such as wilderness areas, which may stimulate involuntary attention and promote mental restoration (Kaplan, 1995). In the present research, older-adult activity was most commonly reported within the confines of home and local environment as a result of individual preferences and earthquake-related barriers.

10.4 The theory of navigated environmental performance

The theory of navigated environmental performance represents the integrated and collaboratively generated answer to the research question: how, if at all, do the environmental conditions of urban areas influence active ageing among independently living older adults? The process of theory generation involved conceptualising phenomena in terms of a set of related concepts and expressing these ideas via a system words and diagrams (Jaccard & Jacoby, 2010). The development of theory is construed as abductive, rather than deductive, following an imaginative and creative procedure undertaken to abstract plausible and generalised meanings from within a complex data array (Charmaz, 2008). The theorising process represents the final step in the analysis of the potential personal and environmental influences on active ageing within an urban setting, incorporating the unanticipated effects of the 2010 and 2011 Canterbury earthquakes. The theory of navigated environmental performance is a mid-range, gerontological theory of active ageing, which predicts and explains how urban environmental conditions interact with individual agency and biological, psychological, and behavioural states to potentially influence activity participation among independently living older adults. This theory has been developed using concepts abstracted directly from the research data; elements from relevant theories of ageing, place, and health
behaviour; and critical feedback from study respondents and advisers.

### 10.4.1 Major premises

Six premises underlie the theory of navigated environmental performance. A premise is conceived as a statement that reflects the abstracted and co-created knowledge arising from the research study and which constitutes the building blocks of theory (Jaccard & Jacoby, 2010). Each of the following premises represents abstracted knowledge arising from three research phases and ongoing collaboration with older adults.

(a) **Older adults:** Independently living older adults are a healthy and active group who engage with their proximate urban environment as autonomous agents seeking opportunities for the performance of preferred activities and overcoming manageable antecedent and emerging barriers commensurate with physical capacity, psychological dispositions, and behavioural patterns.

(b) **Activity participation:** Independently living older adults are active across a range of behavioural domains, although physical, social, and cultural activities are most commonly expressed. Activities are centred around a socio-spatial core of home, local environment, and proximal network interaction. Older adults are active at a nominally high level of participation across a variety of urban areas reflecting a latent resilience in the face of existing and emerging environmental constraints and an intention to preserve activity participation for as long as possible in later life.

(c) **The setting:** Independently living older adults are situated in urban areas of their own choosing, which reflect a diversity of environmental preferences, personal capacity and needs, and affective bonds to people and places. Urban environments present a continuum of more and less supportive physical and social attributes, although potential constraints to activity are ubiquitous throughout the city.

(d) **Environmental influences:** Environmental conditions of urban areas influence the activity participation of older adults. Environmental pathways to active ageing include the malleability of private spaces, the particularity of urban areas, the accessibility of resources, the amenity of local conditions, social network characteristics, perceptions
of one's surroundings, and climate. As environmental conditions become manifestly more supportive of active ageing, older-adult participation is likely to increase from a nominal to a higher level of engagement and the threats of disengagement and disability decrease.

(e) Disaster effects: Earthquake disasters constitute a sudden and negative environmental change, which constrain activity participation for vulnerable older adults once a threshold of disruption is reached. Less resilient older adults experience an overall reduction in their activities, while more resilient individuals continue their participation in pre-existing or new modes of engagement often in alternative and undamaged locations.

(f) Personal influences: Physical capacity, psychological dispositions, and behavioural patterns are foundational influences on activity participation in later life. If personal attributes are not oriented towards activity, then participation is unlikely to proceed and environmental factors may not influence behaviour for older individuals.

10.4.2 The theory

Independently living older adults navigate the frequency, mode, and context of their activity participation (the activity course) as autonomous agents within complex and often unsupportive urban environments. Navigation of activity participation refers to a continual transaction between an older individual and their urban environment. In navigating the course of their activity participation, older adults must reconcile the malleability of their private surrounds; the accessibility and amenity of local conditions; the characteristics of their proximate social network, and the unique contextual and compositional features of their own locality with their intrinsic psychological, biological, and behavioural dispositions. Interactions between personal and environmental variables and particular modes of activity are domain specific reflecting an underlying complexity in the relationship among individual, environment, and activity. Independently living and higher functioning older adults have an advanced tolerance for environmental constraints in most urban areas and seek to preserve activity participation insomuch as it is within their capacity to endure or change. Older adults accentuate the concordance (or degree of fit) between environmental conditions and personal capacities whereby they are often active at a nominal level irrespective of environmental
conditions and sometimes in the midst of significant perceived or genuine constraints. When resources or networks for activity participation are unavailable, unsupportive, or inappropriate, independently living older adults re-chart their course by altering their level, mode, or context of activity participation. Re-charting one's activity course can be either successful or unsuccessful depending on the interplay of personal and environmental conditions. Successful navigation occurs when the environment is sufficiently supportive of preferred activities or when individual resilience and capacity is adequate to overcome antecedent or emerging barriers, resulting in increased or maintained participation over time. Unsuccessful navigation occurs when there is disjunction among preferences, capacity, and urban environmental conditions, which results in reduced participation and potential disablement. When environments are materially supportive of preferred activities and an environmental threshold has been reached, navigation becomes easier and increased participation (or opportunities for participation) results. A perfectly supportive environment is both impracticable and potentially counterproductive, however. Adaptation to a more supportive environment is preferred, which recognises the agency, capacity, and adaptability of older adults as well as the effects of living in malleable, particular, accessible, amenable, and pro-social settings. In the sections below, the theory of navigated environmental performance is depicted in three progressive figures to show the interacting layers of influence on older-adult activity. The final figure represents the full theory of navigated environmental performance.
This diagram represents the first layer of influences on activity participation and shows the antecedent environmental and personal conditions that must be navigated in order for activity to proceed in later life. If the macro-environmental, personal, and urban environmental thresholds cannot be successfully navigated by older adults, activity participation is unlikely to proceed and disablement may be experienced. Note that there is an intentional gap between the antecedent conditions and the y axis of the diagram as the three background layers are not intended to reflect a specific level of activity participation. The presentation of the theory of navigated environmental performance is broadly based upon a format used by Lawton and Nahemow (1973) when they expressed their competence-press model. In congruence the work of Lawton and Nahemow, the model is presented at the intersection of two axes: a) activity participation and b) the urban environmental continuum. The model differs from the environmental competence-press model, however, as notions of competence (personal capability and agency) and press (environmental challenges) are located within the model, rather than as reference points.
Discussion and synthesis of results from three research phases

![Diagram illustrating activity participation capacity across different environmental conditions.](image)

- Generally unsupportive antecedent conditions of the urban environment.
  - Personal threshold / requisite capacity (WHO disability threshold)
  - Health and age
  - Energy, motivation, and belief
  - Routine and continuity
- Macro-environmental threshold (climate)

**Urban environmental continuum**
- Less supportive environment (stronger press)
- More supportive environment (weaker press)
10.4.2.2 Diagram two

This diagram shows the theorised characteristics of older-adult activity in an urban environment. A nominally high level of activity participation is evident across urban areas (represented by the hatched blue and green lines) reflecting a latent capacity and resilience among the population of independently living older adults. Within an active group, there is a range of function reflecting variations in individual fitness. Opportunities for activity become manifestly greater once an environmental support threshold has been reached. Environmental support comprises the malleability of private space, the particularity of urban areas, the accessibility and amenity of local conditions, and a supportive social network. Variations in activity are evident in more supportive environments commensurate with personal capacity, the level of fit between environmental conditions to individual needs and preferences, and the degree of environmental support. In congruence with Lawton and Nahemow's (1973) model, this theory identifies zones of maximal comfort and optimal performance as well as an adaptation level. All of these aspects of the model occur in a broader context, however, that includes a prevailing set of deleterious conditions and general population resilience.
Discussion and synthesis of results from three research phases

[Diagram showing a model of activity participation capacity with various thresholds and zones of maximum performance potential and comfort.]

- Higher capacity activity threshold
- Lower capacity activity threshold
- Range of function (WHO fitness gap)
- Latent capacity / context resilience
- Personal threshold / requisite capacity (WHO disability threshold)
- Energy, motivation, and belief
- Routine and continuity
- Macro-environmental threshold (climate)

- Zone of maximum performance potential
- Zone of maximum comfort
- Malleability
- Particularity
- Accessibility
- Amenity
- Social support

Activity preferences: Physical, Social, Cultural

Environmental support threshold (adaptation level)

Less supportive environment (stronger press)

Urban environmental continuum (real or perceived)

More supportive environment (weaker press)

Context preferences: Home environment, Local environment, Social network
This diagram is representative of the full theory of navigated environmental performance and incorporates the identified constraints to activity participation as well as individual agency, which influences decision making and adaptation. Salient barriers to participation include health change, social constraints, environmental change (natural disasters), and negative perceptions of local conditions. Constraints experienced in less supportive environments potentially foster inactivity and disablement, while more supportive areas may provide opportunities for the continuation or adaptation of activities in the midst of changing personal or environmental circumstances. Negative environmental change has variable effects. For vulnerable older adults, a negative environmental change may precipitate a reduction of activity participation, while more resilient older adults may successfully navigate deleterious conditions by continuing participation in an altered mode or venue. In contrast to the work of Lawton and Nahemow (1973), the final iteration of the model of navigated environmental performance includes the concept of agency to recognise the power of rationale decision making and personal choice in the context of changing personal and environmental circumstances. This concept is particularly important as it acknowledges that older adults are not necessarily at the mercy of environmental and personal conditions, but can make decisions and act independently in accordance with personal preferences for particular behaviours. The final model has both predictive and explanatory qualities. For example, an older adult moving to a new neighbourhood is likely to bring a reserve of physical and mental capacity to adapt to the change and maintain their preferred activities. If the new location is more supportive of preferred activities (it may have a safer and more attractive walking environment for example), the older adult is likely to maintain or increase their level of physical activity (walking in this case). As local activity resources compound (friendly neighbours, access to a local park and walking trail, variable walking routes, smooth and contiguous paths, a variety of interesting vistas etc.) the likelihood of greater levels of activity participation is predicted to increase for this individual.
Discussion and synthesis of results from three research phases

- Individual navigation or agency
- Higher constraint
- Health change (rapid / over time)
- Range of function (WHO fitness gap)
  - Latent capacity / cohort resilience
  - Personal threshold / requisite capacity (WHO disability threshold)
  - Health and age
  - Energy, motivation, and belief
  - Routine and continuity
  - Macro-environmental threshold (climate)

Higher activity preferences:
- Physical
- Social
- Cultural

Zone of maximum performance potential
Zone of maximum comfort

Successful navigation
Malleability
Particularity
Accessibility
Amenity
Social support

Successful navigation - altered mobility / location

Perception of local conditions

Environment change

Generally unsupportive antecedent conditions of the urban environment.

Unsuccessful navigation / potential disembarkation

Environment change

Lower constraint

Less supportive environment (stronger press)

Urban environmental continuum (real or perceived)

More supportive environment (weaker press)

No perfect environment, only perfect adaptation

Context preferences:
- Home environment
- Local environment
- Social network

Activity variation
Activity preservation
Successful navigation
Activity preservation

Activity preservation
Successful navigation
Activity preservation

Activity preservation
Successful navigation
Activity preservation

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10.4.3 Potential limitations of the theory

There are several weaknesses inherent to the theory of navigated environmental performance, which potentially limit its utility as a model of active ageing. Limitations include a lack of quantification of identified thresholds, the relatively narrow focus on active and high-functioning older adults in urban areas, and a lack of recognition of the potential adaptability of older adults over time.

The model does not quantify the activity, environmental support, disability, or disaster thresholds that it introduces. Because of the limitations of the research data, it was only possible to describe general characteristics of these thresholds. While mid-range theory seldom provides fine-grained or quantifiable information, it could be argued that without a fuller delineation of the identified thresholds it is difficult to develop testable hypotheses from the theory. These matters could, however, be addressed by future research as it was not the intention of the present study to delineate empirical limits and thresholds of activity within particular settings. In relation to the environmental support threshold, which is congruent with Lawton's (1982) adaptation level, it may not be possible to define such a point. It has previously been argued that the adaptation level is a range, rather than a fixed point, and that adaptation changes with environment and competence (Nahemow, 2000). It is probable that other thresholds also reflect a range of behaviours and conditions.

The theory of navigated environmental performance is relatively narrow in its focus on independently living older adults who reside in urban areas and who are apparently active and high functioning. It is possible that older adults who are comparatively inactive and low functioning, but who continue to live independently in urban areas, are not adequately addressed by the present model. The findings for a lack of physical environmental barriers to activity participation in the present study (excluding earthquake-related findings) suggest that the sample group may be atypical of older-adult groups in other national and international studies (Annear et al., 2009; Berke et al., 2007; Salvador et al., 2009). The challenge of recruiting and reflecting the experiences of more vulnerable community members is not unique to this study. Social researchers from other health-related disciplines have lamented the difficulty of recruiting and generating effective data with vulnerable population groups, such as isolated or inactive older adults (Crombie et al., 2004; Kowal & Fortier, 2007). A caveat on the model is necessary, therefore, which recognises that it is most applicable to
active and higher-functioning older adults who reside in urban areas.

The theory of navigated environmental performance does not elucidate how older adults fare compared to other age cohorts. The lack of comparative data with other age groups is relevant because if younger or middle-aged adults experience similar barriers and facilitators to activity participation, then the model may have increased applicability for a larger cross-section of the population. If, however, other age cohorts experience different personal and environmental influences to activity participation, then age-specific policies and interventions will be required to support activity and health. The gerontological literature provides evidence for the increased vulnerability of older adults to negative physical and social environmental conditions associated with a growing reliance on home and local environment as spheres of activity (Glass & Balfour, 2003; Smith, 2009). Life-course perspectives also indicate that older adulthood is a time when the accumulation of health, lifestyle, and economic factors often lead older adults in vastly different directions concerning individual well-being, activity participation, and environmental engagement (Findlay & McLaughlin, 2005; Osler, 2006; World Health Organization, 1999). The generation of comparative data was beyond the scope of the present research, although future research in this area is clearly warranted.

Finally, the model is limited by its lack of recognition of personal development and processes of change over time. Such perspectives are reflected in the states of change theory of health behaviour (Prochaska et al., 1992). Even when personal or environmental circumstances are punctuated with constraint, a level of adaptation is likely to occur, although this may take a longer period for those who are very old or frail (Nahemow, 2000). By treating personal and environmental influences as universal and simultaneous in their effects, the model may be charged with fostering an undue sense of urgency and potentially downplaying the adaptability of older adults over time. As the model was developed primarily on the basis of cross-sectional data, it was not possible to observe participants over time to identify whether individuals were capable of adapting to existing or emerging barriers. The earthquake-related data, however, provided examples of how some older adults began to adapt their behaviours and activities in the weeks after a sequence of disasters. More examples of resilience and adaptation may have been evidenced over a longer period as recovery and rebuilding progressed and older adults adjusted to a new normal.
### 10.4.4 Strengths of and potential uses for the theory

While there are several limitations associated with the theory of navigated environmental performance, this perspective also makes contributions to the field of gerontology. Strengths of the theory include the collaborative development of the model, the potential for application beyond the immediate research sample and setting, the introduction of new theoretical concepts, links to existing theory, contributions to understanding how older adults respond to natural disasters, and the prediction and explanation of active ageing behaviour.

The model was developed in collaboration with the reference group and research participants during focus group discussions in 2011 and 2012. Gerontologists have previously argued that when participants contribute to the interpretation and critical examination of research, the validity of the outcomes is enhanced (Blair & Minkler, 2009; Ray, 2007). Older adults critiqued the abstracted concepts and suggested alterations to the model based on their interpretations of the research findings and personal experiences of ageing within an urban setting. In particular, focus group participants emphasised the need to reflect the effects of sudden health changes in later life and the altered modes and locations of activity participation reported after the earthquakes. The reference group also tested their own experiences against the model and explored how it would potentially explain a residential transition in later life, for example. Working together, research participants were satisfied that the active ageing model was a fair reflection of the study results and that it also had wider utility.

The model of navigated environmental performance constitutes a mid-range theory (Merton, 1968) for gerontology, which explains how urban settings potentially affect the activity participation of independently living older adults during times of both stasis and change. The benefit of a mid-range theory is that while the research findings are arguably only applicable to independently living older adults in urban Christchurch, the abstracted model has potential utility beyond the immediate sample (Becker, 1998). The theory of navigated environmental performance introduces new concepts that provide opportunities for the generation of research questions and hypotheses, including personal threshold, activity threshold, disaster threshold, environmental support, successful and unsuccessful navigation, ubiquitous constraint, latent capacity, and activity preservation. In this way, the model
contributes to the recognised paucity of theoretical development within environmental gerontology (Birren, 1999; Kendig, 2003). In addition to the development of new concepts, the theory of navigated environmental performance also incorporates perspectives from existing theories of ageing, place, and health behaviour where they are consistent with the results. It has previously been argued that the most relevant and useful theories are those that build upon the foundations of existing knowledge (Jaccard & Jacoby, 2010).

In response to the unexpected Canterbury earthquakes of 2010 and 2011, the theory of navigated environmental performance also contributes to the understanding of how older-adult activity is affected by sudden and deleterious environmental changes. A review of the literature identified only three existing models, which all predicted higher levels of older-adult resilience following a major disaster (Knight et al., 2000; Norris & Murrell, 1988; Thompson et al., 1993). The theory of navigated environmental performance indicates, however, that older adults display both vulnerability and resilience following an earthquake, which is represented as a spectrum of adaptive and maladaptive behaviour. Adaptive behaviour or successful navigation is associated with maintained activity frequency with potentially altered modes and locations. Unsuccessful navigation or maladaptive behaviour is depicted as overall reductions in activity and the potential for disablement that occurs once a threshold of disruption has been surpassed (as evidenced by the effects of the February 2011 earthquake).

The active ageing model has explanatory and predictive qualities, which could potentially be used to design environmental assessment tools, community development policies, or interventions to facilitate active ageing in urban areas. For example, the model predicts that independently living older adults will be active at a nominally high level even in difficult environmental circumstances, but that activity participation is likely to increase in the presence of malleable private space, unique characteristics, accessible and amenable resources, and supportive social networks. By directing environmental policy or interventions to improve malleability, particularity, accessibility, amenity, or social support, public officials could potentially prompt improvements in activity and health. In this way, the theory also contributes to a core principle of PAR: advocacy for sustainable community change (Israel et al., 2005).

Finally, the model helps to overcome some of the existing issues surrounding the concept of active ageing that prevail in the discipline of Gerontology. A benefit of the theory
of navigated environmental performance is that it clearly defines the behaviours that are most likely to be undertaken by older adults and delineates the conditions under which participation improves or declines. The theory also recognises the importance of ADLs and lower levels of activity as part of individual agency, which exists independently of environmental conditions. Through this research process, several problems emerged with the concept of active ageing. There are relative few studies, with the exception of those considering physical activity, that deliberately explore core concepts of the active ageing framework. This potentially limited the scope of the literature review that provided background to this study as it relied mainly on search terms associated with this concept (physical activity, social activity, cultural activity and others). It is possible that there are other conceptualisations of active ageing behaviours that do not conform to this definition. Component behaviours, such as social activity, for example, may be more commonly expressed by such terms as network interaction or social/cultural capital. The present research responded to this difficulty by utilising broad definitions of six domains of active ageing to cover a range of potential behaviours, although the scope of the original literature review was potentially limited by narrowly framed search terms. This research and associated publications will add to the relatively scarce literature on active ageing and hopefully stimulate greater consideration of a diversity of activity in later life. The range of behaviours covered by active ageing is also potentially problematic. In particular, the concept does not adequately account for activities of daily living (ADLs) or even the importance of doing nothing. Social gerontologists have previously argued that, “Retired and older people understand that the expectations for them to be active present a more complex issue than that suggested by the typical positive/negative binarism inherent in activity programs and literature” (Katz, 2000, p. 147). It is often in day-to-day engagements that the quantum of activities are expressed. There is even meaning and therapeutic value in rest or idleness. This problem may also reflect an overarching health focus whereby the components of active ageing are only seen as relevant where they contribute to imposed notions of well-being (Holstein and Minkler, 2007). For this reason, conceptualisations and discussions of ADLs were considered in the qualitative diaries. It is recommended that future active ageing research and policy explicitly recognises the centrality of ADLs and rest in the maintenance of well-being in later life. Despite some inherent weaknesses, the active ageing concept provides a more thorough consideration of the activities of ageing as they relate to health and well-being (particularly when compared to notions of successful or healthy ageing) (Walker, 2002). With adaptation, this concept should continue to inform the discourse on activity trajectories in old age.
10.5 Reflections on the PAR process and outcomes

10.5.1 Strengths of the PAR process

There were several strengths associated with the use of a PAR process in the present study, including enhanced validity, utilisation of the knowledge and experiences of older adults, an overt focus on action and dissemination, and flexibility to respond to the Canterbury earthquakes.

The PAR process arguably enhanced the validity of the study. By involving older adults in the development of the research problem and the selection and design of methods, the study addressed an area of concern for the over 65 years and older group and ensured that the instruments used were acceptable to and appropriate for participants (Babbie, 2004). The PAR process and the iterative cycles of action and reflection also provided an opportunity for member checking of the results (Denzin & Lincoln, 2005). During focus group discussions, respondents critiqued the results from three research phases, suggested new analyses, and provided explanations for the findings from the perspective of older adults. The PAR process also enhanced validity in several other ways: (a) it ensured that all stakeholder views were represented and that the voice of participants was expressed through the research via direct quotations and photographs; (b) it supported authentic participant involvement in the research process and community action; (c) it fostered an ethical relationship between academics and community members, which reduced researcher bias; and (d) it provided opportunities for critical reflection on the research process and relationships (Greenwood & Levin, 2005; Guba & Lincoln, 2005).

Through consultations with the reference group, it was possible to access the combined knowledge and experiences of a group of experts who were situated within the 65 years and older group. The reference group was composed of individuals who had previously worked as health professionals, aged-care sector workers, or community advocates for older people's health and well-being. These individuals provided an insider perspective on the issues affecting the local community, were familiar with research processes, and had an understanding of the capabilities and interests of the older-adult group in Christchurch. The use of a reference group proved instrumental in setting the research agenda, developing an acceptable design and set of methods, and selecting participants and locations for the study. If
this research had not drawn upon the expertise of older adults, the study would have lacked what could be referred to as *generational relativism* (the ability to get inside the embodied and emplaced reality of later life).

The PAR process also created an environment for connecting stakeholders and creating a dialogue between community members and local decision makers (Baum et al., 2006; Blair & Minkler, 2009). This was achieved through the dissemination of research in community news sources and via the presentation of research findings at a symposium in 2012. A handout from the presentation is included at the end of this thesis (appendix 13.25). During regular focus group discussions, reference group members and participants outlined how and where research data should be disseminated and also who should be invited to attend a final research presentation. Participant recommendations for the improvement of the urban environment and post-earthquake redevelopment were also widely disseminated throughout the community with the intention of informing and creating opportunities for action. Researchers have previously reported that PAR studies make a significant contribution to informing social change and generating discussion among more and less powerful stakeholders (Wang et al., 2004).

PAR is also a flexible and iterative research approach, which is adaptable to changing social or environmental conditions and constantly seeks to understand the evolving relationship between an individual and their surroundings (Israel et al., 2005). The inherent adaptability of PAR proved particularly useful in the context of a changed urban environment that resulted from the Canterbury earthquakes. The study imperative to address an issue of community concern provided the framework for refocussing part of the study on the potential impacts of the earthquakes on local environmental conditions and older-adult activity. Discussions with reference group members assisted in the development of a research design and methods to explore the impacts of the earthquakes in the context of an ongoing study of environmental influences on active ageing. It is likely that the utilisation of a PAR approach and personal interactions with research participants also reduced study attrition following the earthquakes.

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68 In 2011 and 2012, findings were disseminated in several lay publications, including the Greypower and Family Times magazines and the Keeping On newspaper, which have local circulation to thousands of older adults in the Canterbury region of New Zealand.
10.5.2 Challenges and limitations confronted and overcome

Several difficulties arose during the research as a consequence of the collaborative design. Main challenges included time, resource, and academic procedural constraints; difficulties associated with ensuring and maintaining the meaningful participation of older adults and an appropriate relationship between the researcher and respondents; and dealing with potential earthquake disruptions over the course of the research.

As this research was undertaken as part of a 36-month programme of doctoral research, there were necessary temporal, resource, academic standard, and supervisory requirements that had to be adhered to. In this regard, the maximum duration, budget, level of participant control, and degree of external project oversight were necessarily fixed before the study commenced. Related to temporal and resource limits, research participants were not offered training or skill development to help them contribute more effectively in the context of the study, which has previously been identified as a potential barrier to participation (Ray, 2007). While the institutional requirements could not be altered, several measures were undertaken to address the potential limitations: (a) collaboration with a reference group of knowledgeable older adults provided oversight and critique of the research process; (b) project limitations were discussed with research participants at the outset of the project prior to study commencement; and (c) detailed information sheets and instructions were provided to participants for all activities (such as photovoice procedures) in lieu of more extensive and face-to-face training or skill development (appendix 13.18).

One of the tensions that existed within the context of the interactions with the reference group and research participants was ensuring that consultations with older adults were meaningful and equitable. In the context of the present PAR study, the role of the researcher was conceived as that of a facilitator who assisted community members to identify and explore a mutually agreed research problem. Internationally, PAR practitioners have typically described their roles within community projects as facilitators or co-researchers to emphasise the shared and co-created outcomes of research procedures (Baker & Wang, 2006; Minkler, 2000; Wang et al., 2004). A common threat to PAR processes is that group interactions and exercises may become a mechanism for approving the researcher's predetermined designs and conclusions (Gaventa & Cornwall, 2006). This was an ongoing concern during the study, and it is difficult to know whether older people contributed to
discussions in their full capacity or felt intimidated by the researcher. Issues of control and trust are at the heart of PAR and have been identified as major obstacles to a more widespread use of this approach (Baum et al., 2006; Becker, Israel, & Allen, 2005). As previously reported, data analyses and much of the preliminary interpretation of the results were undertaken by the researcher, which is a limitation of this and other PAR studies (Ray, 2007). Analytic techniques were discussed with older adults, but reference group members did not wish to take part in quantitative or qualitative analyses due to a lack of expertise or interest. A reference group member outlined their sentiments as follows:

A lot of it comes down to where your expertise is. From my point of view, I know a bit about statistics, but I'm far from an expert and would happily leave it for someone else to do. Unless you know a lot about the analysis, you really won't be a great help to anybody. Somebody in this room may have that expertise and want to help, but from my perspective it would be wasting my time and yours. We can always ask questions of your analysis (Reference group member, 2011).

In order to guard against researcher bias, reference group members and focus group respondents were routinely asked to comment on whether they felt that their data was being correctly interpreted and their feedback accurately reported in the research direction and results. Throughout the PAR process, respondents indicated that they were satisfied with how their views were being expressed in the development of the research, interpretation of results, and dissemination of key findings. Respondents commented in support of the research process: “It feels like we are having a dialogue, rather than listening to a monologue, which is good to be part of” (Reference group member, 2010); and, 

[Research participation] has opened up my eyes to what's going on around us. You just take things for granted. Getting around with your walks and seeing and looking you realise what's going on around us, what's there and not there, and what's lacking in the environment – the highs and the lows – and just to be part of the group is great (Reference group member, 2012).

The role of the researcher in the PAR study was also key in terms of maintaining meaningful participation and ensuring equitable exchanges between participants. The researcher was located outside the group under investigation (being aged considerably less than 65 years). The position of the researcher as an outsider had the potential to create barriers to the development of a trusting and meaningful relationship with respondents. It is possible that some older adults may have perceived that a younger researcher would lack sufficient
empathy to understand the experiences of ageing individuals. However, like many of the respondents the researcher was well educated and had resided in Christchurch for many years and these features served as the basis for a collaborative research approach. In order to build and sustain an equitable and trusting relationship with respondents it was important to develop rapport during the early stages of the study. This was achieved through introductory presentations that involved the researcher giving a full account of his personal history and research experience and sharing an afternoon tea with participants. In turn, participants were encouraged to give a full introduction of their background and experiences of research at the beginning of focus group interactions. The shared experience of the 2010 and 2011 earthquakes also helped to further build rapport among all research parties. In addition to general rapport building, the researcher also took an attitude of naivety in all meetings with older adults. In this way, the researcher attempted to reframe his position in the study from external expert to a participant investigator who was seeking new perspectives from knowledgeable insiders.

Respondent participation was also threatened by participant drop out due to illness or as a result of earthquake disruptions. One reference group member withdrew due to illness, an unknown number of potential respondents in the second research phase were affected by the September 2010 earthquake (a response rate of only 45% was achieved for a survey in the weeks following this disaster and after telephone follow-up), and 32 (33%) potential respondents in the third research phase withdrew following the February 2011 earthquake. It was felt, however, that the inclusive and interactive nature of the PAR process may have actually limited participant withdrawal. Indeed, after the February 2011 earthquake, over two-thirds of those who had agreed to participate in the phase-three data collection procedures continued or postponed their involvement. PAR procedures are renowned for their flexibility. They afford both researchers and participants the opportunity to change a project's direction in face of unexpected circumstances (Ong, 1993).

The Canterbury earthquakes of 2010 and 2011 provided impetus for refocussing part of the study on the potential effects of the disasters. They also changed the relationship between the researcher and participants somewhat and created temporary discord within the reference group. Following the earthquakes, the researcher was forced to take full control of some elements of the study. Specifically, the researcher initiated follow-up telephone contact with participants to confirm their continued availability and launched human ethics
applications for the administration of earthquake-related questions in October 2010 and
March 2011. These changes to research procedures were discussed with and affirmed by
reference group members after administration. It was not possible to consult widely with the
reference group in the days immediately following the September 2010 and February 2011
earthquakes due to disruptions to telecommunications and transport networks, temporary or
permanent evacuations, curfews, cordons, and the closure of meeting facilities. Future studies
could negotiate contingency plans or pre-approve a set of researcher actions the beginning of
a project to address sudden and unforeseen problems that may arise during the research
process. The reference group was also split in terms of what data should be collected and how
it should be incorporated into the study following the earthquakes. Some members of the
reference group argued that the study needed to change focus completely and collect
information on the impacts of the earthquakes on physical and mental health. After discussion,
however, it was decided that such information would deviate significantly from the main
research problem (as well as repeat research already published internationally) and that it
would be more appropriate to focus on the reported impacts of the disasters on activity
participation and local environmental conditions. In order to capture potentially relevant data
concerning physical and mental health impacts, a question was added to the earthquake
survey that asked respondents to comment generally about their experiences of the disaster. It
was agreed in the context of the group that any data concerning the impacts of the earthquakes
on physical and mental health would be published outside the bounds of the thesis and
disseminated to community stakeholders during presentations. The reference group was also
fractured when it came to determining how the earthquake data should be included in the
context of a thesis on active ageing. Some argued that all reported activities and influences on
activity needed to be considered in the context of the earthquakes and should not be
artificially separated for the purposes of research. Others contended, however, that it was
necessary to stick to the original research process and objectives, while acknowledging the
effects of the earthquakes as supplementary to the main findings. After considerable
discussion during a focus group meeting October 2010, the pragmatic decision was taken to
consider the earthquake effects as a separate set of influences on active ageing. In this way, it
was possible to respond to the main research objectives, while also considering the emerging
influences on activity participation associated with the 2010 and 2011 earthquakes. Factors
that contributed to the decision are as follows: a) the study had already commenced (phase
one complete and phase two materials pilot tested and printed) at the time of the first
earthquake, b) many older adults were not badly affected by the disaster (although there were
variations by area of residence and personal vulnerability), and c) the research could potentially make a wider contribution to the lay and academic community through the consideration of environmental and earthquake effects. All reported findings are subject to the caveat that they occurred against a backdrop of potential constraints created by the 2010 and 2011 earthquakes.

10.5.3 Outcomes of the PAR process

The ultimate outcomes of the PAR process were determined in consultation with reference group members and research participants. The primary outcome requested by participants was a community symposium to disseminate the findings of the research directly to key stakeholders (figure 45). This symposium was undertaken in May 2012. The symposium was structured as a two-hour Power Point presentation. It outlined the main and earthquake-related findings and made recommendations for environmental and policy changes to support active ageing in urban areas and promote an age-friendly rebuild following the 2010 and 2011 Canterbury earthquakes. The symposium also included the presentation of raw photovoice data and participants' qualitative comments to ensure that the voice of respondents was directly expressed to decision makers. A diverse group of 60 community stakeholders were represented at the presentation, including policy makers, local and national politicians, health workers, social service providers, church representatives, local media, academics, students, research participants, and reference group members. The final stage of the PAR process was the symposium, which was conceived as an opportunity for information sharing and consciousness raising. Due to time constraints associated with PhD assessment, it was not possible to undertake further checks to determine how the information was received and whether the politicians and policy makers had incorporated the information in their plans for the redevelopment of Christchurch, although the presentation was given at a time when city officials were actively seeking engagement with community members.
10.6 Potential limitations of the research design

This section considers the potential limitations of the research design, which were manifest across three study phases. Limitations of research methods specific to each phase were discussed in individual results chapters and challenges associated with the use of PAR were addressed earlier. The main limitations associated with the design of the present research that have not previously been addressed included the use of non-probability sampling of areas and participants, the cross-sectional design, and the challenges of employing and integrating a mixed methods and multi-phase approach.

Non-probability sampling was used in the selection of areas and participants. In particular, purposive sampling was used to identify diverse urban areas with higher and lower numbers of older people, and convenience sampling was subsequently used to select available older adults within those areas. A purposive selection of areas was necessary to represent the diversity of local environmental conditions that would help to address the research objectives, identify areas where communities of older adults were located, and provide a mechanism for the recruitment of participants from distinct area types into subsequent qualitative research phases. The use of non-probability sampling, however, potentially reduced the validity, reliability, and generalisability of statistical results, particularly those arising from inferential analyses (Babbie, 2004; Trochim & Donnelly, 2007). The use of non-probability sampling potentially created bias and contributed to the observation that respondents were relatively healthy, active, and better educated. Consequently, there may be a population of older adults that are isolated, unwell, or poorly educated who chose not to participate in the research. This
implies that respondents may not have been representative of all independently living older adults in Christchurch. Limitations associated with use of non-probability sampling were addressed by utilising a relatively large population ($N = 355$) in the second research phase, which provided theoretical stability to sample according to the central limit theorem (Corty, 2007; Tabachnick & Fidell, 2007). Steps were also taken to account for the purposive selection in the statistical procedures, including the use of a nested ANOVA. To address potential difficulties associated with the generalisability of the findings, theoretical concepts were abstracted from within the data to facilitate the creation of the model of navigated environmental performance that has application beyond the immediate sample (Holton, 2008).

As the research was cross-sectional in design, claims for causality are not sustainable (Babbie, 2004; Satariano & McAuley, 2003). Reverse causality is also a possibility (Breeze et al., 2005). It is conceivable that individuals selected into their current locations to support their pre-existing active lifestyles, rather than being influenced to either initiate or reduce participation in response to amenable or deleterious surroundings. The issue of causality is not prohibitive in the context of the present research, however, because the aims of the study were exploratory. Furthermore, as the research was undertaken across three phases, there were opportunities throughout the study to validate and expand findings in subsequent analyses. Questions were also asked of respondents in the third research phase to identify whether self selection into more amenable environments had occurred. The data indicated that self selection had indeed taken place and that it had occurred consistently across the sample group among older adults from more and less affluent areas. The data showed that older adults make careful selections about where they live in later life, but are also influenced by positive and negative elements in their surroundings and personal circumstances.

Finally, it is possible that the use of mixed methods across multiple research phases and the subsequent integration of data may have reduced the validity and reliability of the results. With regard to validity, it could be argued that the mixing of quantitative and qualitative research methods with the aim of combining findings in a theoretical model is fundamentally unsound if methods originate from different paradigms (Guba, 1990). In relation to reliability, it could be argued that it would be difficult for other researchers to reproduce the results of this study due to the diversity of methods used across multiple
phases\textsuperscript{69} (Babbie, 2004). If results could not be reproduced, it would be challenging to validate the findings and generate widespread support for the model of navigated environmental performance. Arguments for the integration of data from qualitative and quantitative research, however, suggest that the use of mixed methods is necessary to yield new insights into complex research problems, such as the interactions among ageing, environment, and activity (Johnson & Onwuegbuzie, 2004; Morgan, 2007). Moreover, mixed methods and multi-phase research arguably increases validity by affording opportunities to verify and extend results across multiple methods and phases (Creswell & Clark, 2011).

10.7 Recommendations and implications

In this section, recommendations are offered that have been derived from the research process, including participant suggestions for the improvement of the post-earthquake urban environment, an interpretation of the theory of navigated environmental performance, and suggestions for future research in response to questions or limitations arising in the course of this study. Implications of the findings for gerontology, disaster recovery, and approaches to environmental change or intervention are considered in tandem with the recommendations and are woven throughout the section.

10.7.1 Recommendations for post-earthquake urban development

During focus group discussions with research participants and reference group members in 2011 and 2012, recommendations were made upon consideration of the results. In small groups, research collaborators were asked to work together in small groups to formulate written responses to the following questions after a presentation of the project findings:

\begin{itemize}
  \item What changes could be made to local environmental conditions in urban Christchurch to promote active ageing?
  
  \item How should we rebuild Christchurch to make it the most age-friendly city in New Zealand following the 2010 and 2011 earthquakes?
\end{itemize}

\textsuperscript{69} Results of the present study may also be difficult to reproduce in light of the disruptions associated with the 2010 and 2011 Canterbury earthquakes.
Discussion and synthesis of results from three research phases

Participant recommendations were then collated by the researcher and discussed at a following group discussion. Some recommendations were combined and others expanded in the subsequent discussion. The resultant recommendations are reproduced exactly as they were created and agreed with focus group respondents. The development of stakeholder recommendations was undertaken to facilitate the translation of participatory research findings into information for action, which is a common goal of PAR processes (Reason & Bradbury, 2006). Participant recommendations addressed the existing physical and social environment, local and national policy, and post-earthquake environmental conditions.

Many of the participant recommendations are consistent with general guidelines in the World Health Organisation's (WHO) Age Friendly Cities policy document (World Health Organisation, 2007). This alignment is unsurprising as WHO guidelines were developed through a participatory research process with over 1,500 older adults in 33 urban centres, although no New Zealand cities contributed. Participant recommendations reflect the specific needs and preferences of independently living older adults who reside in Christchurch.

Rationale for the inclusion of recommendations for the improvement of environmental conditions in this thesis also comes from a lack of support for active ageing in urban areas and a shortage of effective local and national policy. There is currently limited government policy in New Zealand, which could guide the implementation of measures to improve the physical and social environment. A decade ago, the Ministry of Social Policy (2001) released the Positive Ageing Strategy, which is an aspirational document that aims to facilitate opportunities for participation, inclusion, and respect for an increasingly diverse population of older adults. The strategy contains goals and actions addressing health, retirement income, housing, security, transport, cultural diversity, accessibility, community attitudes, and growth and participation (Ministry of Social Policy, 2001). A major threat to the strategy, however, is that it is not backed by financial resources or legislative power to implement the actions it recommends. Rather, the Positive Ageing Strategy is implemented through relationships with other government departments and local bodies.

Recommendations could potentially also be developed from this research to address actions that could be undertaken by older adults themselves to facilitate increased opportunities for activity participation. Such recommendations could include maintaining or returning to hobbies and interests of early life to develop continuity with sustainable and preferred pursuits in later life, or moving to a retirement village if living alone to facilitate social interaction and diverse activity opportunities. These recommendations have not been included as the primary focus of this thesis is on environmental influences.

Local and regional councils, district health boards, and quasi-autonomous government agencies.

70 Recommendations could potentially also be developed from this research to address actions that could be undertaken by older adults themselves to facilitate increased opportunities for activity participation. Such recommendations could include maintaining or returning to hobbies and interests of early life to develop continuity with sustainable and preferred pursuits in later life, or moving to a retirement village if living alone to facilitate social interaction and diverse activity opportunities. These recommendations have not been included as the primary focus of this thesis is on environmental influences.

71 Local and regional councils, district health boards, and quasi-autonomous government agencies.
adults are addressed in a haphazard and voluntary manner and at a low level of implementation in some cases (Ministry of Social Policy, 2008). Government agencies and organisations also vary in the degree to which they choose to implement actions associated with the Positive Ageing Strategy, which leaves many older adults subject to vagaries of local political processes. As an example, and in response to the national policy objective “older people feel secure and can age in their community”, the Ministry of Social Policy reported that a civil defence briefing to 70 older people undertaken by a North Island Council was evidence of key achievements towards this goal (Ministry of Social Policy, 2008). Such actions are highly localised and potentially independent of the Positive Ageing Strategy, which suggests that a fortuitous alignment of policy objectives across government organisations and departments should not be mistaken for evidence of effective implementation of a national strategy.

In response to the Positive Ageing Strategy, the Christchurch City Council developed the Ageing Together Policy, which is also an aspirational statement addressing an intention to prepare for a more aged city (Christchurch City Council, 2007a). Policy goals are general in their formulation and address access to information, access to places and services, and opportunities for participation (Christchurch City Council, 2007a). Like the Positive Ageing Strategy, the Ageing Together Policy is enacted through other council programmes, including social housing, urban design guides, and earthquake rebuilding plans (Christchurch City Council, 2007b, 2011b, 2011c). The implementation of this policy through third-party departments and policies is also a threat at a local level. As an example, the draft Central City Rebuild Plan (the guiding document for post-earthquake recovery of the central city), acknowledges the need to plan for and include older adults, but provides no actions for achieving this and references the WHO Age Friendly Cities framework as check-list to potentially inform planning decisions (Christchurch City Council, 2011b). In actuality, age-friendly cities is an international programme that municipalities register for, which provides a time-limited and objectively assessed pathway for cities to adapt their structures and systems in order to become supportive of active ageing (World Health Organisation, 2007). There are examples of local initiatives that support active ageing, such as discounts at public facilities for the over 65s and the distribution of recreation guides for older adults, but there is no coordinated and city wide policy that attends to the diverse physical and social environments within which older adults live. Paying lip service to international frameworks and developing goals without associated actions, time frames, or financial resources is not effective policy
making and indicates an unstated intention to maintain the current state of affairs, which is arguably a local environment that is inherently unsupportive of active ageing. The following recommendations (table 25) may be useful in helping local and central government agencies to target or prioritise their planning for older residents in urban areas.
<table>
<thead>
<tr>
<th>General recommendation</th>
<th>Participant recommendations</th>
<th>Consistent with WHO Age Friendly City guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Supportive pedestrian conditions</td>
<td>Walking routes are safe and contiguous throughout the city, following riparian areas, transport corridors, and public green spaces. Walking infrastructure is accessible for wheelchair and mobility scooter users and frail older adults through the provision of wide footpaths, graduated curb cut-downs and crossing points, low curb heights, and an absence of trip hazards. Sheltered bench seating is available within the walking environment and in public parks to facilitate active transport and multi-part journeys.</td>
<td>NO</td>
</tr>
<tr>
<td>2) Sustainable community hubs</td>
<td>Age-appropriate services and facilities (including medical centres, dental clinics, recreational centres, shopping facilities, and libraries) are available in areas with larger populations of older adults, within walking distance of residential areas, and accessible to users of varying abilities. Affordable and age-appropriate housing is available to older adults in areas that are identified as more supportive of active ageing. Retirement villages, older-adult housing, and aged-care facilities are embedded within supportive community hubs that provide access to the services and facilities required by those aged 65 or older.</td>
<td>YES</td>
</tr>
<tr>
<td>3) Accessible public transportation</td>
<td>Bus routes and stops provide access to destinations that are regularly utilised by older adults (including hospitals, medical centres, libraries, parks, banks, and shopping centres). Bus stops are located close to where older people live. Public transportation subsidies are available for all older adults who have impaired mobility or are no longer capable or confident to drive. Public transportation is safe and comfortable for older users. Bus stops provide seating, shelter, clear information, lighting, and are well maintained. Smaller and low-floor buses are available for disabled and frail users. Public transportation is reliable and frequent.</td>
<td>YES</td>
</tr>
<tr>
<td>4) Parks and public green spaces as activity destinations</td>
<td>Outdoor exercise equipment and stations suitable for older adults are provided in public parks and green spaces. Paved walking surfaces are provided within and around the periphery of urban parks to facilitate recreational walking. Visually attractive gardens and landscaping are provided in urban parks and other public green spaces.</td>
<td>NO</td>
</tr>
<tr>
<td>5) Navigable and unique urban areas</td>
<td>Public signage and building numbers are clear and readable, with large fonts and placement at eye level. Public artworks and place-sensitive urban design are evident in local communities, creating a unique identity and sense of place.</td>
<td>NO</td>
</tr>
<tr>
<td>6) Accessible public amenities</td>
<td>Accessible and disability friendly toilets are well-signposted and located near shopping areas and parks in local communities. Street trees provide shelter and shade in public areas.</td>
<td>YES</td>
</tr>
<tr>
<td>General recommendation</td>
<td>Participant recommendations</td>
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<tr>
<td>7) The physical environment facilitates social interaction</td>
<td>Seating and walking paths are located in proximity to young person's play areas in public spaces to encourage intergenerational interactions. Multi-use community centres are available, which are purpose built to meet the needs of vulnerable users, including frail older adults and the disabled (comfortable seating, warmth, and accessible toilets). Community centres provide facilities for all local users to encourage economic viability and intergenerational interactions. Public facilities and spaces incorporate multiple venues that cater for older adults' interests, while providing opportunities for social interaction (the co-location of cafés within public libraries, for example, that are present in a small number of council facilities in Christchurch). Public transportation routes provide access to social destinations frequented by older adults (social clubs, educational organisations, and civic groups).</td>
<td>YES</td>
</tr>
<tr>
<td>8) Positive community attitudes towards older adults</td>
<td>Young people have formal and informal opportunities to learn about and interact positively with older adults in their communities (community events and festivals for all ages and educational opportunities). Private services and staff are supportive of older adults' needs (ramp or wheelchair access, accessible toilets, taking a pleasant and patient disposition with older customers, and large font menus and information).</td>
<td>YES</td>
</tr>
<tr>
<td>9) Cooperation between diverse sectors of the community</td>
<td>Community resources, including school buildings and community centres, are shared across intergenerational user groups to facilitate lifelong learning and skill development. Opportunities are available for older adults to share their skills, knowledge, time, and energy with community members and younger people.</td>
<td>YES</td>
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<tr>
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<td>Participant recommendations</td>
<td>Consistent with WHO Age Friendly Cities guidelines.</td>
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<tr>
<td>10) Age- and disability friendly buildings and infrastructure</td>
<td>Legislation covering public buildings, private dwellings, and community infrastructure includes design standards for low-functioning users (wheelchair access and ramps, single-storey developments, low shelving, automatic doors, large and clear fonts on street and building signs, footpaths and crossing points designed for wheelchairs and mobility scooters).</td>
<td>YES</td>
</tr>
<tr>
<td>11) Funding support for community based aged-care services</td>
<td>Financial support is available for neighbourhood watch and community patrols to increase older adults' perceptions of safety in their local environment.</td>
<td>NO</td>
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<tr>
<td></td>
<td>Not-for-profit social organisations that provide services and support to older adults receive government funding in recognition of the role that they play in facilitating activity and health (social clubs, educational organisations, and civic groups).</td>
<td>NO</td>
</tr>
<tr>
<td>12) Access to community information</td>
<td>Information about local resources and groups catering for the activity needs of older adults is readily available in locations frequented by older adults.</td>
<td>YES</td>
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<td></td>
<td>Computer and internet facilities and training classes are accessible to older adults.</td>
<td>YES</td>
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<tr>
<td>13) Government subsidies</td>
<td>Significant subsidies are available for public transportation and user-pays services and facilities utilised by older adults to create incentives for participation.</td>
<td>YES</td>
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<tr>
<td>14) Participation in policy development</td>
<td>Government policy documents explicitly recognise and address the needs of older adults.</td>
<td>YES</td>
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<td></td>
<td>Older adults participate in local and national government consultation processes during policy development.</td>
<td>YES</td>
</tr>
<tr>
<td>General recommendations</td>
<td>Participant recommendations</td>
<td>Consistent with WHO Age Friendly Cities guidelines.</td>
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<tr>
<td>15) Transportation and mobility needs of older adults in earthquake-affected suburbs</td>
<td>Public transportation is accessible for older adults in earthquake-affected suburbs. Subsidies are available, mini-bus services are provided, and routes prioritise destinations utilised by older adults (medical centres, shopping areas, venues for social activities).</td>
<td>NO</td>
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<tr>
<td></td>
<td>Remaining hazards in the road and footpath are repaired (uneven surfaces, cracks, pot holes, debris, and remaining liquefaction).</td>
<td>NO</td>
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<td></td>
<td>Information concerning road closures and re-openings is widely available to older adults in their communities.</td>
<td>NO</td>
</tr>
<tr>
<td>16) Age- and disability friendly cities emerge from the rubble</td>
<td>Landscaped and walkable green spaces are developed in riparian and coastal margins as development retreats from earthquake-prone areas.</td>
<td>NO</td>
</tr>
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<td></td>
<td>Rebuilt buildings and infrastructure incorporate age- and disability friendly design principles (ramps and wheelchair access, automatic doors, accessible toilets, appropriate furniture, wide doors oriented to the street, and wide footpaths).</td>
<td>YES</td>
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<td></td>
<td>Rebuilt communities are aesthetically pleasing and inculcate a strong identity and sense of place (rubbish bins, street trees, underground wiring, public artworks, and urban design).</td>
<td>YES</td>
</tr>
<tr>
<td>17) Older-adult support agencies are resilient and helpful in a crisis</td>
<td>Home-help services (such as Nurse Maude and Meals on Wheels) are equipped and trained to provide support and counselling to independently living older adults in the aftermath of a disaster as well as maintaining their regular functions.</td>
<td>NO</td>
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<td></td>
<td>Churches and non-for-profit community groups receive government assistance to locate or rebuild new facilities in recognition of the important role they play in supporting older adults' activities and well-being.</td>
<td>NO</td>
</tr>
<tr>
<td>18) Access to venues and events for social and cultural activities</td>
<td>The repair and rebuilding of infrastructure for cultural and social events is prioritised in recognition of the important role these venues play in the everyday activities of older adults.</td>
<td>NO</td>
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<td></td>
<td>Information about available and restored activity opportunities and venues is widely disseminated to older adults in their communities.</td>
<td>NO</td>
</tr>
<tr>
<td>19) Remediation of earthquake-affected areas</td>
<td>Remediation of infrastructure (particularly water services) and support for daily activities is prioritised in badly affected eastern suburbs.</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Financial support is available for older adults who must relocate in recognition of their reduced capacity to earn income and to ensure that they are in healthy and safe accommodation. Information is available to help older adults make decisions about a new residential location.</td>
<td>NO</td>
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<td></td>
<td>Vacant properties are maintained (lawns cut, checked regularly by police, graffiti and rubbish removed) to make neighbouring residents feel more comfortable in their environment, reduce the fire risk, and discourage squatters or vandals.</td>
<td>NO</td>
</tr>
<tr>
<td>20) Communities are safe and resilient</td>
<td>Buildings and infrastructure are rebuilt in areas that are at lower risk of damage in future disasters.</td>
<td>YES</td>
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<td></td>
<td>Building standards are raised to increase real and perceived safety. Low rise developments are the prevailing form across the city.</td>
<td>YES</td>
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<td></td>
<td>Older adults have information about disaster preparedness and are involved in drills to ensure they know what to do in a future emergency.</td>
<td>YES</td>
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</table>
10.7.2 Recommendations from the theory of navigated environmental performance

In addition to the aforementioned recommendations that were developed in collaboration with older adults, it is also pertinent to consider how emergent concepts from the theory of navigated environmental performance potentially inform urban change and affect activity outcomes for older adults.

10.7.2.1 Malleability

Older adults who live independently in communities of their choice often inhabit environments that are highly adaptable and which provide diverse opportunities for involvement in preferred activities. In the third research phase, it was evident that older adults used their indoor and outdoor spaces in diverse ways. For example, some preferred to maintain a small, ornamental garden to improve the aesthetic quality of their environment, while others tended larger garden plots and fruiting trees with the aim of producing food for themselves and their families. Planners and designers of older-adult housing or retirement villages should ensure that private indoor and outdoor spaces are modifiable and that older adults are able to alter their surroundings in significant ways that are commensurate with their activity preferences and physical capacity. For example, the provision of tillable garden space without restrictions on usage or plantings in older-adult housing developments and retirement villages may support continued or increased activity and independence. Such spaces need not take up a large area, although they must accommodate a diversity of use.

10.7.2.2 Accessibility

When activity related resources are located in proximity to older adults, can be readily utilised by individuals of varying abilities and circumstances, and are well-known and understood by local people, higher levels of participation are likely to ensue. In order to promote and support active ageing in local environments, activity related resources should be located within walking distance from the homes of older adults and barriers to access should be identified and attended to. For example, location of a community recreation centre within five to ten minutes walking distance of an older adult's place of residence, which provides subsidised entry and services and facilities suitable for the frail or disabled is likely to encourage participation at all ages. Improvements to accessibility may require a long-term
strategy as the cost of providing new facilities in relatively deprived urban areas could be high. In the short term, however, changes could be made to existing facilities to support greater participation of those aged 65 years or older, and community transportation services may play a role in improving access for older adults who live far from appropriate facilities or services.

10.7.2.3 Amenity

When local resources are visually attractive and supportive of activities that are preferred by older adults, participation is likely to be facilitated. For example, a local park provides a high level of amenity for older adults when it is appropriately landscaped and maximises a sense of comfort and safety. Such a setting may incorporate a smooth, contiguous, and all-weather walking surface; sheltered seating; accessible toilets; and visually appealing plantings. Consistent with this recommendation, researchers have previously argued that by changing urban planning practices to improve the utility and aesthetic appeal of the local environment, particularly improvements to pedestrian infrastructure, it may be possible to engineer a setting that supports active ageing and health across the life course (Nagel et al., 2008; Takano et al., 2002). Improving urban amenity is potentially a lower-cost approach to supporting active ageing as such strategies could involve retrofitting existing facilities and infrastructure to improve their quality, attractiveness, and appropriateness for older users.

10.7.2.4 Particularity

In some urban environments, there are unique physical or social resources that provide valued activity opportunities for older adults. Such resources may be of a similar type to those in other areas, such as parks or social groups, but differ in a meaningful way that makes a significant difference for older-adult activity. For example, residents of Holmwood (an area of significantly higher activity participation) have access to a public reserve, which contains the last remnants of native forest in the city, historically significant architecture and rose gardens, and links to the pioneer families of Christchurch. An in-depth examination of context-specific resources that are valued and utilised by older adults in areas with high rates of participation could lead to the formulation of a design template for community services and facilities that may be applied across urban areas. While it might not be possible to transplant a sense of history or a particular geography from one place to another, there may be design or
landscaping techniques that could be used to increase the particularity of urban areas and influence activity participation. It is notable that older adults recommended using urban design and public art, among other approaches, to inculcate a unique sense of place in urban environments as part of age-friendly rebuilding following the Canterbury earthquakes.

10.7.2.5 Supportive networks

Interactions with a social network can facilitate or constrain activity participation depending on the relative levels of support, obligation, isolation, or fear of victimisation. While it is generally difficult for external agents to influence the quality of social relations, several strategies could be used to facilitate improved network interactions within an urban setting. Measures could be undertaken within the local environment to ensure that older adults feel safe in their surroundings (such as the prompt removal of graffiti and routine community patrols), have opportunities to participate in community life (street parties; community events; and access to social, cultural, and civic groups), and have access to resources that encourage cooperation, social cohesion, and natural interactions among community members of all ages (multi-use parks, community shopping areas, and age-friendly buildings and streets). A focus on community based crime prevention strategies involving older adults may also improve social relations, reduce feelings of isolation and victimisation, and make individuals feel more confident about venturing into their local environment (Walker & Hiller, 2007). It is likely that range of strategies will be required to address and improve proximal and community relationships such that older adults in diverse surroundings feel supported in their activity participation.

10.7.2.6 Agency

The research data showed that independently living older adults were autonomous agents who carefully selected where they wished to reside based on personal and environmental considerations and overcame existing and emerging barriers within the urban environment to participate in activities. To support participation, older adults should be provided with a range of options and information to facilitate individual decision making and activity choices in their local environment. In the words of Holstein and Minkler (2007), “agency unnoticed is agency denied” (p. 18). Even if it is not feasible to provide new community services or facilities, there may utility in providing information to older adults
who can then determine their own course of action in unsupportive settings. This may be a particularly relevant approach in Christchurch where post-earthquake rebuilding will take years and many older adults were forced to abandon or adapt their activities and routines. Considering the agency of older adults and intentions to remain active in spite of barriers, it would also be appropriate to involve them in decision making processes concerning the provision of activity resources and mechanisms for addressing antecedent and emerging constraints (Barnett et al., 2007; Bowling et al., 2006). The PAR process used in the present research revealed that independently living older adults are experienced and astute observers of their surroundings who can offer an insider perspective on the barriers to active ageing in urban environments.

10.7.2.7 Ubiquitous constraints

Urban environments are characterised by diverse constraints to active ageing, which older adults are forced to overcome in order to be active. It is important, therefore, to undertake systematic and citywide environmental audits to identify and classify antecedent barriers to activity with a view to undertaking remediation work over time. Such audits would be best achieved employing older adults as participant observers as they are well placed to identify urban challenges that younger observers may not appreciate. During the audit process, it would also be appropriate to differentiate between those constraints that can be overcome by a majority of older adults (such as unattractive local surroundings), those that can be overcome with minor modification and at low cost (crossing times at signalised intersections for example), and those that require significant environmental and policy changes (such as provision of new community facilities or increased community policing). Such categorisation would allow decision makers to develop an achievable and targeted urban renewal programme that fits within existing budgetary constraints and recognises the agency and adaptability of older adults.

10.7.2.8 Activity preferences

The data suggest that older-adult activity revolves around a socio-spatial core of home, local environment, and social network. Within these contexts, physical, social, and cultural activities are most frequently undertaken. In seeking to support active ageing and promote the health and well-being of older adults, government agencies and service providers should focus
on the local provision resources. Centralisation of community facilities is an increasingly common phenomenon in New Zealand cities. Local authorities may view this approach as a measure for providing large, multi-use facilities, while reducing costs associated with the maintenance or redevelopment of smaller, community resources. However, such facilities often have a higher user charges and may be less accessible for vulnerable individuals who live far from the resource. Localised facilities and services should also provide opportunities for participation in physical, social, and cultural endeavours, which appear to constitute the largest portion of active ageing behaviour in urban Christchurch. Examples of provision consistent with the activity preferences of older adults include appropriate walking infrastructure nested within local parks and reserves, community markets that foster local interaction, and the co-location of library and café facilities. It would also be appropriate for service providers to consider potential environmental barriers to engagement in less frequently performed activities (including civic, spiritual, and economic endeavours) that may provide meaning and satisfaction for older adults. Focus group participants were clear in their feedback that frequency of participation does not always equate to preference.

10.7.2.9 Domain specificity

Approaches to facilitating activity should recognise that there are likely to be variable influences on the diverse types of participation in later life. Active ageing is not a singular and coherent outcome, but rather the interplay of multiple and meaningful behaviours that create positive expressions of later life. Researchers have previously recognised that activity promotion strategies must respond to the varying influences on different modes of activity and be personalised as much as possible to individual preferences and the needs of social groups (Cohen-Mansfield, Marx, Biddison, & Guralnik, 2004; Lim & Taylor, 2005). There is unlikely to be a one-size-fits-all solution to activity promotion among older adults. For example, influences on physical activity are potentially different from those on social and cultural activity. Survey data from the second research phase suggested that the personal factors of health and age are likely to be important influences on physical activity participation, while perceptions of local environmental conditions and area of residence potentially affect engagement in social and cultural endeavours. Older adults who choose to be active in particular domains may be unaffected by the environmental conditions that affect other types of activity. Where possible, those who provide resources relevant to activity should design facilities and services that offer opportunities for involvement in a range of activities. It is
important to understand not only the preferred activities of older adults, but also the diverse ways that older adults use their local resources and the variable influences on each mode of participation.

10.7.2.10 Disaster effects

The present research indicates that there is a dichotomy of vulnerability and resilience within the older-adult population following an urban disaster and corresponding variations in adaptation to or withdrawal from activities. Vulnerabilities to activity disruption that were identified during the research include being female, belonging to an ethnic minority, and experiencing high levels of neighbourhood disruption. In order to attend to those in greatest need, an up-to-date register of vulnerable or isolated older adults who live independently could be developed and maintained, which would allow authorities to make contact with those likely to require assistance in the aftermath of a disaster. Such an assessment could involve general practitioners or social service providers who have frequent contact with older adults completing a baseline assessment of physical and psychological condition, social circumstances, and available resources to cope with foreseeable crises. Such information could be updated annually during regular appointments or check-ups. Following a disaster, information could also be disseminated to vulnerable older adults detailing accessible and undamaged support services and the ways that individuals might adapt their activities and routines to ensure that they do not become isolated or inactive in the ensuing weeks and months.

10.7.3 Recommendations for future research

In addition to participant recommendations for urban development and opportunities stemming from the theory of navigated environmental performance, the findings of this study also raise questions and open new areas for research. The field of environmental gerontology has previously been criticised for lacking native theory and new research directions (Andrews et al., 2007; Kendig, 2003). This thesis addresses these concerns by creating avenues for enquiry and theory development.

72 In New Zealand, the standardised InterRAI clinical tool is beginning to be used for the assessment of older adults who present with complex illness or disability and who are in need of ongoing care from diverse public health providers (InterRAI, 2012). It is possible that related or adapted InterRAI measures may be appropriate for the preliminary assessment of independently living older adults in urban areas prior to or in the aftermath of disaster.
More work could be undertaken to explore the thresholds identified in the theory of navigated environmental performance. It would be useful to understand the level of functional capacity that precipitates disability in less supportive environments. If such a measure could be identified, it may help to inform the scale of urban interventions required to stave off untimely disengagement. It would also be valuable to determine the precise quantity and quality of urban conditions that are associated with greater levels of activity participation. It is possible that there is a particular combination of higher-quality resource provision and supportive social conditions that maximises opportunities for participation. If such conditions could be accurately delineated, the next step would be to design targeted and efficient environmental interventions based on current understanding to promote activity participation among older populations. The data also indicated that a disaster threshold may influence older-adult activity participation. It would be useful to determine the precise level of disruption required to overcome older adults' latent capacity. Such information would be beneficial for informing the development of resilient communities or identifying the scale of disaster response required to address the needs of older people.

One of the difficulties with social research undertaken with volunteer participants, particularly in the aftermath of a natural disaster, is that it can be difficult to enlist isolated, unwell, or poorly educated older adults (Victor et al., 2007). This was identified as a limitation during discussions with research participants who noted that there appeared to be an over-representation of healthy, active, and well-educated older adults in the study sample. Research should be undertaken to quantify the number of vulnerable and isolated older adults in Christchurch, identify their location, and seek ways to engage with them to explore their experiences of the 2010 and 2011 earthquakes. Such knowledge will be vital for social and health-related services who seek to meet the needs of independently living older adults, particularly in the aftermath of a natural disaster when many may be fearful of leaving their homes or not wish to be a burden on emergency services.

Reference group members suggested that future research be undertaken to explore the effects of a deliberate environmental intervention or change on the activity participation of older adults. While the earthquake represented a deleterious environmental change that affected activity participation for some older adults, it was unanticipated and the research was not originally designed to address this situation. Future research could explore the activity participation of a group of older adults before and after a residential transition (either within
the community or to independent accommodation within a retirement village). Such research could be used to test concepts presented in this thesis and may incorporate environmental observations and assessments of activity experiences before and after the transition. A practical way to explore the effects of environmental change in the context of a recovering urban environment would be to return to the 12 areas assessed as part of the first research phase (prior to the September 2010 earthquake) and repeat a series of collaborative and systematic observations. This information would reveal how the environments have changed and whether the recovery and rebuilding processes are making them more supportive of active ageing in the eyes of older residents. As part of future audits of local areas, it would also be useful to assess the quality, utility, and accessibility of these locations and their resources. Such research could help to create a baseline assessment for a range of urban areas in Christchurch, which could be used to prioritise urban renewal and redevelopment projects.

Finally, it would be advantageous to explore how the expressions of vulnerability and resilience displayed by older residents of Christchurch compare to the experiences of other age cohorts. This could potentially be conceived as a test of the burden hypothesis (Thompson et al., 1993), which suggests that older adults tend to be more resilient than younger age cohorts. This hypothesis could not be explored in the present research due to the focus on the 65 years and older group. It is recommended that future research undertaken in Christchurch explores the health and activity related impacts upon different age groups, including young and middle-aged adults. Evidence reported in the local media suggests that younger adults, particularly those with small children, were among those most negatively affected by the earthquakes and most likely to leave the city (Stylianou, 2012). If older adults are shown to be either more or less resilient that other age cohorts, this would have implications for the provision of resources and services in the aftermath of a disaster.
This thesis explored how the environmental conditions of urban areas potentially influence active ageing among independently living older adults in Christchurch, New Zealand. The research utilised an original participatory and mixed methods design with 355 adults and a reference group of knowledgeable advisers who were all aged over 65 years. The study was undertaken over three research phases and in the midst of an unanticipated and destructive sequence of earthquakes that occurred in 2010 and 2011, which affected environmental conditions and activity participation across the city.

The maintenance of health and independence in later life supports continued involvement in family and community affairs and may offset projected and deleterious outcomes of population ageing, including increasing old-age dependence and the associated health and societal costs (Dunstan & Thompson, 2006; Walker, 2002). There is growing evidence that a compression of morbidity (reduced duration of ill-health and disability in later life) may be achievable in more developed societies as a consequence of improved medical care and proactive lifestyle behaviours (Fries, 1980, 2003; World Health Organisation, 1986). A mechanism for achieving population-level reductions in morbidity is via the promotion and uptake of active ageing at all levels of society (Walker, 2002). Active ageing seeks to optimise opportunities for health, participation, and security in order to enhance quality of life for ageing individuals commensurate with capacity and preference (Clarke & Warren, 2007; World Health Organisation, 2002a). In this research, active ageing was operationalised as six behaviours known to be associated with holistic conceptions of health, including physical, social, cultural, civic, spiritual, and economic activity (World Health Organisation, 2002a).

The extent to which population ageing becomes a burden or a dividend will depend to a large extent upon how societies structure their environments and services to accommodate the needs and preferences of older adults. Two of the most significant aspects of environment for older adults include the physical and social surroundings with which there is constant interaction (Morris et al., 2006; Stokols, 1992). Older adults may have a greater reliance on their proximate physical and social environments due to preferences for ageing in place, a constricting social sphere, reduced work responsibilities, and decreased mobility or travel...
behaviour (Smith, 2009). Larger cities and their suburbs are likely to be a locus for population ageing in the coming years due to trends in urbanisation at older ages (World Health Organisation, 2007). Urban areas that support active ageing, so-called age-friendly cities, have adapted their structures and services to be accessible to and inclusive of older people with varying needs and capacities (World Health Organisation, 2007). Such areas are likely to realise the opportunities of population ageing to a greater extent than locations that fail to respond to the forthcoming demographic transition.

Environmental influences on the health and activity participation of older adults are receiving attention in research and policy in recognition of the potential consequences of the expansion of the older-adult group in urban areas (Annear et al., 2009; McNeill et al., 2006; World Health Organisation, 2002a). In response to a growing body of research, a wide literature was reviewed in this thesis to assess evidence for environmental influences on health and activity among older populations (Annear et al., in press), including the potential impacts of earthquakes and other disasters. This research identified and addressed knowledge gaps and limitations in the gerontological and disaster-related literature by exploring potential environmental influences on diverse modes of activity among older adults who reside in a New Zealand city, considering the proximate effects of earthquake disasters, incorporating quantitative and qualitative methods, systematically examining the prevailing conditions of urban areas, collaborating with older adults as research partners, and contributing to theory development. The research was developed over three phases commensurate with an iterative PAR process.

The first research phase was initiated prior to the earthquakes of 2010. The main objective was to identify diverse geographic areas within urban Christchurch inhabited by larger populations of older adults, which potentially influence active ageing. Utilising GIS analyses of existing geographic and demographic data and systematic observations with older adults, 12 diverse urban areas were selected for inclusion in the study. These areas reflected variations in geographic location, land use and residential density, numbers of older adults, and socio-economic conditions. Further GIS analysis identified relatively better access to activity related resources in some higher-deprivation areas. It was also found that across urban areas older adults had generally poor access to community halls, recreational centres, swimming pools, and libraries, but better access to parks, health facilities, churches, and shopping areas. Systematic observation findings indicated that all locations displayed a
continuum of environmental facilitators of and constraints to activity. Study areas also exhibited prominent barriers to participation irrespective of prevailing socio-economic conditions, and no locations were identified as completely supportive of active ageing by older observers. Prior to the 2010 earthquake, observed constraints to participation evident across urban areas included poor access to activity resources, heavy traffic, inappropriate pedestrian infrastructure, unattractive surroundings, an absence of people in public areas, poor integration of land uses, and a lack of public transport infrastructure.

The second research phase was undertaken in the weeks following the September 2010 earthquake. The main objective was to explore the composition, context, and potential correlates of active ageing among independently living older adults. A quantitative survey was used during this phase, which was designed in collaboration with and pilot tested by older adults. Survey findings showed that most research participants were healthy, active, and well educated. Respondent activity revolved around a core of physical, social, and cultural endeavours undertaken most often in the contexts of home, local environment, and social network. Statistically significant personal and environmental influences on activity were identified and included health, age, perceptions of local environment, and residential location (nested in particular area deprivation contexts). Other personal and environmental variables included in the analysis showed no association with the domains of active ageing, which indicates a complex interrelationship between ageing individuals and their environments. The existence of multiple levels of influence on active ageing behaviours provided rationale for in-depth, qualitative investigations in a third research phase.

The third research phase was undertaken in the weeks following the February 2011 earthquake. The main objective was to explore the emplaced experiences of independently living older adults and discern the pathways to activity participation. Activity diaries and photovoice procedures were selected by older-adult advisers as appropriate tools for use throughout the third phase. Participants were initially asked to comment on how they came to live in their current location to explore whether self selection into more favourable areas had occurred. Across all 12 urban areas, older adults indicated that they had deliberately chosen their dwelling location on the basis of personal or environmental criteria: environmental pull, environmental push, health change, intentions to downsize, or preferences for ageing in a familiar place. A daily log of activity participation verified survey findings and showed that older adults were routinely active in physical, social, and cultural domains, particularly in the
contexts of home and local environment. Diary and photovoice data reinforced and extended the survey findings for a mix of personal and environmental influences on activity participation. Environmental influences on activity were identified in the contexts of home, local environment, social network, and climate. Home provided an important venue for exercise, food production and plant propagation, relaxing and transcendent activities, indoor entertainment, and formal or informal work. Home also acted as the site for social isolation, however, when the external environment became threatening or if social contacts diminished. At the interface of home and local environment, older adults engaged in positive interactions with neighbours and undertook altruistic activities to benefit their communities. Retirement living environments were valued as tailored residences for older adults that provided opportunities for shared leisure in age-appropriate settings. The local environment was regarded solely as a facilitator of activity participation, which was characterised by familiarity, proximity and accessibility of resources, walkability, and availability of valued networks and destinations. Interactions with social networks were reported as both facilitators of and constraints to activity participation. Facilitators of activity participation included spending leisure time with family members, giving and receiving support, involvement in a religious community, and participation in charitable or hobby groups. The social network could also constrain activity, however, through the imposition of unwanted responsibilities and obligations. Climate was the only macro-environmental factor identified as a potential influence on activity participation. A comparatively smaller number of personal influences on activity participation were identified in the third research phase, which included health and functional ability; energy, motivation, and interest; and routine and continuity. Several themes were omitted from the qualitative results following discussions with older adults and due to a lack of evidence.

Across the second and third research phases, quantitative and qualitative questions were employed with research participants to explore the experiences and potential influence of the 2010 and 2011 Canterbury earthquakes on local environmental conditions and activity participation. These questions assessed the impact of the disasters on the sample population and illustrated how a rapid and adverse environmental change potentially influences the activity trajectories of older adults. Following the analysis of quantitative data from both earthquakes, there was a positive correlation between higher levels of reported environmental damage and disruption to activity participation. However, the highly destructive February 2011 earthquake caused significantly greater disruption to local environmental conditions and...
activity participation than the initial September 2010 earthquake. The data also indicated that those living in central and eastern suburbs, women, and ethnic minorities suffered the greatest disruptions to activity participation. Analysis of qualitative responses indicated that older adults displayed both vulnerability and resilience in regard to their activity participation during the earthquake sequence. More vulnerable older adults had their activities knocked off course due to the loss of activity venues, cancellation of meetings and events, confinement and isolation, fragmentation of social networks, emergence or exacerbation of local hazards, and disruptions to activities of daily living. In contrast, more resilient older adults found ways to continue to be active through involvement in recovery activities, caring for others, remaining adaptable and flexible, accessing networks of support, and undertaking disaster preparations.

The three research phases culminated in the development of the model of navigated environmental performance – a mid-range theory of active ageing that addresses a reported paucity of recent theorising within the field of environmental gerontology (Birren, 1999; Kendig, 2003). The model provided a pragmatic means for integrating diverse data and addressing the overarching research question. It drew upon emergent concepts abstracted from the research, existing theoretical perspectives, and feedback from collaborators during focus group discussions. The theory proposes that independently living older adults navigate their activities as autonomous agents within complex and often unsupportive urban environments. They must reconcile the malleability of their private surrounds; the accessibility and amenity of local conditions; the level of support of their proximate social network, and the unique contextual and compositional features of their own locality with their cognitive, biological, and behavioural dispositions to initiate and sustain activity. Older adults have a tolerance for environmental constraints in most urban areas and seek to preserve activity participation insomuch as it is within their capacity to endure or change. Successful navigation occurs when the environment is sufficiently supportive of preferred activities or when individual resilience and capacity is adequate to overcome antecedent or emerging barriers, resulting in increased or maintained participation. Unsuccessful navigation occurs when there is disjunction among preferences, capacity, and urban environmental conditions, which results in reduced participation and potential disablement. The experience of a natural disaster potentially exacerbates environmental problems – challenging personal resilience and potentially hastening unsuccessful navigation and disablement for many.
Drawing on the study results, the theory of navigated environmental performance, and discussions with older-adult collaborators, recommendations were developed for age-friendly urban development and rebuilding following the 2010 and 2011 earthquakes. Salient results and recommendations were presented to local decision makers and stakeholders at a community symposium in 2012 in line with the objectives of the PAR process. This research, therefore, provides timely and collaboratively generated data to inform the largest rebuilding project in New Zealand's history following a major urban disaster and at a time when the older-adult group is rapidly expanding in urban areas. As contributions to the international literature, the research provides a detailed understanding of the multi-layered pathways to activity, introduces a new theory of active ageing, and describes a novel process for engaging with older adults as research partners in the exploration of environmental influences on behaviour.

This thesis began with a quote from Lawton (1986), which asserted that a supportive environment is a human right that should not require justification. Unfortunately, as this thesis has shown, many older adults live in urban environments that are replete with existing or emerging constraints to participation, which may hasten decline and disability and be antagonistic of adaptation to normal ageing. While many are tolerant of environmental barriers and maintain activity in difficult circumstances, resilience is exhaustible and many will be defeated by their surroundings in the long run. Throughout history, cities have been planned and built in the image of the young and powerful with little regard for the needs and preferences of older and more vulnerable residents. A time is fast approaching, however, when cities will become the boom towns of a greying society. To realise the substantial opportunities that population ageing and urbanisation may afford and offset the challenges of unmanageable dependency, the physical and social conditions of urban environments must become more closely aligned with the capabilities and preferences of older residents. When environments are structured for our most vulnerable, they are supportive of us all.
12 References


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13.1  Project introduction sheet for Elder Care Canterbury Consumer Group

**Project title:** Contextual influences on active ageing in Christchurch, New Zealand: A community based participatory investigation.

**Description of the research**

The tentative aim of this PhD research is to explore the relationship between local environment and active ageing behaviours among community dwelling men and women aged 65 years and older in Christchurch. The behaviours of interest in this research include physical activity, social and cultural activity, civic activity and work-related activity. These so-called active ageing behaviours have been identified by the World Health Organisation as significant contributors to health and well-being in later life, yet relatively little is known about how the physical and social environment affect active ageing. The proposed research design incorporates a participatory action approach – collaboration with older adults on the design, data collection, analysis and presentation of results. The research also employs a mixed methods design, utilising daily activity diaries, photovoice and focus group discussions, to explore the research problem. In addition to the participatory and mixed methods approaches, this research will compare the behaviours and experiences of older adults across diverse locations across Christchurch – including rural/urban areas and deprived/non deprived areas.

**Overview of older adult reference group requirements**

As part of the participatory design requirements of the research, it is necessary for older adults to have direct input into all phases of the research to ensure that it appropriately addresses issues of concern to this cohort. The first, and arguably most important, phase of the research is the development of the research aims/questions, design and methods. To this end, we seek the participation of members of the Elder Care Canterbury Consumer Group in an older adult reference group to provide project guidance. The Elder Care Canterbury Consumer Group has been identified as an appropriate organisation for this role due to its composition of older adult advocates, knowledge of older adults’ health issues in Canterbury and close working relationship with local health agencies. It is anticipated that the reference group would meet bi-monthly on an ongoing basis for approximately 1.5 to 2 hours to provide guidance on the proposed research. We are calling for volunteers to participate in this collaborative research process – a first meeting will be held in March.

Please contact Michael Annear (03 3780496 / michael.annear@gmail.com) or Sally Keeling (03 3377932 / sally.keeling@otago.ac.nz) if you wish to be involved or to discuss the project.

**About the research team**

This research is based out of the University of Otago Department Of Medicine (Christchurch Hospital) and is supervised by gerontologist Dr Sally Keeling and geriatrician Professor Tim Wilkinson. PhD student Michael Annear has a Masters degree in Applied Science with first class honours from Lincoln University where he previously researched the relationship between neighbourhood deprivation and leisure time physical activity among the 65 and older cohort. The findings of this work have been published internationally.
13.2 Final human ethics committee approval letter

Dr Sally Keeling  
Department of Medicine  
Christchurch School of Medicine and Health Sciences  
University of Otago  

23 March 2011

Dear Dr Keeling,

Re: Environmental influences on active ageing: a participatory investigation

We wish to thank you for the correspondence through Michael Annear regarding the proposal to extend the questionnaire to phase two participants to compare the impacts of the September 2010 and February 2011 earthquakes.

Your proposal continues to be fully approved by the Human Ethics Committee. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing. I hope all goes well for you with your upcoming research.

Yours sincerely,

Gary Witte  
Manager, Academic Committees  
University of Otago

Cc Professor Z H Endre, Head, Department of Medicine, Christchurch

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73 Ethics committee approval was also granted in March 2010 for preliminary reconnaissance, September 2010 for the full study, and October 2010 following amendments made in response to a major earthquake.
13.3 Subjective assessment of study areas

In your opinion, to what extent does the street segment (including both sides of the road in this block) support active ageing (physical, social, cultural, civic, spiritual and economic activity)?

<table>
<thead>
<tr>
<th>Area Assessment</th>
<th>Please tick the appropriate box</th>
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<tbody>
<tr>
<td>Does not support active ageing</td>
<td></td>
</tr>
<tr>
<td>Somewhat supports active ageing</td>
<td></td>
</tr>
<tr>
<td>Strongly supports active ageing</td>
<td></td>
</tr>
</tbody>
</table>

Please provide an explanation for your response above.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
13.4 Project information and survey introduction

Michael Annear
Department of Medicine
University of Otago

October 11, 2010

Dear Sir or Madam

Active Ageing in Christchurch Study

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate in the research. If you decide to participate we thank you. If you decide not to take part, there will be no disadvantage to you of any kind and we thank you for considering our request. You have been selected for potential participation in this research from the national Electoral Roll. The success of this research relies on the participation of people in your age group who live in Christchurch.

The main aim of this research is to explore how local environmental conditions may influence participation in health-related activities in later life. This project is being undertaken as part of requirements for a PhD qualification at the University Of Otago Department Of Medicine, based at Christchurch Hospital. We seek the participation of adults aged 65 years and older who are living independently in communities of their choice in urban Christchurch. This includes people living in their own home, in rented accommodation, in government-provided social housing, with friends or relatives, or in private units within retirement villages or communities. This project is significant as it will help us to understand how the local environment potentially constrains or facilitates health-related activities in later life and may contribute to age-friendly developments in Christchurch.

This study is divided into two parts, and we invite you to participate in one or both parts:
1. In the first part, please complete the attached survey form concerning your activities, your environment and your health, and return it to us in the envelope provided by Thursday the 28th of October. It takes approximately 10 minutes to complete the survey. On the final page of the survey, you are asked whether or not you would like to participate in the second part of the research. Even if you don’t want to take part in the second part, we would still be grateful if you would complete the attached survey and return it to us.
2. The second part of the study involves completing a daily diary of your activities over a two-week period in February/March 2011 and, for those who are interested, using a disposable camera to photograph influential conditions in your local environment. Volunteers who wish to will also be invited to attend regular group discussions concerning ageing, activity, health and environment, which will be undertaken every two months during 2011 and 2012.

Please note that you are free to withdraw your participation from the study at any stage without disadvantage. You may also complete and return the survey with no further involvement in the study if you wish. All resources necessary for participation will be provided by the researchers.
The following people will have access to raw data from the research: Michael Annear (principal researcher), Dr Sally Keeling (research supervisor), Professor Tim Wilkinson (research supervisor), and the person employed as a transcriber and data manager. The data collected will be securely stored in such a way that only those mentioned above will be able to gain access to it. At the end of the project, any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed. Reasonable precautions will be taken to protect and destroy any data gathered or transmitted by email. However, the security of electronically transmitted information cannot be guaranteed. Master coding sheets and lists of names of study participants will be kept separately to preserve your anonymity during the research process.

The thesis resulting from this research will be available in the University of Otago Library (Dunedin, New Zealand). Every attempt will be made to preserve your anonymity in the thesis and in any published papers reporting on this project. You are most welcome to request a copy of the results of the project should you wish.

If you have any questions about our project, now or in the future, please feel free to contact:

Michael Annear (lead researcher) OR Dr Sally Keeling (primary supervisor)
Department of Medicine Department of Medicine
University of Otago University of Otago
Christchurch Hospital Christchurch Hospital
Telephone Number: 03 378 6479 Telephone Number: 03 337 7932
Email: annmi304@student.otago.ac.nz Email: sally.keeling@otago.ac.nz

This study has been reviewed and approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the researcher you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Yours sincerely

Michael Annear
Lead researcher
13.5 Active Ageing in Christchurch Survey

Active Ageing in Christchurch Survey

University of Otago
Christchurch School of Medicine
Survey instructions

This University of Otago, Christchurch School of Medicine survey is about your activity participation, your local environment, and your health. A supplementary section addressing the impact of the recent Canterbury Earthquakes has also been included. Please complete each section of the survey and read definitions and questions carefully. Some questions will require you to tick a box or to circle a number. Other questions will require a short written answer. This survey will take approximately 10 minutes to complete. Please return the completed survey to the lead researcher, Michael Annear, using the self-addressed envelope provided.

This survey is part of a larger research project exploring the relationships between local environment and active ageing. If you would like the lead researcher to contact you about possible involvement in further associated research activities in early 2011, please tick the box at the end of the survey. Further participation may involve keeping a record of your activities over a number of days and photographing and talking about your local environment using equipment provided by the researcher.
1. Your activity participation

Activity is broadly defined as participation in physical, social, civic, cultural, spiritual or economic endeavours.

Q. 1a Which of the following activities do you participate in regularly (at least once every two weeks on average)? Please tick all appropriate boxes.

☐ Physical activity (For example, gentle exercise, active leisure, sports, tai chi, golf, walking, gardening, bowls, tennis, swimming, sailing or other physical activities)

☐ Social activity (For example, meeting friends or family members, social club participation, chatting with neighbours or other local residents, or other social activities)

☐ Civic activity (For example, participation in service groups such as Lions or Rotary, assisting neighbours, unpaid community or environmental work, or other civic activities)

☐ Cultural activity (education or learning activities, reading, cultural group participation; dance, drama or singing, hobby or craft participation, or other cultural activities)

☐ Spiritual activity (prayer or meditation, church attendance, faith or worship-related activities, or other religious activities)

☐ Economic activity (paid full time, part-time or casual work; self employment; working in exchange for goods or services, or other economic activities)

☐ I don’t participate in any activities.

Q. 1b During a typical two week period, about how many times do you participate in the following activities? For example, attending church once every Sunday for two weeks = 2 times per fortnight. Please write the number of times per fortnight.

Physical activity = _________ times per fortnight

Social activity = _________ times per fortnight

Civic activity = _________ times per fortnight

Cultural activity = _________ times per fortnight

Spiritual activity = _________ times per fortnight

Economic activity = _________ times per fortnight

☐ I don’t participate in any activities
Q. 1c When you participate in activities are you generally, 
Please tick one appropriate box.

- [ ] Alone
- [ ] With one other person
- [ ] Part of a group
- [ ] Varies based on the type of activity
- [ ] I don’t participate in any activities

2. Your local environment

The local environment is defined as the area surrounding and including your current place of residence that is meaningful and accessible to you on a regular basis and which has features that distinguish it from other places. The local environment incorporates physical and social components and access to knowledge and information. The local environment is sometimes referred to as the neighbourhood or community.

Q. 2a In general, how would you rate the current conditions of your local environment? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Excellent</th>
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<td>0</td>
<td>1</td>
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<td>2</td>
<td>3</td>
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<td>4</td>
<td>5</td>
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</tbody>
</table>

Q. 2b When you participate in activities are you generally, 
Please tick one appropriate box.

- [ ] At home (current place of residence)
- [ ] Within my local environment, but away from my home
- [ ] Outside of my local environment
- [ ] Varies based on the type of activity
- [ ] I don’t participate in any activities
3. Your Health

Health is defined as a state of physical, mental and social well-being – not merely the absence of disease or infirmity.

Q. 3a In general, how would you rate your current state of health? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Q. 3b In general, to what extent do current health problems or disabilities limit your activity participation? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>Limited a lot</th>
<th>Not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

4. Your background information

Q. 4a Are you? Please tick the appropriate box

- [ ] Male
- [ ] Female

Q. 4b How old are you in years? Please write the number of years

__________________________ Years

Q. 4c How long have you lived at your current address? Please tick the box or write the number of years

- [ ] Less than one year
- OR
- [ ] Number of years _______ years
Q. 4d  What ethnic group do you belong to?
Please tick the box or boxes which apply to you.

☐ New Zealand European  ☐ Tongan
☐ Māori  ☐ Niuean
☐ Samoan  ☐ Chinese
☐ Cook island Māori  ☐ Indian
☐ Other such as *DUTCH, JAPANESE*. Please state: __________________________

Q. 4e  Which one of these statements is true about your current living situation?
Please tick the appropriate box.

☐ I live alone
☐ I live with one or more people (husband, partner, family, friends etc.)

Q. 4f  Print your highest qualification, and the main subject, for example:

Qualification:  Trade certificate
Subject:  Electrical engineering

Qualification (and level if applicable):

Subject:

______________________________
5. Supplementary Canterbury earthquake questions

This questionnaire addresses older adult activity participation, health and local environmental conditions. Considering the significant earthquakes that have hit the region in recent weeks and the environmental focus of this research, it is now relevant to also consider how the Canterbury earthquakes may have influenced activity participation and altered conditions of the local environment. Three supplementary questions have been added to this questionnaire to begin to understand the impact of the earthquakes on older adult residents of Christchurch.

Q. S1 To what extent has your regular pattern of activity participation been disrupted by the recent Canterbury earthquakes? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>No disruption to activities</th>
<th>Significant disruption to activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  1  2  3  4  5</td>
<td></td>
</tr>
</tbody>
</table>

Q. S2 To what extent has your local environment been disrupted by the recent Canterbury earthquakes? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>No disruption to local environment</th>
<th>Significant disruption to local environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  1  2  3  4  5</td>
<td></td>
</tr>
</tbody>
</table>

Q. S3 Please comment on how the earthquakes have affected you.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Thank you for taking the time to fill in this survey form. Please return it to Christchurch Hospital in the pre-paid envelope provided.

If you would like the lead researcher, Michael Annear, to contact you about possible involvement in further research activities in 2011, please tick the box below.

Yes, I would like to be contacted about further participation in this study.

Preferred name: __________________________

Contact phone number: ______________________

Contact email (if applicable): __________________________

If, during the completion of this survey, issues have been raised that have made you concerned or upset, please discuss these with someone you trust, such as a family member, general practitioner or pastor. Additional free services are available to help you should you require further advice or assistance. Toll free phone numbers are listed below:

- Health-line 0800 611 116 for free 24-hour health advice
- Life-line 0800 543 354 for free 24-hour counselling
- Age Concern Canterbury 0800 803 344 for older adult support & information

If you would like to discuss this particular survey or the wider research topic of which this survey is a part, please contact the lead researcher, Michael Annear, at Christchurch Hospital on the following telephone number: 03 378 6479, or email annmi304@student.otago.ac.nz.
## 13.6 Distribution and characteristics of continuous survey data

<table>
<thead>
<tr>
<th>Continuous variables</th>
<th>Kolmogorov-Smirnov</th>
<th>Skewness</th>
<th>Kurtosis</th>
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<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>Sig.</td>
<td>Statistic</td>
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<td>.77</td>
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<td>Two-week social activity frequency</td>
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<td>1.15</td>
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<tr>
<td>Two-week civic activity frequency</td>
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<td>&lt;.001</td>
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<tr>
<td>Two-week cultural activity frequency</td>
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<td>Two-week spiritual activity frequency</td>
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<td>Two-week economic activity frequency</td>
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<td>Influence of health and disability on activity participation</td>
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<td>&lt;.001</td>
<td>-.71</td>
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<td>Age in years</td>
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<td>.29</td>
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<td>&lt;.001</td>
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### 13.8  Mean age of respondents and non respondents by study area

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<th>Participation</th>
<th>M</th>
<th>SD</th>
<th>n</th>
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<tr>
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<td>54</td>
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<td>Participation</td>
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<td>7.14</td>
<td>12</td>
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<tr>
<td>Non participation</td>
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<td>7.69</td>
<td>25</td>
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<td>7.43</td>
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<td>Participation</td>
<td>73.56</td>
<td>5.98</td>
<td>25</td>
</tr>
<tr>
<td>Non participation</td>
<td>83.08</td>
<td>6.37</td>
<td>13</td>
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<tr>
<td>Total</td>
<td>76.82</td>
<td>7.57</td>
<td>38</td>
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<td>Participation</td>
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<td>6.40</td>
<td>75</td>
</tr>
<tr>
<td>Non participation</td>
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<td>Total</td>
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<td>6.32</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>Participation</td>
<td>73.98</td>
<td>5.40</td>
<td>44</td>
</tr>
<tr>
<td>Non participation</td>
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<td>6.77</td>
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<tr>
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<td>44</td>
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<td>5.68</td>
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<tr>
<td>Non participation</td>
<td>74.53</td>
<td>7.23</td>
<td>17</td>
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</tr>
<tr>
<td>Total</td>
<td>74.22</td>
<td>6.37</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Redcliffs</td>
<td>Participation</td>
<td>80.16</td>
<td>7.17</td>
<td>43</td>
</tr>
<tr>
<td>Non participation</td>
<td>77.62</td>
<td>7.77</td>
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<tr>
<td>Total</td>
<td>78.86</td>
<td>7.55</td>
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</tr>
<tr>
<td>Ferrymead</td>
<td>Participation</td>
<td>76.86</td>
<td>7.55</td>
<td>35</td>
</tr>
<tr>
<td>Non participation</td>
<td>76.20</td>
<td>5.95</td>
<td>35</td>
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</tr>
<tr>
<td>Total</td>
<td>76.53</td>
<td>6.75</td>
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<tr>
<td>Bryndwr</td>
<td>Participation</td>
<td>72.89</td>
<td>8.05</td>
<td>9</td>
</tr>
<tr>
<td>Non participation</td>
<td>74.26</td>
<td>6.05</td>
<td>31</td>
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<td>6.47</td>
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<td>Participation</td>
<td>72.90</td>
<td>7.46</td>
<td>10</td>
</tr>
<tr>
<td>Non participation</td>
<td>67.43</td>
<td>2.51</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>70.65</td>
<td>6.43</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Participation</td>
<td>77.29</td>
<td>7.34</td>
<td>354</td>
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<tr>
<td>Non participation</td>
<td>77.38</td>
<td>7.44</td>
<td>431</td>
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<tr>
<td>Total</td>
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<td>7.39</td>
<td>785</td>
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</table>
### 13.9 Survey response by study area

<table>
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<tr>
<th>Study Area</th>
<th>Number of surveys distributed</th>
<th>Returned usable responses post telephone follow up</th>
<th>Non completion due to poor health / disability</th>
<th>Refusals / not interested</th>
<th>Non completed returns</th>
<th>Late returns</th>
<th>Undeliverable surveys / return to sender</th>
<th>Reported deaths</th>
<th>Non response post telephone follow up</th>
<th>Overall response rate</th>
</tr>
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<tr>
<td>Holmwood</td>
<td>54</td>
<td>26</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>26</td>
<td>48%</td>
</tr>
<tr>
<td>Central City</td>
<td>40</td>
<td>12</td>
<td>-</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21</td>
<td>30%</td>
</tr>
<tr>
<td>Papanui High</td>
<td>38</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>72</td>
<td>66%</td>
</tr>
<tr>
<td>Papanui Low</td>
<td>164</td>
<td>75</td>
<td>-</td>
<td>13</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>82</td>
<td>42%</td>
</tr>
<tr>
<td>New Brighton</td>
<td>109</td>
<td>44</td>
<td>-</td>
<td>17</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12</td>
<td>40%</td>
</tr>
<tr>
<td>Hawthorndon</td>
<td>78</td>
<td>34</td>
<td>1</td>
<td>19</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>64</td>
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<tr>
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<td>19</td>
<td>-</td>
<td>43</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>20</td>
<td>53%</td>
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<tr>
<td>South Hornby</td>
<td>88</td>
<td>43</td>
<td>4</td>
<td>35</td>
<td>1</td>
<td>-</td>
<td>-</td>
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<td>9</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>10</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>23%</td>
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<td>4</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>59</td>
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Total
### 13.10 Parameter estimates for 14-day total activity participation

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<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
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<td></td>
<td></td>
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<td>1.25</td>
<td>.21</td>
<td>-4.46</td>
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<td>0a</td>
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<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Central City (high deprivation)</td>
<td>15.64</td>
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<td>5.50</td>
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<td>-18.42</td>
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<tr>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Holmwood (low deprivation)</td>
<td>7.96</td>
<td>4.80</td>
<td>1.66</td>
<td>.10</td>
<td>-1.50</td>
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<td>Papanui (low deprivation)</td>
<td>4.26</td>
<td>4.43</td>
<td>.96</td>
<td>.34</td>
<td>-4.48</td>
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<tr>
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<td>4.46</td>
<td>.33</td>
<td>.74</td>
<td>-7.33</td>
</tr>
<tr>
<td>North Hornby (low deprivation)</td>
<td>2.30</td>
<td>4.79</td>
<td>.48</td>
<td>.63</td>
<td>-7.13</td>
</tr>
<tr>
<td>Redcliffs (low deprivation)</td>
<td>5.46</td>
<td>4.63</td>
<td>1.18</td>
<td>.24</td>
<td>-3.66</td>
</tr>
<tr>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
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<td>-.91</td>
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*a. This parameter is set to zero because it is redundant*

### 13.11 Parameter estimates for 14-day physical activity participation

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*a. This parameter is set to zero because it is redundant*
### 13.12 Parameter estimates for 14-day social activity participation

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a. This parameter is set to zero because it is redundant

### 13.13 Parameter estimates for 14-day cultural activity participation

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a. This parameter is set to zero because it is redundant
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a. This parameter is set to zero because it is redundant
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<td>.78</td>
<td>-1.019</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>North Hornby (Low dep)</td>
<td>.01</td>
<td>.47</td>
<td>.02</td>
<td>.99</td>
<td>-.906</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>Redcliffs (Low dep)</td>
<td>.01</td>
<td>.46</td>
<td>.02</td>
<td>.99</td>
<td>-.902</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>Rutland (Low dep)</td>
<td>0a</td>
<td>. . .</td>
<td>. .</td>
<td>. .</td>
<td>. .</td>
<td>. .</td>
<td></td>
</tr>
<tr>
<td>Age in years</td>
<td>-.01</td>
<td>.01</td>
<td>-.89</td>
<td>.38</td>
<td>-.031</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Dwelling type (community / retirement village)</td>
<td>-.10</td>
<td>.53</td>
<td>-.18</td>
<td>.86</td>
<td>-1.130</td>
<td>.94</td>
<td></td>
</tr>
</tbody>
</table>

a. This parameter is set to zero because it is redundant
13.16 Introduction to activity diary and photovoice procedures

Michael Annear
Department of Medicine
Christchurch Hospital / University of Otago
PO Box 4345
Christchurch 8140

February 20, 2011

Dear

Active Ageing in Christchurch Study: Phase 2 – Activity Diary and Camera Activity

Thank you for your ongoing interest in this important research. As you will be aware, this research explores the potential influence of the urban environment on active ageing behaviours in Christchurch. In October, 2010, you completed a survey relating to your activity participation, perceptions of your local environment, and demographic information. A number of questions were also posed regarding the impacts of the Canterbury earthquake on your activity participation and environment. These results are currently being analysed and will soon be disseminated. We are now sending you an activity diary and disposable camera (for those who requested a camera) to allow you to make a further contribution to the research.

The purpose of this phase of the research is to obtain a more in-depth understanding of your day-to-day activity participation and to allow you to provide more detailed comments about the potential influences on your participation. This phase will involve completing a daily diary of your activities over a two-week period from the 1st to the 14th of March, 2011 and, for those who have indicated their interest, using a disposable camera to photograph aspects of their everyday life and environment. Volunteers who wish to, will also be invited to attend regular group discussions concerning ageing, activity, health and environment, which will be undertaken once every two months for a period of 12 months from May 2011.

The following people will have access to raw data from the research: Michael Annear (principal researcher), Dr Sally Keeling (research supervisor), Professor Tim Wilkinson (research supervisor), and the person employed as a transcriber and data manager. The data collected will be securely stored in such a way that only those mentioned above will be able to gain access to it. At the end of the project, any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed. Reasonable precautions will be taken to protect and destroy any data gathered or transmitted by email. However, the security of electronically transmitted information cannot be guaranteed. Lists of names of study participants will be kept separately from the data to preserve your anonymity during the research process.

The thesis resulting from this research will be available in the University of Otago Library (Dunedin, New Zealand) once the examination is completed. Every attempt will be made to preserve your anonymity in the thesis and in any published papers reporting on this project. You are most welcome to request a copy of the results of the project should you wish.
If you have any questions about our project, now or in the future, please feel free to contact:

Michael Annear (lead researcher) OR Dr Sally Keeling (research supervisor)
Department of Medicine Department of Medicine
University of Otago University of Otago
Christchurch Hospital Christchurch Hospital
Telephone Number: 03 378 6479 Telephone Number: 03 337 7932
Email: annmi304@student.otago.ac.nz Email: sally.keeling@otago.ac.nz

This study has been reviewed and approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479 8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Please read the enclosed information carefully before beginning the activity diary and camera activity. If you have any questions or concerns, please contact the lead researcher, Michael Annear without delay.

Yours sincerely

Michael Annear
Active Ageing in Christchurch 2011

14-day activity diary (March 1 – 14)
Please complete this diary over 14 consecutive days beginning on March 1st, 2011. Return the completed activity diary and camera (if applicable) to Michael Annear in the envelope provided, or call to have the items collected (03 378 6479).

This diary explores the influences on activity participation among men and women aged 65 years and older that live in urban Christchurch. Activity is broadly defined and includes participation in physical, social, cultural, civic, spiritual and economic pursuits. We are particularly interested in the potential influences of local environmental conditions on activity participation.

The activity diary consists of four questions that are to be completed everyday for a period of 14 days. The first question requires you to recall five main activities that you participated in each day and to identify the purpose (or purposes) and setting for each activity. The second question asks you to consider potential environmental influences on your activity participation. Question three asks you to provide details about any personal factors that may have influenced your activity participation. Question four provides space for you to make any further comments that may be relevant to the present research about your daily activity participation. A more detailed response is desirable in questions two, three and four.

Each daily diary entry should take approximately 10 minutes to complete, although you are welcome to take more time if you desire. If there is not enough space for you to complete your answer, please continue writing on additional pages (please ensure that you clearly indicate to which day your comments refer). Please write as clearly as possible, so that the researcher can understand and analyse your responses.
Please read through the glossary of key terms below before beginning the diary writing exercise.

**Activities of daily living** refer to everyday self-care activities, such as showering or bathing, dressing, preparing a meal, making the bed, washing the dishes, shopping for necessities, managing personal finances and other everyday activities.

**Civic or volunteer activity** refers to helping activities that are undertaken for the benefit of the community, friends or neighbours, the environment or specialist groups. Examples of civic activity include participation in service groups such as Lions or Rotary, assisting neighbours, fund raising activities, or unpaid community or environmental work.

**Cultural activity** refers to activities undertaken for the purpose of learning or education, expressing personal skills and interests, or expressing ethnic or cultural identity. Examples of cultural activity include studying, reading, cultural group participation, dance, drama, singing, or hobby or craft participation.

**Economic activity** refers to participation in activities for the purpose of earning money for yourself or your family.

**Local environment** refers to the immediate area surrounding and including your home. The local environment is sometimes referred to as local surroundings, neighbourhood or community. The concept of environment includes both the physical and social characteristics of your area.

**Personal factors** refer to individual attributes or circumstances, including physical and mental health, motivation, emotional states, beliefs, knowledge, self-confidence, attitude and demographic factors.

**Physical activity** refers to activities that increase the heart rate, breathing rate and energy expenditure for a prolonged period. Physical activity is often undertaken for purpose of increasing fitness, strengthening muscles, weight loss, enjoyment or satisfaction, or completing chores around the house or garden. Examples of physical activities include gentle exercise, sports participation, tai chi, golf, walking, gardening, housework, bowls, tennis, swimming, or sailing.

**Social activity** refers to activities undertaken with other people for the purpose of socialising and enjoying the company of others, receiving social support, or sharing experiences and values. Examples of social activity include meeting with friends or family members, social club participation, attending a community event or festival, or chatting with neighbours or other local residents.

**Spiritual activity** refers to religious or contemplative activities that are concerned with the spirit, soul or transcendence. Examples of spiritual activities include prayer or meditation, church attendance, faith or worship-related activities.
Researcher contact details

If you have any questions or comments during the diary writing procedure, please don’t hesitate to contact lead researcher, Michael Annear, at Christchurch Hospital.

Direct dial:  03 378 6479
Email:       annmi304@student.otago.ac.nz

Final instructions

• Please read each question carefully. If you have difficulty with any of the questions, please refer to the instructions and glossary at the front of the diary.

• Please contact the researcher if you have any questions or experience problems during the activity diary procedure.

• Please print diary entries clearly so the researcher can effectively record and analyse your responses.

• We are interested in a variety of different activities that you may participate in each day. Feel free to report everyday activities as well as activities that are out of the ordinary.

• You are free to change or edit dairy entries at any stage during the 14-day diary writing period; however, you will not be able to change responses once the diaries have been returned to the researcher.

The Activity Diary begins on the next page.
Preliminary diary questions

Please take a moment to answer the preliminary questions below before beginning your daily diary entries.

1. At the time you moved to your present location, what were the reasons for your move to this address?

2. How, if at all, do the physical and social characteristics of your local environment influence your day to day participation in activities?

A discussion group will be formed from activity diary participants to analyse, discuss and publicize the results of this project. The group will meet once every two months from April 2011 until April 2012 for 1 to 2 hours at a time. If you would like to be involved in this discussion group, please tick the box below and the lead researcher will contact you in the coming weeks.

Yes, I would like to participate in the Active Ageing in Christchurch discussion group.
### Activity diary – Day 1 (1/3/2011)

1. Please name up to five main activities that you participated in today, identify the purpose or purposes of the activity, and identify the setting for the activity.

<table>
<thead>
<tr>
<th>Description of activity</th>
<th>Main purpose(s) of activity</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical activity</strong></td>
<td>Social activity</td>
<td>At home</td>
</tr>
<tr>
<td></td>
<td>Cultural activity</td>
<td>Within local environment</td>
</tr>
<tr>
<td></td>
<td>Civic / volunteer activity</td>
<td>Beyond local environment</td>
</tr>
<tr>
<td></td>
<td>Spiritual activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic activity</td>
<td></td>
</tr>
</tbody>
</table>

*Example:* Morning tea with friends

| Morning tea with friends (Example)       | ✓                          | ✓                         |

2. How, if at all, did aspects of your local environment or surroundings influence your participation in activities today?

3. How, if at all, did personal factors influence your participation in activities today?

4. Are there any other comments that you would like to make about your activity participation today? This may include comments about your activities of daily living.
13.18 Photovoice instructions

Camera activity instructions

Thank you for your interest in participating in the camera activity. You have been provided with a 27-exposure disposable camera for the purposes of contributing data to a research project that is exploring the influences of local environmental conditions on older adults’ activity participation. The camera activity is a procedure in which research participants use cameras to photograph aspects of their everyday lives and environments that are relevant to a particular research topic or instruction.

In this research, you are asked to take as many photographs as you wish using the camera provided in response to the following instruction:

**Please photograph aspects of your everyday life or environment that you believe influence your participation in daily activities.**

The camera activity is to be undertaken in conjunction with the activity diary. As a consequence, we ask that you take your photographs during the 14-day activity diary writing period beginning from the 1st of March, 2011. Once you have completed the diary and camera activity, please return the diary and camera to me in the envelope provided. Alternatively, you can contact me by phone (03 378 6479) once you have completed the diary and photographic exercises and I will come and collect the material from you if that is more convenient.

Once you have taken your photographs and returned the camera to me, the film will be processed and the developed photographs will be returned to you. At this point, you will be asked to write a title and short description for a selection of 4 to 6 images, which best reflect the aspects of your everyday life or environment that potentially influence your activity participation. These images may be displayed and published during the course of this research.

Please read the camera and safety guidelines outlined below before beginning the activity.

Camera and safety guidelines

1. Please do not take covert photographs of individuals or private property. Make sure that you obtain verbal consent first.

2. Please be aware of your surroundings when taking photographs, and do not go onto private property without permission or put yourself in potentially harmful situations. Be particularly aware of traffic, and do not stand in driveways or on the road while taking photographs.

3. If you are taking photographs of your local environment, it is advisable for you to travel with a friend or partner. If a friend or partner is not available, please contact the lead researcher, Michael Annear, who will be available to accompany you if you wish.

4. If you feel uncomfortable or unsafe at any time during the camera activity, you may discontinue the activity at any stage or to return at a different time or on a different day.

5. Photographs will look best when they are taken on a fine day. Please ensure that the flash button is in the ON position when taking photographs indoors, in shaded areas or in overcast conditions. Remember to return the flash button to the OFF position once you have finished taking photographs (otherwise the battery will drain rapidly).

6. Please ensure that you are stationary while taking photographs.
13.19 Secondary administration of earthquake questions

Michael Annear
University of Otago
Christchurch Hospital

24 March, 2011

Dear

Re: Active ageing in Christchurch Study – Earthquake update.

As you will be aware, the second phase of the Active Ageing in Christchurch Study was scheduled to begin on the 1st of March. However, the earthquake on February 22nd has had a major impact on Christchurch citizens, caused significant disruption to many parts of the City and it is likely to have a bearing on our current research project, both in terms of participation in the research and the ultimate outcomes. If you no longer wish to continue participation in this research, we completely understand and ask only that you contact the lead researcher, Michael Annear, via email (annmi304@student.otago.ac.nz), telephone (03 378 6479), or by sending a note back in the return envelope provided.

Hopefully, you have now received an activity diary and camera (for those who were selected to use one). If you have begun/completed the activity diary and camera exercise, we thank you for your diligence at this difficult time and ask that you return these in the envelope supplied when you have completed your task. If you have not yet begun your activity diary and camera exercise but would still like to contribute to this research, we ask that you begin these tasks from the 1st of April, 2011, if you are able to do so. If you require a new diary or camera, due to loss or damage resulting from the earthquake, please let me know as soon as possible and I will endeavour to provide replacements.

We have attached to this letter, a supplementary question about the potential impacts of the recent earthquake. We would be most grateful if you could complete this and return it to us in the envelope provided as it will allow us to better assess the impacts of the most recent earthquake on older adults in urban Christchurch and to understand how this event has impacted upon the research study.

We appreciate that this is a difficult time for all those who experienced the Christchurch earthquake, including our research team. It is our earnest hope that this research will go some way to improving the lives of older adults as the City rebuilds in the coming months and years.

If you need assistance at all or would like to talk with anyone about the earthquake or your current situation, please call one of the following free call numbers:

24-hour government earthquake help line 0800 779 997
Support and counselling helpline 0800 777 846
Earthquake Commission (repairs and claims) 0800 326 243
Lifeline 0800 543 354
Healthline 0800 611 116

Yours sincerely,

Michael Annear
University of Otago
Active ageing in Christchurch Study: Phase 2 earthquake supplement

1. To what extent has your regular pattern of activity participation been disrupted by the February 22\textsuperscript{nd} earthquake? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>No disruption to activities</th>
<th>Significant disruption to activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

2. To what extent has your local environment been disrupted by the February 22\textsuperscript{nd} earthquake? Please circle one appropriate number.

<table>
<thead>
<tr>
<th>No disruption to local environment</th>
<th>Significant disruption to local environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

3. Please comment on how, if at all, you have been affected by the February 22\textsuperscript{nd} earthquake. We are particularly interested in how the earthquake may have affected your local environment and your patterns of regular activity, although you are free to comment on other areas of life that are relevant to you.

Please return this page to researcher Michael Annear at the Department of Medicine, Christchurch, in the envelope provided.
13.20 Photovoice follow-up letter

Michael Annear  
Department of Medicine  
PO Box 4345, Christchurch  

6 May, 2011  

Dear  

Last month you completed an activity diary and camera exercise as part of your participation in the Active Ageing in Christchurch Study. Thank you very much for your involvement. We appreciate that recent weeks have been both emotionally and physically demanding for many Christchurch residents as a result of the February earthquake. As part of your involvement in the research, you took a number of photographs of your local environment in response to the instruction, “please photograph aspects of your everyday life or environment that you believe influence your participation in daily activities”. We have now processed your photographs and are returning them to you for one final analysis. We would be most appreciative if you could please undertake the following using the photographs provided:

1. Please select up to six of the photographs that best show how your local environment influences your activity participation (remember that environment can include natural, manmade or social settings).

2. On the back of each selected photograph write a short title for the image.

3. Underneath the photograph title, write a description of what the photograph is showing and how the particular environment in the photograph influences your activity participation.

Please return the selected photographs (with titles and descriptions) to me at the Department of Medicine, in the envelope provided. You are free to keep the remaining photographs for yourself. Note that the images that you return may be used in research publications and presentations, although your identity will remain anonymous. Please keep this in mind when you select your images. Thank you once again for your help in what is turning out to be a very interesting project.

Yours sincerely

Michael Annear
13.21 Request for consent from photographic subjects

Michael Annear
Health Care of the Elderly Research Group
Department of Medicine
The Princess Margaret Hospital
Christchurch

April, 2012

Dear

During March and April, 2011, you participated in a research project investigating the impact of local environmental conditions on the activity participation of adults aged 65 years and older. During your participation, you took a number of photographs of your surroundings and of the people who matter to you in your environment. A number of your photographs have significant merit in the context of this research and have been selected for publication. We intend to publish these images in a doctoral thesis and in academic journals addressing the health and well-being of older adults. Additionally, we intend to use your photographs in presentations to academic and community audiences. Please be assured that no names or readily identifiable personal details will be associated with published images. Before we can publish or present these images, however, we require the consent of the individuals depicted in the attached image(s). There are two options available for obtaining consent and we seek your help in this matter.

1. If you know the people in the attached photograph(s), could you please ask them to sign the attached consent form. Could you then please return the consent form(s) to me in the envelope supplied. One consent form per individual.

2. If you do not know how to contact the people in your photograph(s) or if it is not possible to obtain consent from all of those in the photograph(s), please return the empty consent form(s) in the supplied envelope. In this case, we will use a computer programme to obscure their identity.

If there are any children depicted in your photograph(s), could you please obtain written consent from a parent. If we do not have a response from you within four weeks we will obscure the faces of all those depicted. Thank you for your contributions to this research. We look forward to sharing our findings with you in the near future.

Yours sincerely

Michael Annear
I, __________________________ agree to be photographed, or for my child / children, __________________________ to be photographed for the purposes of research.

With your consent, this image(s) will be used as part of a study investigating the physical and social environmental influences on active ageing in Christchurch and will be published in a doctoral thesis, academic journals, and presented in a number of academic and community forums.

Signed: ___________________________ Date: ___________
13.22 Study area maps

Central City

Holmwood
### South Hornby

#### Deprivation level
- Low deprivation areas
- High deprivation areas

#### 400m buffer (eqv. 5 mins walking)
- Low deprivation buffer
- High deprivation buffer

#### Land use
- Industrial land
- Low density living areas
- Medium to high density residential
- Rural land
- Special purpose areas (e.g., airport)

#### Shopping and service areas
- Council / public housing
- Public parks and open space
- Golf course

#### Waterways and sea
- Major roads
- Streets
- Railway lines
- Public swimming pools
- Churches
- Aged care facilities
- Community centres
- Libraries
- Health facilities

### North Hornby / Hei Hei

#### Deprivation level
- Low deprivation areas
- High deprivation areas

#### 400m buffer (eqv. 5 mins walking)
- Low deprivation buffer
- High deprivation buffer

#### Land use
- Industrial land
- Low density living areas
- Medium to high density residential
- Rural land
- Special purpose areas (e.g., airport)

#### Shopping and service areas
- Council / public housing
- Public parks and open space
- Golf course

#### Waterways and sea
- Major roads
- Streets
- Railway lines
- Public swimming pools
- Churches
- Aged care facilities
- Community centres
- Libraries
- Health facilities
Ferrymead

Redcliffs
Appendix

Papanui high deprivation

Papanui low deprivation
Bryndwr (control)

Rutland (control)
### Appendix

#### 13.23 Example page from the Irvine-Minnesota Inventory

<table>
<thead>
<tr>
<th>Date</th>
<th>Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Segment #**

**Answer questions 1-6 based on this end of the segment**

##### Intersection

**Neighborhood Identification**

1. Are there monuments or markers including neighborhood entry signs that indicate that one is entering a special district or area?  
   1. yes = 1; no = 0

##### Street Crossing

2a. Consider the places on the segment that are intended for pedestrians to cross the street. Are these places marked for pedestrian crossing?  
   2. all = 3; some = 2; none = 0; NA = 8

2b. What type of marking do the crosswalks have? Mark all that apply

- White painted lines  
  3. yes = 1; no = 0

- Colored painted lines  
  4. yes = 1; no = 0

- Zebra striped  
  5. yes = 1; no = 0

- Different road surface or paving (e.g., tiles, colored concrete, marble, etc.)  
  6. yes = 1; no = 0

- Other  
  7. yes = 1; no = 0

3. Are there curb cuts at all places where crossing is expected to occur?  
   8. all = 3; some = 2; none = 0; NA = 8

4. What type of traffic/pedestrian signal(s)/system(s) is/are provided? Mark all that apply.

- Traffic signal  
  9. yes = 1; no = 0

- Stop sign  
  10. yes = 1; no = 0

- Yield sign  
  11. yes = 1; no = 0

- Pedestrian activated signal  
  12. yes = 1; no = 0

- Pedestrian crossing sign  
  13. yes = 1; no = 0

- Pedestrian overpass/underpass/bridge  
  14. yes = 1; no = 0

5. For an individual who is on this segment, how safe (traffic wise) do you think it is to cross the street from this segment?  
   15. pretty/very safe = 1; not very safe/unsafe = 0; cul-de-sac = 8

6. For an individual who is on this segment, how convenient (traffic wise) do you think it is to cross the street from this segment?  
   16. pretty/very convenient = 1; not very/inconvenient = 0; cul-de-sac = 8

**Answer questions 7-11 while standing at the beginning of the segment**

**Neighborhood Identification**

7. Does the segment have banners that identify the neighborhood?  
   17. some/a lot = 3; few = 2; none = 0

**Street Characteristics**

8a. Is this a pedestrianized street?  
   18. yes = 1; no = 0

8b. Is the street a ...  
   19. one way = 1; two way = 2

9. Is this segment an alley?  
   20. yes = 1; no = 0

10. How many vehicle lanes are there for cars? (Include turning lanes).  
    21. six or more = 6; five = 5; four = 4; three = 3; two = 2; one = 1; NA (no lanes for car travel) = 8

**Views**

11a. Is this segment characterized by having a significant open view of an object or scene that is not on the segment? The view must be a prominent one  
   22. yes = 1; no = 0

11b. How attractive is the open view?  
   23. attractive = 3; neutral = 2; unattractive = 1; NA (no views) = 8
13.24 Example page from the St Louis Checklist

**Audit Tool**

**Checklist Version**

<table>
<thead>
<tr>
<th>Audit information collected by:</th>
<th>☐ Foot</th>
<th>☐ Auto</th>
<th>☐ Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location information collected by:</td>
<td>☐ Foot</td>
<td>☐ Auto</td>
<td>☐ Both</td>
</tr>
</tbody>
</table>

**LAND USE ENVIRONMENT**

1. Are **residential and non-residential land uses** visible in this **segment**?
   - Yes ☐ No ☐
   - Integration of diverse land uses ☐ ☐

2. What **types of buildings or features** are present in this **segment**?

<table>
<thead>
<tr>
<th>Types of residential destinations</th>
<th>Visible</th>
<th>Not Visible</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Single-family home?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Two-, three-, four-, five-, or six-family home (“walk-ups”)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Apartment building/complex or condominium?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Apartment over retail in multi-story building?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Mobile home or trailer?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Mobile home or trailer park/community?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Other? Specify:</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

3. What **types of commercial destinations** are visible in this **segment**? (Land Use Diversity)

<table>
<thead>
<tr>
<th>Types of commercial destinations</th>
<th>Visible</th>
<th>Not Visible</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Gas station (i.e., any destination that sells gasoline)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Fast food restaurant (i.e., national/local chain or other destination that primarily sells carry-out burgers, fried chicken, pizza, or “americanized” Mexican, Chinese, etc.)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Other restaurant?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Convenience or small grocery store (i.e., those that do not fall under a or e)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Supermarket (e.g., Sam’s, Cosco, Kroger, Winn Dixie, Save Right, Dierbergs)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Bank or credit union?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Pharmacy or drug store (e.g., CVS, Eckerts, Drug Emporium, Walgreens)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. Coffee shop (e.g., Starbucks’, Gloria Jeans)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. Laundry or dry cleaners?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>j. Movie theater?</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>k. Other entertainment (i.e., entertainment provided on-site)?</td>
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</tr>
<tr>
<td>l. Hotel or motel?</td>
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<tr>
<td>m. Indoor mall or super center (e.g., Super Walmart)?</td>
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<tr>
<td>n. Department store or “big box” store (e.g., Home Depot, Best Buy, Sears)?</td>
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<tr>
<td>o. Strip mall or shopping center (i.e., multiple shops housed in linked buildings)?</td>
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<tr>
<td>p. Warehouses, factories, or industrial buildings?</td>
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<tr>
<td>q. Office building?</td>
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<tr>
<td>r. Bar? Liquor store?</td>
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<td>☐</td>
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<tr>
<td>s. Auto shop (e.g., car repair, detail, tires, oil, brakes, car wash)?</td>
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<tr>
<td>t. Other retail (e.g., bakery, card shop, video rental, florist)?</td>
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<tr>
<td>u. Other services (e.g., beautician, lawyer, accountant)?</td>
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Active ageing in a disaster zone

Michael Annear, Sally Keeling, Tim Wilkinson (UOC).

Research background and methods

An ongoing study has examined physical and social environmental influences on active ageing in urban Christchurch. This research was unintentionally aligned with the September 2010 and February 2011 earthquakes, which severely disrupted human lives and activities within the Canterbury region. A sample of 355 independently living older adult adults who resided in 12 diverse urban participated in the research. Study areas reflected a variety of geographic, demographic, and socio-economic conditions across the City. Older adults were also involved as project collaborators and were consulted on research design and development, interpretation of results, and modes of dissemination. Methods of investigation included area observations, surveys, activity diaries with photographic procedures, and group discussions.

Primary research findings

In urban Christchurch (and during a sequence of earthquakes), older adults' activity revolved around a core of home, local environment, and proximate social network. Within these contexts, physical, social, and cultural activities were the most prevalent domains of participation. Across diverse urban areas, independently living older adults displayed moderate levels of activity in the midst of significant environmental constraints to participation (both existing and emerging). While study participants were generally resilient in the face of identified environmental challenges, activity participation was significantly higher in areas characterised by accessibility (familiarity, proximity, and usability), amenity (age-appropriateness and aesthetic appeal), and social network interaction and support. Prevailing environmental constraints to activity participation include social isolation, social obligations, and negative perceptions of local conditions.

Earthquake impacts on health and activity

The earthquakes of 2010 and 2011 constituted a major disruption to the health and activities of older adults in Christchurch. The February 2011 earthquake was particularly disruptive for vulnerable older adults; although many displayed tremendous resilience and contributed to community recovery.

Earthquake challenges: mental health problems (anxiety, depression, self-defeating behaviours, insomnia, difficulties coping with everyday life), transport network disruptions, loss of venues and destinations, cancellations of meetings and events, fragmentation of social networks, confinement and isolation, environmental hazards, disruptions to activities of daily living.

Expressions of resilience: participation in earthquake recovery activities; care of family, friends, and neighbours; undertaking disaster preparations, being adaptable and flexible with activities and routines, and maintaining and accessing networks of support.
Recommendations

Research participants made a number of recommendations during the active ageing in Christchurch study concerning alterations to the urban environment to support active ageing and post-earthquake remediation. Please contact Michael Annear if you would like more specific information.

<table>
<thead>
<tr>
<th>Context</th>
<th>Participant recommendations</th>
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<tr>
<td>Physical environment</td>
<td>Supportive pedestrian conditions (safe and contiguous walking routes, seating and shelter) Sustainable community hubs (age-appropriate and accessible resources and housing) Accessible public transportation (punctual services, proximate and sheltered bus stops, available subsidies, appropriate destinations, age-friendly buses) Parks and green spaces as destinations (equipment for older adult use, paved walking surfaces, attractive landscaping). Navigable and unique urban areas (artworks and clear signs and building numbers) Accessible public amenities (shelter, shade, and toilet access in community locations)</td>
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<tr>
<td>Social environment</td>
<td>Services and facilities provide opportunities for social interaction (multi-use facilities, seating and footpaths near play equipment, public transport routes provide access to social destinations) Positive community attitudes (young people learn about and interact with older adults, and private services and staff are supportive of older adult needs). Cooperation between community groups (sharing equipment and facilities between intergenerational user groups, older adults have opportunities to share skills, knowledge, and experiences with younger community members).</td>
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<tr>
<td>Policy</td>
<td>Age- and disability friendly buildings are entrenched in building and infrastructure codes. Funding support is available for community based aged-care services Ready access to community information and information technology, including the internet Sustainable and equitable government subsidies for public transport and user-pays facilities. Meaningful participation in policy process (consultation during development and reflection of older adult needs in published policy)</td>
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<tr>
<td>Earthquakes</td>
<td>The post-earthquake mental health needs of independently living older adults are assessed Vulnerable and potentially isolated older adults are identified and contacted The transportation needs of isolated older adults in eastern suburbs are addressed The rebuilt city is age- and disability friendly Access to venues for social and cultural events is restored and information is widely disseminated Eastern suburbs are prioritised for remediation of infrastructure and facilities (water services are restored, vacant homes are kept tidy, financial support is provided for residential transitions) Communities are safe and resilient (low building height, rebuilding in areas of low liquefaction risk, information provided to older adults concerning disaster preparedness)</td>
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Final thoughts

Christchurch has experienced a rare sequence of earthquakes that have destroyed the City's past, disrupted it's present, and forever altered its future. As we enter a phase of concerted recovery and rebuilding, we would be wise to begin this undertaking with an eye on the future. Defining trends of this century will include population ageing and increasing urbanisation. If we build our cities to be inclusive and accessible for older adults, we will have created an environment suitable for all ages and abilities.

If you would like further information about the active ageing in Christchurch study, please contact lead researcher, Michael Annear, by email: annmi304@student.otago.ac.nz