To change or not to change?

Determinants of changing lifestyle and health behaviour for dementia risk reduction

Sarang Kim

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Declaration

I, Sarang Kim, hereby declare that, except where otherwise acknowledged, this thesis is my own original work and has not been submitted for a higher degree at any other university or institution. I developed the research questions, collected data, and conducted and interpreted all statistical analyses presented herein.

Sarang Kim
"Human behavior flows from three main sources: Desire, Emotion and Knowledge"

Plato
Acknowledgement

First and foremost, I must express my sincere gratitude to my supervisor Professor Kaarin Anstey for guiding me throughout my PhD candidature and always offering encouragement, honest feedback and sound advice. I would also like to acknowledge my panel advisors: Dr. Kerry Sargent-Cox for always finding the time to read my work and providing prompt comments and suggestions; Dr. Nicolas Cherbuin for helping me develop items for the MCLHB-DRR scale.

This research would not have been possible without the many participants who kindly volunteered their time towards completing questionnaires and contributing to the focus groups. My warm gratitude goes to every one of them.

Finally, I must give my special thanks to my parents and my brother for their continued believe, love and support, Mandy for her ongoing friendship, and most deeply to Rei for her constant love and support, for keeping me sane and happy, and for making me a better person each and every day.
Précis

Behavioural and lifestyle changes are something we all try to achieve at least once in our lives. However, not everyone successfully carries out or maintains the changes we intend to make. Health behavioural and lifestyle changes for dementia risk reduction may appear to be harder to make as the changes have to be made early in our lives (most effectively in mid-life or earlier) and the changes need to be maintained for a longer period of time (until late-life). In addition, the changes need to be multi-domain as one specific lifestyle and health behaviour change may not be effective in dementia risk reduction.

Health behaviour and lifestyle factors that reduce the risk of, and increase the protection from developing dementia have been identified. However, motivations for changing lifestyle and health behaviours, as well as whether the actual health behaviour and lifestyle changes are made have yet to be identified. This thesis explores the determinants of behavioural and lifestyle changes for dementia risk reduction. The broad substantive aims of this thesis are: 1) to better understand potential consumers of dementia risk reduction interventions in relation to their perceptions of dementia and dementia risk reduction, 2) to develop a scale assessing beliefs and attitudes about lifestyle and health behavioural changes for dementia risk reduction, 3) to identify predictors of intentions to change lifestyle and health behaviour for dementia risk reduction, 4) to examine attitudes towards dementia compared to other common chronic diseases, and 5) to identify the determinants of health behavioural and lifestyle changes for dementia risk reduction.
Five sub-studies have been conducted to achieve the aims of this thesis. The first study, a focus group study, investigates motivators and barriers for intentions to change lifestyle and health behaviours for dementia risk reduction. This study also examines potential consumers’ knowledge of, and perception towards dementia. The second study involves the development of a scale based on the Health Belief Model. The third study tests the applicability of this scale on intentions to change lifestyle and health behaviours. The fourth study conducts a cross-national investigation examining people’s attitude towards dementia and their willingness to make lifestyle and health behavioural changes for dementia compared to other chronic diseases. Finally, the fifth study assesses determinants of intentions as well as actual health behavioural and lifestyle changes for dementia risk reduction among individuals with increased risk.

This thesis is the first of its kind attempting to use a theoretically driven scale to understand potential intervention users’ beliefs and attitudes about health behaviour and lifestyle changes for dementia risk reduction. The findings suggest that the determinants for behavioural and lifestyle changes were different from determinants for intentions to change lifestyle and health behaviour for dementia risk reduction. People with high intentions do not necessarily change their health behaviour and lifestyle for dementia risk reduction as well. It was also suggested that the motivations/predictors of behaviour and lifestyle changes for dementia risk reduction differ between males and females. Therefore, it would be cost effective and more accurate to take gender differences into consideration when designing interventions in dementia prevention.
Publications arising from this thesis

Journal Article


Conference Abstracts


Kim, S. Sargent-Cox, K., Cherbuin, N., & Anstey, K. J. (September 2012). Understanding intentions to change lifestyle and health behaviour for dementia
risk reduction: A study based on the health belief model. Poster presented at the National Dementia Research Forum, Canberra, Australia.


**Kim, S.** (September, 2011). Motivations and barriers to lifestyle and behaviour change for dementia risk reduction, Poster presented at the National Dementia Research Forum, Sydney, Australia.
Colloquia, Committee and Community Presentations

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**Kim, S.** (September, 2013). “Determinants of changing lifestyle and health behaviour for dementia risk reduction”. Talk at the *Australian Association of Gerontology, ACT Division Student Research Showcase*. Canberra, Australia.


**Kim, S.** (March 2011). “Motivations and barriers to lifestyle and behaviour change for dementia risk reduction”. Report for the Dementia Collaborative Research Centre – Early Diagnosis and Prevention meeting: The Australian National University.

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CHAPTER 1: Lifestyle and health behaviour and their
link with dementia risk reduction

Synopsis

This chapter lays the rationale for the key research questions guiding this thesis. The thesis aims to better understand potential consumers of dementia risk reduction interventions and to identify determinants of health behaviour and lifestyle changes for dementia risk reduction. The main objective for this research is the identification of ways to encourage people to adopt healthier lifestyle and health behaviours to reduce their risk of developing dementia. Dementia and the impact of an ageing population on society are addressed in this chapter followed by the importance of interventions. This chapter concludes with identifying the specific aims of this study, research questions and outline the structure of this thesis.
1.1 Introduction

The Australian population is ageing rapidly with declining fertility rates and increasing longevity (Department of the Treasury, 2004). The Australian Bureau of Statistics (ABS) reported that 14.4% of the Australian population was 65 years or older in 2013 (ABS, 2013a). The numbers in this age group are expected to rise as the first wave of the baby boomer generation (those born from 1946 to 1965) turned 65 in 2011 (see Figure 1.1 for projections; ABS, 2013c). Population ageing should be celebrated as it reflects remarkable advances in health and overall quality of life (UNFPA, 2012). However, the social and economic implications of this phenomenon are also profound and it presents major challenges.

Figure 1.1 Projected Australian population aged 65 and over, 2012 – 2050
Older age is often associated with greater vulnerability and susceptibility to disease and disability (Almeida, Norman, Hankey, Jamrozik, & Flicker, 2006). Among diseases and disabilities affecting older adults, dementia, in its many forms, is one of the most disabling and burdensome health conditions that decrease the quality of life in individuals aged 65 years and older (Access Economics, 2009; Desai, Grossberg, & Sheth, 2004). In 2011, there were an estimated 298,000 people with dementia (Australian Institute of Health and Welfare, 2012) and it was the third leading cause of death following ischaemic heart and cerebrovascular diseases (Table 1.1; ABS, 2013b), taking almost 10,000 lives. This statistic indicates a massive increase in dementia of 126% since 2002. Without prevention or intervention, the number of people with dementia in Australia is expected to be close to 0.9 million by 2050 (Figure 1.2; Australian Institute of Health and Welfare, 2012).

The growing number of people with dementia and the costs associated with the disease places a heavy economic burden on society. The total direct health and aged care system expenditure on people with dementia was estimated to be $4.9 billion in 2009-10, excluding expenditure for people with dementia in hospital who were admitted for some other reasons (Australian Institute of Health and Welfare, 2012). The expenditure on dementia is projected to be $83 billion representing 11% of health and residential aged care sector spending by 2060 (Access Economics, 2009). This makes dementia one of the fastest growing sources of major disease burden, overtaking coronary heart disease in its total wellbeing cost by 2023.
Table 1.1 Ten leading causes of death in Australia in 2002, 2006, and 2011

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>2002</th>
<th>Rank</th>
<th>2006</th>
<th>Rank</th>
<th>2011</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischaemic heart diseases</td>
<td>26,063</td>
<td>1</td>
<td>23,132</td>
<td>1</td>
<td>21,513</td>
<td>1</td>
</tr>
<tr>
<td>Cerebrovascular diseases</td>
<td>12,533</td>
<td>2</td>
<td>11,479</td>
<td>2</td>
<td>11,251</td>
<td>2</td>
</tr>
<tr>
<td>Dementia and Alzheimer's disease</td>
<td>4,364</td>
<td>6</td>
<td>6,550</td>
<td>4</td>
<td>9,864</td>
<td>3</td>
</tr>
<tr>
<td>Trachea, bronchus and lung cancer</td>
<td>7,303</td>
<td>3</td>
<td>7,353</td>
<td>3</td>
<td>8,114</td>
<td>4</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>6,256</td>
<td>4</td>
<td>5,463</td>
<td>5</td>
<td>6,570</td>
<td>5</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3,329</td>
<td>9</td>
<td>3,669</td>
<td>8</td>
<td>4,209</td>
<td>6</td>
</tr>
<tr>
<td>Colon, sigmoid, rectum and anus cancer</td>
<td>4,649</td>
<td>5</td>
<td>3,857</td>
<td>6</td>
<td>4,087</td>
<td>7</td>
</tr>
<tr>
<td>Blood and lymph cancer</td>
<td>3,791</td>
<td>7</td>
<td>3,700</td>
<td>7</td>
<td>3,978</td>
<td>8</td>
</tr>
<tr>
<td>Heart failure</td>
<td>3,367</td>
<td>8</td>
<td>2,902</td>
<td>11</td>
<td>3,488</td>
<td>9</td>
</tr>
<tr>
<td>Diseases of the urinary system</td>
<td>2,887</td>
<td>11</td>
<td>3,197</td>
<td>9</td>
<td>3,386</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: ABS, 2013b
Figure 1.2 Estimated number of people with dementia by gender (Source: Australian Institute of Health and Welfare, 2012)
Despite the high prevalence and severity of the disease, dementia and cognitive decline are often thought of as a part of normal ageing (Clare, Goater, & Woods, 2006), unavoidable and incurable (Flicker, 2009). Although dementia is a condition that primarily affects older people, it is not a normal part of ageing (Bartlett, et al., 2006). It is different from the “age-related memory disorder,” which is characterised by loss of memory in people aged 50 or over with no other explainable causation and is considered a part of the normal ageing process (Casanova-Sotolongo, Casanova-Carrillo, & Casanova-Carrillo, 2004). At present, there are no cures or effective treatment for dementia (Chung, Mehta, Shumway, Alvidrez, & Perez-Stable, 2009; Coley et al., 2008; Polidori, Nelles, & Pientka, 2010; Rockwood, Wallack, & Tallis, 2003) and drugs given to dementia sufferers have mainly symptomatic effects (Rodda & Carter, 2012). Therefore, prevention of dementia is the key to prevalence and incidence reduction and is the key objective of current dementia research (Mangialasche, Kivipelto, Solomon, & Fratiglioni, 2012). Increasing attention is being paid to factors that might prevent or delay the onset of dementia and it is believed that intervening early by reducing dementia risk factors has the potential to reduce risk and delay onset of dementia for individuals and reduce the incidence of dementia in the population (Middleton & Yaffe, 2010). Barnes and Yaffe (2011) estimated that up to half of AD (the most prevalent cause of dementia) cases are potentially attributable to seven risk factors (diabetes, midlife hypertension, midlife obesity, depression, physical inactivity, smoking and cognitive inactivity). They estimated that up to 3 million cases of AD could be prevented worldwide by reducing 10-25% of these risk factors.
A full review of the risk factors for dementia, including seven risk factors stated above, will be examined in more detail in Chapter 2. In summary, research has shown that lifestyle factors play a major role in reducing the risk of dementia. For example, participating in cognitively stimulating leisure activities has been associated with lower incidences of dementia (Akbaraly et al., 2009; Barnes et al., 2013; Verghese et al., 2003; Wilson, Barnes, & Bennett, 2003). Moreover, regular physical activity (Abbott et al., 2004; Angevaren, Aufdemkampe, Verhaar, Aleman, & Vanhees, 2008; Flicker et al., 2005; van Uffelen, Paw, Hopman-Rock, & van Mechelen, 2008; Weuve et al., 2004), higher engagement in social activity (Fratiglioni, Paillard-Borg, & Winblad, 2004), and a moderate alcohol consumption (Anstey, Mack, & Cherbuin, 2009; Anttila et al., 2004; Espeland et al., 2005; Flicker et al., 2005; Ganguli, Vander Bilt, Saxton, Shen, & Dodge, 2005; Solfrizzi et al., 2007; Truelsen, Thudium, & Gronaek, 2002) appear to be associated with a lower risk of dementia. On the other hand, smoking (Anstey, von Sanden, Salim, & O'Kearney, 2007), high blood pressure (Razay, Williams, King, Smith, & Wilcock, 2009), mid-life high cholesterol (Anstey, Lipnicki, & Low, 2008), alcoholism and excessive alcohol consumption (Ferreira & Willoughby, 2008), depression (Ownby, Crocco, Acevedo, John, & Loewenstein, 2006), diabetes (van den Berg, de Craen, Biessels, Gussekloo, & Westendorp, 2006), and mid-life obesity (Anstey, Cherbuin, Budge, & Young, 2011; Farooki, 2009; D. Gustafson, 2008) are associated with an increased risk of dementia.

However, to date, there has not been any large scale community based, lifestyle interventions in Australia to examine their efficacy in reducing the risk of cognitive decline and dementia. It is critical that behavioural interventions are
developed locally in Australia to account for cultural influences, policy setups and health systems. Research translation in the Australian context interventions for preventing dementia is therefore necessary.

Furthermore, to develop an effective and targeted population based lifestyle intervention with the aim of reducing risk factors for dementia, it is necessary to first understand the targeted population and how behaviour changes occur for them. The opening quotation by Plato in this thesis (p. iii) suggests underlying foundations to understand human behaviour: desire, emotions and knowledge. Recent researchers have not shifted away from these key resources and effort to understand behaviour and/or behaviour change has been focused on motivation or intentions (desire), attitudes toward the behaviour (emotions) and literacy or awareness level (knowledge). However, literature on behaviour change for dementia prevention is still lacking.
1.2. Aims and Research Questions

Due to the gap in current literature, it is absolutely necessary to understand potential consumers of the interventions in terms of their attitudes towards, and knowledge on dementia and dementia risk reduction. It is also important to gain an understanding of factors contributing to both the intention to change behaviour and the actual behaviour changes needed for dementia risk reduction as it will lead to more effective interventions. The aim of this thesis is therefore to understand potential consumers of a dementia risk reduction intervention in relation to their perceptions of dementia and dementia risk reduction, and to examine how individuals' perception of dementia and motivations towards lifestyle changes play a role on the actual behavioural and lifestyle changes. In order to achieve the overall aim, six research questions will guide the research:

**Question 1. What are the motivators and barriers surrounding health behaviour and lifestyle change for dementia risk reduction?**

This question captures the most fundamental elements for any effective behaviour and lifestyle focused interventions: understanding of intervention users. Despite the fact that there are no known cures for dementia, multiple lifestyle risk factors for dementia have been identified. This suggests that people may be able to enjoy a longer life free from dementia if they are willing to modify their health behaviour and lifestyle (Noar, Benac, & Harris, 2007).
It is therefore essential to first give voice to consumers and identify their knowledge regarding risk factors for developing dementia, as well as motivators and barriers for behaviour change for dementia risk reduction. This information will be important for developing effective interventions because it allows us to understand why some people are engaging in lifestyle and behavioural changes to delay or prevent the onset of dementia. This information will also help in the development of interventions to assist people who are not amenable to lifestyle changes.

**Question 2.** Which behaviour change model would be most suitable to act as the framework for the intervention program for dementia risk reduction?

Theories provide a helpful basis for designing interventions to change behaviour (Michie, Johnston, Francis, Hardeman, & Eccles, 2008) and there is increasing recognition that interventions to change behaviour should be drawn on theories of behaviour. There are number of behaviour change models explaining how behaviour change occurs using different mechanisms. The six commonly used models are Health Belief model, Health Locus of Control, Theory of Reasoned Action/Theory of Planned Behaviour, Stages of Change/Transtheoretical Model of Change, and Common Sense Model of Self-Regulation. These models will be described and compared against each other to address the second research question. The most suitable model for dementia risk
reduction should be decided after strengths and weaknesses of each model are considered. The chosen behaviour change model will drive the rest of the thesis.

**Question 3.** Can we use the theoretical model to qualitatively measure attitudes, beliefs and motivations regarding behaviour change for dementia risk reduction with good reliability and validity?

There are no studies to date using a behavioural change model as a theoretical framework to examine attitudes regarding motivation for behaviour and lifestyle changes for dementia risk reduction. The third research question relates to the development and evaluation of a scale developed based on the chosen behaviour change model from the second research question. A scale will be designed to provide a quantitative measurement of the domains from the chosen model, which assesses beliefs and attitudes about lifestyle and health behavioural changes for dementia risk reduction among middle-aged and older Australians.

**Question 4.** What factors of the chosen behaviour change model associate most with intentions to change lifestyle and health behaviour for dementia risk reduction?

The six commonly used models considered in Question 2 explain how specific behaviour change occurs using different mechanisms. However,
predictors of intention to change lifestyle and health behaviours for dementia risk reduction may be different from the predictors of other behaviour changes. For this reason, the fourth research question addresses the applicability of the chosen behaviour change model on measuring the intentions of lifestyle and behavioural changes for dementia risk reduction using the scale developed as a part of this thesis.

**Question 5.** How would attitudes and intentions to perform health behaviours for dementia risk reduction be different from attitudes and intentions to perform health behaviours to reduce risk for other chronic diseases?

Unlike other chronic diseases, dementia has a strong stigma associated with it. It is perceived that ignorance is often the basis of stigma and discrimination, and education as a priority in combating it. Stigma is also very much embedded within cultural norms and expectations and therefore is culturally sensitive. Since, individuals’ knowledge and attitude about an illness is generally linked to their illness-related behaviours (Lee, Lee, & Diwan, 2010), assessing individuals’ knowledge about an illness and integrating it into educational materials for the general public, and intervention strategies for health care professionals are the first steps in addressing appropriate illness-related behaviours. Unfortunately, little is known about the attitudes and beliefs of the elderly towards dementia, especially in comparison to other chronic diseases. Moreover, there have been no comprehensive studies conducted in a cross cultural
context that have systematically explored the nature, and or the extent of stigmatising attitudes and beliefs towards dementia or people living with dementia. Cross cultural studies in dementia risk reduction can help develop better intervention as culture plays an important role in human behaviours and behaviour changes. The fifth research question therefore investigates individuals’ attitude towards dementia and their intention to change their lifestyle and health behaviours for dementia prevention, in comparison to other chronic diseases.

**Question 6. Would high intention to change translate to actual behaviour and lifestyle changes for dementia risk reduction?**

Most people attempt to change an aspect of their health behaviour at some point in their life (Ogden, Karim, Choudry, & Brown, 2007). These intentions are sometimes translated successfully into behaviour changes. However, on many occasions, such intentions never result in actual behaviour change or may do so only for a short period of time (Ogden et al., 2007). Failure to translate intention into behaviour change is often referred to as the intention behaviour gap (Sniehotta, Scholz, & Schwarzer, 2005).

Behaviour change for dementia prevention is especially challenging because all the known risk and protective factors do not guarantee the prevention of dementia. The last research question will be the most important question in this thesis. It will ask whether people with higher intentions to change their health behaviours and lifestyle will result in behavioural and lifestyle change and
maintenance of that behaviour change. Characteristics of individuals with behaviour and lifestyle changes as well as other determinants of the behaviour change will be examined.

1.3 Thesis outline

Chapter 2 reviews the relevant literature. The definitions of dementia and mild cognitive impairment will be examined followed by a summary of risk factors that are associated with dementia and cognitive impairment. Studies that have focused on dementia intervention for older adults will also be discussed.

Chapter 3 presents the focus groups study, answering the first research question of what motivates and discourages people from changing their health behaviours and lifestyle for dementia risk reduction. In addition, participants’ knowledge of, and perception towards dementia will be examined.

Chapter 4 presents the theoretical frameworks and practical uses of six commonly used behaviour change models. The benefits and limitations of each model will be considered and components within each model will be examined to see how they can be applied to dementia risk reduction. Finally, the most suitable behaviour change model will be chosen to answer the second research question.

Chapter 5 will describe the development of the questionnaire which will assist in answering the third research question: development and evaluation of the scale developed based on the chosen behaviour change model. Chapter 6 will investigate the applicability of the chosen behaviour change model, the Health Belief Model, on intention to change lifestyle and behaviours.
Chapter 7 will examine people's attitudes towards dementia and their willingness to make lifestyle and behavioural changes for dementia prevention in comparison to other chronic diseases. Dementia literacy and stigma will be measured and compared across two countries, Australia and South Korea, with different cultural backgrounds (Western and Eastern) to examine cultural effects.

Chapter 8 will assess determinants of intention to change lifestyle and health behaviour for dementia risk reduction among individuals with dementia risk factors. It will then examine whether high intentions will be followed by actual lifestyle and behavioural changes in individuals after psychoeducation interventions, which provide information on how to modify lifestyle and health behaviours. The questionnaire developed in Chapter 5 will be incorporated in an online intervention study (Body Brain Lifestyle (BBL)) to measure the psychological aspects of behavioural change.

Finally, Chapter 9 offers an integration of the results of the research, articulating the main findings, and conveying the contributions that the research outcomes offer. This chapter also identifies some of the limitations of the research and offers recommendations for future research and policy implications.
CHAPTER 2: Risk factors and interventions for dementia

risk reduction

Synopsis

The purpose of this chapter is to provide a review of relevant current literature in the area of dementia prevention/risk reduction. The definition of dementia and mild cognitive impairment will be discussed followed by an examination of both modifiable and non-modifiable risk factors for dementia and mild cognitive impairment. This review will also investigate dementia prevention interventions that are either currently available or have been recently completed. Finally, this chapter will highlight the need for Australian community-based interventions that address multi-risk factors as an effective way of reducing dementia risk and overall dementia prevalence.
2.1 Introduction

This chapter provides reviews of literature related to the current project. The definition of dementia and mild cognitive impairment will be examined followed by a summary of risk factors for dementia and mild cognitive impairment. Lifestyle interventions on dementia will also be examined. The purpose of this review chapter is to provide a rationale and background for the main research objectives of this thesis.

2.1.1 Dementia and mild cognitive impairment

Dementia is an umbrella term used to describe a syndrome associated with more than 100 different diseases that are characterized by the progressive global deterioration of cognitive functioning (Australian Institute of Health and Welfare, 2012; NIH, 2010). Typical symptoms include decline in the person’s ability to remember, understand, communicate and use learned skills (Department of Health, 2009). In the longer term, it leads to difficulty in performing the activities of daily living and loss of independence. Non-cognitive symptoms, primarily mood and behavioural changes, are also common particularly as the part of the brain that controls emotion becomes affected (Alzheimer’s Society, 2009). Dementia is usually developed gradually and is progressive in nature (Australian Institute of Health and Welfare, 2012). Diagnostic and Statistical Manual of Mental Disorders (DSM-V; APS, 2013) and International Classification of Diseases (ICD-10; WHO, 1992) are the standard diagnostic tools that are commonly used for clinical diagnosis of dementia and cognitive impairment.

Alzheimer’s disease (AD) is the most common form of dementia and accounts for between 50 to 70% of all dementia cases (Alzheimer’s Australia,
AD is characterised by short term memory loss, apathy and depression in the early stages (Australian Institute of Health and Welfare, 2012). It is common among older females than males (Vina & Lloret, 2010). Other common forms of dementia include vascular dementia (VaD), which is considered to be the second most common type of dementia accounting for about 20-30% of dementia cases. VaD is associated with problems of circulation of blood to the brain (e.g., stroke) and mood fluctuations are more prominent in people with VaD than AD (Gustafson & Passant, 2004; Seeher, Withall, & Brodaty, 2011). Frontotemporal dementia, which is more common in males with a younger onset of dementia (Ratnavalli, Brayne, Dawson, & Hodges, 2002), is associated with personality and mood changes, disinhibition and language difficulties (Gorno-Tempini et al., 2004). Dementia with Lewy bodies is a result of development of abnormal cells in the brain and is characterised with fluctuation in cognitive ability and visual hallucinations (Collerton, Burn, McKeith, & O'Brien, 2003). Progression tends to be more rapid than AD. Lastly, dementia in Parkinson’s disease (PD) is the most common neurodegenerative adult-onset movement disorder (Marti, Tolosa, & de la Cerda, 2007; Seeher et al., 2011).

The term mild cognitive impairment (MCI) on the other hand, is used to fill the gap between cognitive changes associated with normal ageing and those associated with dementia (Dubois & Albert, 2004; Petersen et al., 2001). People with MCI have cognitive decline greater than expected for an individual’s age and education level but that does not interfere notably with activities of daily life (Gauthier et al., 2006). MCI is also regarded as a risk state for dementia because it
has a high risk of progression to dementia, particularly of the Alzheimer type (Palmer, Fratiglioni, & Winblad, 2003).

2.1.2 Risk and protective factors for dementia and mild cognitive impairment

Risk factors are not causes of dementia although they may increase a person’s chances of developing dementia. Therefore, the more dementia risk factors one has, the greater the chance one might have in developing dementia. The number of risk and protective factors for late life cognitive impairment and dementia are identified below. These consist of both modifiable and unmodifiable factors.

2.1.2.1 Unmodifiable risk and protective factors for dementia and mild cognitive impairment

Advancing age is the strongest known risk factor for dementia (Lindsay et al., 2002; Qiu, Kivipelto, & von Strauss, 2009) even though dementia is not age dependent. The rate of dementia roughly doubles every 5 years between the ages of 70 and 84, and the rate of increase slows thereafter (Anstey et al., 2010). However, onset of dementia can occur before the age of 65 although it is very uncommon and when it does, it is likely due to a genetic cause (Alzheimer's Disease International, 2009).

Family history of dementia is also generally considered a definite risk factor (Fratiglioni, 1996) where an increased risk of AD has been consistently reported among relatives of patients with AD (Silverman, Ciresi, Smith, Marin, & Schnaider-Beeri, 2005). Both twin studies and population based studies have indicated that genetic factors play an important role in developing dementia (Brickell et al., 2006; Lautenschlager et al., 1996; Pedersen et al., 1998).
In regard to genetics, ε4 allele of the Apolipoprotein E (APOE – ε4) gene on chromosome 19 has been identified as a major risk factor for AD, MCI and VaD (Ashford, 2004; Davidson et al., 2006; DeCarli et al., 2001; Seripa et al., 2009). Bang and colleagues (2003) conducted a meta-analysis of studies that had included over 10,000 patients with dementia. They found that the association between APOE-ε4 and AD (OR 4.2) was stronger than between APOE-ε4 and VaD (OR 1.3) and between APOE-ε4 and mixed dementia (OR 2.6). On the other hand, the ε2 allele of the APOE E appears to be a protective factor of dementia (Farrer et al., 1997). However, recent research has suggested that while the presence of the APOE ε2 genotype was associated with a somewhat reduced risk of dementia, neurologic examination revealed its association with increased AD neuropathology among the oldest old. In other words, the oldest old APOE ε2 carriers may have some mechanism in maintaining cognition independently of the formation of AD pathology (Berlau, Corrada, Head, & Kawas, 2009).

2.1.2.2 Modifiable risk and protective factors

Modifiable risk factors for dementia provide an opportunity to significantly lower the future incidence of dementia. Although some of these modifiable risk factors require stronger evidence to support their effect on reducing the risk of developing dementia, some established risk factors can be the key to the reduction in prevalence and incidence of dementia. Modifiable risk and protective factors are listed below:

2.1.2.2.1 Cognitively stimulating activities

The most recognised modifiable risk factor for dementia is engaging in cognitively stimulating activities. Observational studies have shown that a
decreased risk of AD was associated with more frequent involvement in activities considered to be cognitively engaging (Akbaraly et al., 2009; Verghese et al., 2003; Wilson et al., 2002; Wilson, Scherr, Schneider, Tang, & Bennett, 2007). Cognitive engagement, such as reading, writing, crossword puzzles, board or card games, group discussions, or playing music, has also been positively associated with a lower risk of MCI (Verghese et al., 2006; Wilson, Bennett, et al., 2003).

Positive association was also found in Wilson and colleagues’ (2007) 5 year longitudinal study examining the relationship between cognitive activity (reading a newspaper, playing games, visiting a library, or attending a play) and the risk of developing AD. They found that more frequent participation in cognitive activity was found to significantly reduce the risk of AD (HR 0.58, 95% CI 0.44 – 0.77) and a cognitively inactive person was 2.6 times more likely to develop AD than a cognitively active person.

Another longitudinal trial study, Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study (Ball et al., 2002; Rebok et al., 2014; Willis et al., 2006), examined the effects of cognitive training on improving long term cognitive performance. Participants were randomly assigned to one of three cognitive treatment groups (memory training, reasoning training, or speed of processing training) or the control group with no contact. Each intervention group showed improvement in the targeted cognitive ability compared with baseline, and the effect was still evident two, five, and ten years later. In addition, reasoning and the speed of processing trainings, but not memory training protected against functional decline (measured with self-reported instrumental activities of daily living (IADL)) over the 10 year follow up period compared with the control.
condition. This outcome suggests that directed cognitive exercise can produce robust and enduring benefits on a general functional outcome that is highly relevant to dementia onset (Valenzuela & Sachdev, 2009).

Systematic reviews have also shown a positive association between cognitive activities and the protection of developing dementia. Valenzuela and Sachdev (2009) systematically reviewed randomized clinical trials of cognitive training on normal older people. They concluded that cognitive exercise training, using several cognitive tasks on memory, problem solving, and information processing speed, in healthy older individuals produced strong and persistent protective effects on longitudinal neuropsychological performance.

Another systematic review (Stern & Munn, 2010) aiming to determine the effectiveness of cognitive leisure activities in preventing dementia among older adults found that five out of six studies showed a positive association between participating in activities, and a reduced risk of developing dementia when interventions were undertaken in middle adulthood. Six out of seven studies produced a positive association for late life participation. Television viewing was used as a cognitive activity in studies that did not produce a positive association between cognitive activity and a reduced risk of developing dementia (Fabrigoule et al., 1995; Lindstrom et al., 2005). Therefore, it can be argued that cognitive activities except for television watching can be a protective factor for dementia (Rundek & Bennett, 2006).

2.1.2.2 Physical activity

Regular and high levels of physical activities are associated with a decreased risk of dementia (Lindsay et al., 2002; Rolland & Vellas, 2008).
Observational studies demonstrated an inverse association between physical activity with cognitive decline (Almeida et al., 2006; van Gelder et al., 2004; Weuve et al., 2004; Yaffe, Barnes, Nevitt, Lui, & Covinsky, 2001) and increased levels of physical activity are associated with a subsequently decreased incidence of dementia (Abbott et al., 2004; Podewils et al., 2005).

A systematic review of randomised control trials (RCTs) has examined the effects of physical exercise on the cognitive abilities of older adults (Colcombe & Kramer, 2003). The overall effect size from this review was 0.48 for exercisers and 0.16 for those in control groups, indicative of a relative effect size of approximately 0.32. More specifically, participants who took part in combined strength and aerobic training programs improved to a reliably greater degree than those who participated in aerobic training alone. Participation in relatively brief training programs provided at least as much benefit as moderate training, but not quite as much as long-term training programs. In addition, short bouts of exercise (<30 min) had very little impact on cognitive function (Colcombe & Kramer, 2003). However, these RCT studies did not have longitudinal follow ups, and therefore the applicability of these findings for the prevention of dementia remains unclear. Another three systematic reviews (Angevaren et al., 2008; Jedrziewski, Lee, & Trojanowski, 2007; van Uffelen et al., 2008) also suggested significant reduction in the risk of dementia with greater physical activity although not all studies included in these reviews showed the association. However, those studies that found no association had relatively small sample sizes when compared to the sample sizes of other studies with significant association.
An intervention study has produced promising results (Lautenschlager et al., 2008), supporting the benefits of physical activity. Participants in this study were randomly assigned to a 24 week home based program of physical activity (at least 150 minutes of moderate-intensity physical activity per week, where the most frequently recommended type of activity was walking although other forms of exercise were also possible) or control group. The findings indicated that the intervention group improved 1.3 points compared to those in control group on the Alzheimer Disease Assessment Scale – Cognitive Subscale (ADAS-Cog) at the completion of the 24 week trial. The improvement was maintained for 12 months after the completion of the intervention. Although majority of the previous studies stated above have shown a positive association between physical activities and the prevention of dementia, further research identifying the type, intensity, frequency, and duration of the physical activities that most effectively reduced the risk of cognitive impairment and dementia should be conducted.

2.1.2.2.3 Dietary factors

Dietary factors have mixed evidence in their association with dementia. The use of supplementary folate supplements, with or without vitamin B12, to prevent cognitive decline has produced conflicting results (Malouf & Grimley Evans, 2008). Some studies have found that an increased intake of serum concentrations of vitamin B6, vitamin B12, or folate in mid or late life led to a reduced cognitive decline or dementia (Corrada, Kawas, Hallfrisch, Muller, & Brookmeyer, 2005; Tucker, Qiao, Scott, Rosenberg, & Spiro, 2005). However, other studies found no relation (Luchsinger, Tang, Miller, Green, & Mayeux, 2007; Morris et al., 2006) or found that increased dietary folate intake was
associated with increased cognitive decline (Morris et al., 2005). A RCT that examined the effect of B vitamins on maintenance of cognitive function also showed that combined B vitamin supplements did not delay cognitive decline (Kang, Ascherio, & Grodstein, 2005). In addition, a recent review of vitamin E concluded that there was no evidence of efficacy for the prevention of dementia (Isaac, Quinn, & Tabet, 2008).

The supplementation with omega 3 polyunsaturated fatty acids (PUFAs) has been suggested as a possible intervention for dementia. A recent RCT involving twenty three people with MCI and dementia found some benefits of omega 3 PUFAs but the study was inconclusive (Chiu et al., 2008). A systematic review examining the association between fish consumption or taking long chain omega 3 fatty acid supplements and the risk of AD or cognitive decline (Fotuhi, Mohassel, & Yaffe, 2009) supported a negative association between fish consumption and cognitive decline. However, clinical trials have not provided conclusive evidence on the benefits of long-chain omega-3 fatty acids in the prevention of dementia.

Mediterranean-type diet, characterised by high intake of fruits, vegetables, whole grain products, and fish, is also associated with lower risk for AD (Scarmeas, Luchsinger, et al., 2009; Scarmeas, Stern, Tang, Mayeux, & Luchsinger, 2006) and mild cognitive impairment (Feart et al., 2009; Scarmeas, Stern, et al., 2009). However, no RCTs have been conducted to support that the Mediterranean diet improves or maintains cognitive ability or function. Due to the inconclusive findings of the effects of dietary factors on dementia, further research is needed in this area.
2.1.2.2.4 Medical factors

Broad medical factors, such as diabetes, stroke, obesity, hypertension, and high cholesterol, are also contribute to the development of dementia and cognitive decline. Diabetes mellitus is a well-established risk factor for the development of cognitive impairment and dementia (Biessels, Staekenborg, Brunner, Brayne, & Scheltens, 2006; Lu, Lin, & Kuo, 2009; van den Berg et al., 2006). A systematic review has shown that the incidence of dementia was increased by 50 to 100% in people with diabetes relative to people without diabetes (Biessels et al., 2006). Another review indicated that an increased risk of AD (Relative risk (RR) of 1.39), and VaD (RR of 2.38) were found in diabetic patients (Lu et al., 2009).

It is suggested that other established vascular risk factors (stroke, hypertension, and obesity) also increase the risk for both vascular dementia and AD, and accelerate the associated cognitive decline (Farooki, 2009; Razay et al., 2009; White & Launer, 2006). Stroke has been reported to be positively associated with dementia (Reitz, Bos, Hofman, Koudstaal, & Breteler, 2008). A review paper that examined the relationship between stroke and dementia reported that in community-based studies, the prevalence of dementia in stroke survivors is about 30 % and the incidence of new onset dementia after stroke increases from 7 % after one year to 48% after 25 years (Leys, Henon, Mackowiak-Cordilini, & Pasquier, 2005).

Low and high blood pressure levels have also been reported to relate to faster cognitive decline in AD patients (Razay et al., 2009). Qiu and colleagues reviewed population based observational studies and randomised controlled trials examining the relationship between blood pressure, antihypertensive treatments
and dementia (Qiu, Winblad, & Fratiglioni, 2005). They found that four out of five longitudinal studies reported a positive association between midlife hypertension and an increased risk of late life dementia and cognitive impairment. However, there was no strong evidence suggesting that hypertension in later life is a risk factor for dementia unlike hypertension in mid-life. Another review indicated that antihypertensive drug treatment may reduce VaD, showing a weak association between antihypertensive drug use and an improvement in cognitive impairment (Aronow & Frishman, 2006). However, these findings were not replicated in a review by McGuinness and colleagues (2008) where they concluded that there was no strong evidence that blood pressure lowering treatment prevented the development of dementia or cognitive impairment in hypertensive patients.

Cholesterol level is another risk factor for dementia and cognitive decline. A systematic review conducted by Anstey and colleagues (2008) found consistent associations between high midlife total serum cholesterol and an increased risk of dementia. However, the review found no evidence supporting an association between late life cholesterol level and dementia.

Abnormal body mass index (BMI) has also been established as a risk factor for dementia (Gorospe & Dave, 2007; Kivipelto et al., 2005; Whitmer, Gunderson, Barrett-Connor, Quesenberry, & Yaffe, 2005). A recent meta-analyses of 16 articles reporting on 15 prospective studies conducted by Anstey and colleagues (2011), investigated the relationship between body mass index (in midlife and late-life) and dementia. Findings showed that BMI in late-life was not associated with dementia. However, low BMI in midlife was associated with 1.96
(95% CI: 1.32, 2.92) times the risk of developing AD. The pooled relative risks for AD, VaD, and Any Dementia for overweight BMI (25-30) in midlife compared with normal BMI (18-25) were 1.35 (95% CI: 1.19, 1.54), 1.33 (95% CI: 1.02, 1.75), and 1.26 (95% CI: 1.10, 1.44), respectively. In addition, the pooled relative risks of dementia for obese BMI (30+) in midlife compared to normal BMI were 2.04 (95% CI: 1.59, 2.62) and 1.64 (95% CI: 1.34, 2.00) respectively. Therefore, the study concluded that obesity and being under and overweight in midlife increased the risk of dementia.

Lastly, head injuries have been found to increase the severity of dementia (Fleminger, Oliver, Lovestone, Rabe-Hesketh, & Giora, 2003). A meta-analysis of 15 case controlled studies examining the relationship between prior head injury with loss of consciousness and the risk of developing AD have indicated that a history of prior head injury was associated with an increased risk of developing AD (OR 1.58, 95% CI 1.21 – 2.06). However, this increased risk was only apparent in males (OR 2.26; 95% CI 1.13 - 4.53) and not females (OR 0.92; 95% CI 0.53 – 1.59). Moreover, there are inconsistent results where several epidemiological studies have reported an increased risk of dementia in individuals who had suffered head injury (Plassman et al., 2000) while other studies have found no association (Lindsay et al., 2002).

2.1.2.2.5 Smoking

There have been conflicting studies suggesting that smoking is positively associated with developing dementia. Systematic reviews of prospective studies that examined the association between tobacco use and the development of AD and cognitive decline has been conducted (Almeida, Hulse, Lawrence, & Flicker,
Although one systematic study (Almeida et al., 2002) examining case-control and cohort studies produced conflicting results as to the direction of the association between smoking and AD, two other systematic studies (Anstey et al., 2007; Peters, Poulter, et al., 2008) have found that smoking does indeed increase the risk for dementia. Anstey and colleagues found that the current smokers at baseline, relative to non-smokers, had the greatest risks of incidence of AD (RR 1.79, 95% CI 1.43 – 2.23) followed by VaD (RR 1.78, 95% CI 1.28 – 2.47) and any dementia (RR 1.27, 95% CI 1.02 – 1.60). Current smokers at baseline also showed significantly greater cognitive decline compared to non-smokers. However, former smokers do not appear to be at increased risk of AD. Peters and colleagues’ (2008) findings also suggested that people who currently smoke have an increased risk of AD and may have an increased risk of other dementias. Therefore, it is important to encourage people to stop smoking.

2.1.2.2.6 Alcohol consumption

Alcohol consumption has been identified as one of the risk factors of dementia (Anstey et al., 2009; Anttila et al., 2004; Espeland et al., 2005; Ganguli et al., 2005; Peters, Peters, Warner, Beckett, & Bulpitt, 2008; Sabia et al., 2014). Two systematic review papers examined the association between alcohol use and the development of dementia and cognitive decline (Anstey et al., 2009; Peters, Peters, et al., 2008). These reviews have shown that individuals who drink light to moderate amounts of alcohol, in comparison to abstainers or heavy drinkers, in late life appear to be at reduced risk of AD and cognitive decline. Peters and colleagues (2008) carried out meta-analyses on the relationship between incident...
dementia and alcohol consumption and found that a small amount of alcohol reduced the risk of dementia (RR 0.63, 95% CI 0.53 – 0.75) and AD (RR 0.57, 95% CI 0.44 – 0.74), but not VaD (RR 0.82, 95% CI 0.50 – 1.35) and cognitive decline (RR 0.89, 95% CI 0.67 – 1.17). Therefore, while excess alcohol intake should be discouraged due to its association with a faster cognitive decline compared to light to moderate alcohol consumption (Sabia et al., 2014), it appears safe and reasonable to recommend the continuation of moderate alcohol intake for people who are already consuming alcohol moderately (Simons, Simons, McCallum, & Friedlander, 2006).

2.1.2.2.7 Social engagement

It is a common belief that the maintenance of an active life help older people to preserve their physical and mental health (Fratiglioni et al., 2004). However, no RCTs were identified that evaluated a social engagement intervention to improve or maintain cognitive ability or function: the evidence regarding social engagement preventing dementia is entirely observational (Flicker, 2009).

Fratiglioni and colleagues (2004) explored the effect of social networks, physical leisure, and non-physical activity on cognition and dementia. They concluded that an active and socially integrated lifestyle in late life protects against dementia and AD. James et al. (2011) also found that participants who were more socially restricted had a greater likelihood of developing dementia within the four year follow up period. As such, avoiding social isolation and maintaining various types of social activities may assist with protection against cognitive impairment and dementia in late life.
Another prospective study examined whether social networks had a protective association with the incidence of dementia among elderly women (Crooks, Lubben, Petitti, Little, & Chiu, 2008). Over four years of follow up, they found that women with larger social networks had a reduced risk of dementia compared to those with smaller networks after controlling for age at entry, education, hormone use, cognitive status scores, and health conditions (HR 0.74, 95% CI 0.57 – 0.97). Further RCT studies should be conducted to support the association between social networks and the development of dementia.

2.1.2.2.8 Depression

Depression and depressive symptoms have been consistently found to be associated with dementia and cognitive decline. Individuals with a history of depression are more likely to be diagnosed with AD later in life showing pooled OR of 2.03 (95% CI: 1.73 – 2.38) for case control and of 1.90 (95% CI: 1.55 – 2.33) for cohort studies (Ownby et al., 2006). Another study provided further evidence that a history of depression, particularly an early onset depressive disorder increases the risk of AD (HR 3.76, 95% CI: 1.41 – 10.06) (Geerlings, den Heijer, Koudstaal, Hoffman, & Breteler, 2008). However, since depression may be a prodromal symptom of AD (Ownby et al., 2006), the direction of the association between depression and dementia should be investigated further.

2.1.2.2.9 Pesticide exposure

Pesticide exposure is believed to increase the risk of developing dementia although the correlation between pesticide exposure and dementia has been inconclusive. A prospective cohort study of 1507 French elderly have shown that the relative risk of developing AD was found to be considerably higher (RR 2.39,
95% CI 1.02 – 5.63) in males but not in females, who had been occupationally exposed to pesticides (Baldi et al., 2003). A review study also indicated evidence of a link between cognitive decline and pesticide exposure, although the effects of a single acute exposure as opposed to a chronic exposure are unclear (Zaganas et al., 2013). More research in the future is needed to decipher the link between pesticide exposure and dementia, given that many of the current studies are inconclusive.

2.1.2.2.10 Education

Education level is also believed to influence the development of dementia and cognitive decline. Literature investigating the relationship between education and dementia and/or cognitive decline has found that higher levels of education is a protective factor against dementia while lower levels of education have been associated with an increased risk of cognitive decline and/or dementia, even after controlling for age and occupation (Valenzuela & Sachdev, 2006). A systematic review by Valenzuela and Sachdev reported that the combined OR for incident dementia for individuals with high education compared to low education was 0.53 (95% CI: 0.45 - 0.62), indicating a decreased risk of 47 percent. This relationship was supported by a longitudinal study with an average follow up of 21 years (Ngandu et al., 2007). They found that compared to individuals with formal education of 5 years or less, those with 6 to 8 years of education had OR of 0.57 (95% CI: 0.29 – 1.13) and those with 9 years of education or more had OR of 0.16 (95% CI: 0.06 – 0.41) for dementia.

Another systematic review indicated that lower education was associated with a greater risk for dementia in many but not all studies (Sharp & Gatz, 2011).
Sharp and Gatz added that the level of education that was most associated with dementia risk varied by study region, age, sex and race/ethnicity.

This finding was also supported by a recent study (Ye et al., 2013) where it found the protective effects of education against cognitive decline remaining in early stage amnestic mild cognitive impairment (aMCI) but not in late stage aMCI.

2.1.3 **Interventions for dementia risk reduction**

There has been intervention studies using modifiable risk factors mentioned above to investigate the effectiveness of modifying these risk factors on dementia and cognitive decline. A French study estimated the percentage reduction in incidence of dementia that would be obtained when specific risk factors were eliminated (Ritchie et al., 2010). The results showed that eliminating depression and diabetes, and increasing fruit and vegetable consumption and crystallised intelligence had the biggest impact on reducing the incidence of dementia, outweighing even the effect of removing the principal known genetic risk factor.

However, it appears that multi-domain interventions would be more suitable for preventive interventions because of the multifactorial origin of dementia (Coley, 2008). Several intervention trials of this nature are currently underway in the USA (using physical and mental activity), Germany (using physical and mental activity) and Finland (using nutritional guidance as well as physical and mental activity) (Barnes, 2008; Heuser, 2008; Kivipelto & Ahtiluoto, 2011) but none in Australia.
There are three large ongoing dementia prevention studies in Europe (see Table 2.1). The Prevention of Dementia by Intensive Vascular Care (PreDIVA) investigates the effect of nurse-led intensive vascular care in primary care on decreasing the incidence of dementia (Ligthart, Richard, Moll van Charante, & Van Gool, 2010). The PreDIVA is a 6 year longitudinal study examining over three thousand 70-78 years old (at baseline) community dwellers. The Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) is a multi-domain intervention consisting of nutritional guidance, exercise, cognitive training and social activity, and management of metabolic and vascular risk factors (Kivipelto et al., 2013). The FINGER involves over one thousand community dwellers aged 60-77 at baseline. The Multi-domain Alzheimer Preventive Trial (MAPT) is another multi-domain intervention (nutritional, physical and cognitive training) aiming to prevent cognitive decline in frail elderly persons aged 70 years or over (Carrie et al., 2012; Gillette, 2009).

In addition, there are limited numbers of randomised controlled trials (RCTs), which have shown positive but moderate or vague effects of physical exercise, omega-3 fatty acid consumption and cognitive training on cognition (Lautenschlager et al., 2008; Lustig, Shah, Seidler, & Reuter-Lorenz, 2009; van de Rest et al., 2008; Willis et al., 2006). Although these results may not be conclusive and require further extensive research, there is mounting evidence from observational studies that point to the importance of reducing these risk factors for dementia prevention.
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However, unlike countries mentioned above, Australia has not had any large scale community based, lifestyle interventions to date examining their efficacy in reducing risk for cognitive decline and dementia. It is therefore necessary that behavioural and lifestyle focused interventions are developed locally in Australia which addresses multi-risk factors as an effective way of reducing dementia risk and overall dementia prevalence. Moreover, these intervention or RCT studies are expensive and clinically based. Therefore, there is an urgent need to develop population based low cost interventions that can reduce the risk of AD.
Synopsis

The aim of this chapter was to investigate perceptions of dementia and dementia risk reduction held by individuals without dementia, providing much needed qualitative information that can inform the development of effective interventions. Six focus groups (N = 34) with older adults aged between 52 to 90 years were conducted. The long-table approach was used to identify themes regarding dementia knowledge, risk and attitudes, and to categorize data. Results showed that participants were able to identify many known dementia risk factors at the group level but had poorer knowledge at the individual level. Participants’ responses regarding their perceived likelihood of developing dementia could be classified into three distinctive themes; fear, rational and cynical perceptions. Both fear of developing dementia and the need to improve dementia knowledge were considered major motivators towards adopting healthier lifestyle and health behaviours. Lack of knowledge on risk and protective factors for dementia was identified as a major barrier for behavioural and lifestyle change. These findings can be used to develop effective and personalized community-based interventions that increase motivators and reduce barriers by tailoring interventions to individual’s dementia risk reduction literacy and motivations to change behaviours. Greater public health promotion and education regarding risk and
protective factors for dementia are also necessary to increase dementia health literacy and to reduce overall dementia prevalence.
3.1 Introduction

Existing research demonstrates that there are multiple lifestyle and environmental risk factors for dementia, some of which are modifiable. These modifiable risk and protective factors, addressed in Chapter 2, are themselves behaviours. Therefore, individuals might be able to add years to their lives as well as reduce substantial suffering if they are willing and able to make the necessary health behavioural changes (Noar et al., 2007).

It is suggested that interventions modifying these risk factors can reduce the risk of developing dementia and reduce the prevalence of dementia. However, only limited numbers of community based interventions have been developed using different risk factors (Barnes et al., 2013; Ritchie et al., 2010) and further research should be sought applying all the identified risk factors to strengthen the efficacy of dementia interventions. Furthermore, research that gives a voice to the potential consumers of dementia interventions remains absent from the current literature. In addition, there is a gap in research about how to enable individuals to change their behaviour. Hence, understanding how to develop interventions that result in a positive behaviour change is one of the bigger challenges facing dementia prevention research. This thesis will therefore seek to address this gap and understand potential consumers of community-based interventions and their attitudes toward dementia risk reduction.

Theory provides a helpful basis for designing interventions to change behaviour because interventions are likely to be more effective if they target causal determinants of behaviour change (Michie et al., 2008). Most widely used behaviour change theories, such as the Social Cognitive Theory (Bandura, 1997),
the Health Belief Model (Janz & Becker, 1984) and the Theory of Reasoned Action/Theory of Planned Behavior (Ajzen, 1991; Ajzen & Fishbein, 1980) offer different causal determinants/constructs to explain behaviour change. Nevertheless, there is a consensus on four major constructs that surround health behaviours and behaviour change. These are 1) health literacy – knowledge of risk factors for the target disease/outcome, and ways in which to address or reduce these; 2) perceived susceptibility of disease/threat; 3) motivation or perceived benefits of performing or changing behaviours to reduce risk of disease, and 4) perceived barriers of performing or changing behaviours to reduce risk of disease. However, the investigation into these four constructs with regards to dementia risk reduction intervention programs has been extremely limited in the literature. In particular, directly examining the beliefs, knowledge, and perceived motivations and barriers in potential consumers of dementia risk reduction interventions has been largely neglected in the dementia and health behaviour change literature. It is therefore essential to first give voice to consumers and identify what they believe to be risk factors for developing dementia as well as motivators and barriers for behaviour change for dementia risk reduction. This information will be important for developing effective interventions in the future because it allows us to understand why some people are engaging in lifestyle and behavioural changes to delay or prevent the onset of dementia. This information will also help in the development of a measurement of motivation for behavioural and lifestyle change for dementia risk reduction.

The purpose of this research is to explore and identify motivators and barriers to the health behavioural and lifestyle change to reduce dementia risk. It
also aims to measure peoples’ knowledge on risk and protective factors for dementia as well as on dementia in general. As a measure of peoples’ perception toward dementia, participants’ perceived risk of dementia will also be examined.

3.2 Methods

3.2.1 Study design

Focus group interviews are becoming increasingly popular in health research for exploring individuals’ beliefs as well as why they behave in the way they do (Rabiee, 2004). Information regarding what motivates and what discourages people from changing their behaviour and lifestyle to reduce their risk of dementia is scarce. Therefore, focus groups were conducted in this exploratory research as focus group methodology captures the shared experience of a group of people and gives voice to consumers of dementia risk reduction interventions in a carefully guided, nonthreatening environment (Morgan, 1998).

3.2.2 Participants

Focus group participants were recruited through an advertisement in a community newspaper distributed to all homes in the Australian Capital Territory and Queanbeyan. Participants of the focus groups had to meet two criteria: (a) age 50 years and older and (b) without a dementia diagnosis. Fifty years and older individuals were the target population as it is suggested that pathological processes that lead to the development of dementia, especially Alzheimer’s disease, commence years and even decades before the onset of any detectable symptoms of dementia (Sperling et al., 2011).
Thirty four participants were assigned to six focus groups and the group size per focus group ranged between five to seven people. This was within recommendations for optimum group size that is large enough to gain a variety of perspectives and small enough not to become disorderly or fragmented (Krueger & Casey, 2000; Morgan, 1998).

Participants were between 52 and 90 years old (M= 67.03, SD=8.85). All were White and majority were women (73.5%), married or in de facto relationship (64.7%) and retired (55.9%). Mean years of education was 14.5 years (SD=4.6).

3.2.3 Procedure

“Dementia Risk Reduction Study” was advertised as the research focus in the print recruitment material (see Appendix A). The purpose of the study was explained in the information sheet provided to participants prior to attending the focus groups. Written informed consent was also obtained. Reflective and open ended questions were used to facilitate discussions and to allow group participants to talk freely. Questions used for the present analysis, which were drawn from the four constructs of behaviour change theories, include the following: (a) “literacy” - what do you think are risk factors for dementia and how can you reduce your risk of developing dementia?; (b) “perceived susceptibility” - what is your likelihood of developing dementia?; (c) “motivators and perceived benefits” - what would motivate you to change your health behaviour and lifestyle to reduce your risk of dementia?; and (d) “perceived barriers” - what would stop you from changing your health behaviour and lifestyle?

The primary researcher was assisted by one of two research assistants in being group facilitators (one assistant per session). All facilitators, including the
primary researcher, had clinical backgrounds as a clinical psychologist or a medical doctor. All focus group sessions lasted for about 60 minutes and were audio recorded for later analyses. After six focus groups had been conducted, data saturation (Llewellyn, Sullivan, & Minichiello, 1999) was considered to have been achieved because participants kept citing similar issues. The focus groups were conducted in February 2011 and were held in a conference room at the Centre for Mental Health Research at the Australian National University. The study was approved by the Australian National University Ethics committee and all participants provided written informed consent to participate.

3.2.4 Data analysis

The audio files from the focus groups were transcribed verbatim into a Word document by the primary researcher. The preliminary data analysis began after each focus group concluded, with the facilitators involved in each session briefly discussing the data that had been collected during the interviews. When all interviews had been completed, the primary researcher and one of the supporting facilitators read through the verbatim transcripts of the audio recorded interviews to get a general sense of what had been discussed in the various groups. The verbatim transcripts were read while making notes using a mind-map technique (Buzan & Buzan, 2003).

The long-table approach, an effective low-technology method that has been used in previous qualitative analyses, was used to identify themes and categorize results (Krueger & Casey, 2000). This method allows researchers to identify themes and categorize results by looking at participants’ answers to focus group questions and any other important comments said about the topic. Initial
themes were determined a priori (from the focus group guide) and additional categories emerged from the analysis. Participants’ quotations were cut and pasted by the focus group guide question, theme, and categories. The result from each focus group was analysed separately by the two facilitators, the primary researcher and one of supporting facilitators. The results were then combined and reviewed in totality.

3.3 Results

After reviewing the discussions, participants’ comments were categorized into the four a-priori themes that covered everything raised during the focus groups: (1) dementia and dementia risk factors literacy; (2) perceived susceptibility; (3) motivators and perceived benefits; and (4) perceived barriers.

3.3.1 Dementia and Dementia Risk Factors Literacy

Participants were able to identify many known dementia risk factors for dementia as a group. Age and genetics were the most recognized non-modifiable risk factors whereas lack of cognitive engagement was the most recognized modifiable risk factor. Identified risk factors are listed in Table 3.1.

The most common answer participants provided as ways to reduce one’s risk of developing dementia was increasing mental stimulation such as completing cross words puzzles or Sudoku and learning something new. Other suggestions that reduce risk of dementia included increasing or keeping physically active, socializing, and maintaining a good diet. Younger participants also suggested giving up smoking and drinking whereas older participants suggested having regular medical check-ups.
Overall, participants had a high knowledge of dementia risk factors listing most of evidence-based risk and protective factors correctly. Participants also reported that majority of what they knew about dementia was learnt from the media.

Some participants were more knowledgeable than others:

…smoking like you said, and too much alcohol consumption and bad food…they are finding more and more that physical exercise is keeping the brain working better, which is interesting…I certainly think there are hereditary factors in it…and then brain damage, and anaesthetics for some people…

At an individual level however, some lacked knowledge on risk factors for dementia and also on dementia itself. One participant said “Can I ask you a silly question to start with? What is dementia?”

Not surprisingly, dementia was also seen as a normal part of ageing by some participants, “…I think (dementia) is a natural process of ageing for a lot of people and it isn’t necessarily linked to a particular malfunction.” Some misbelief about risk factors and dementia were also found, “I did read a few reports that say smoking actually does reduce your risk of dementia.”

Participants also expressed their uncertainty about dementia risk factors because of their conflicting experiences. The following quotes depict the participants’ confusion: “For some people it is to do with ageing but for some it is not. Because not only old people get dementia.” Another participant replied:
I find it interesting that some people with a wonderful brain and who have done amazing work and they still develop dementia. They tell you if you keep using your brain, you are less likely to get dementia ... they are obviously still using their brain and they get it.
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3.3.2 Perceived Susceptibility

In regard to their likelihood of developing dementia, three groups of response types were formed. The first (fear) group, which included the majority of the participants, reflected those who avoided the question by expressing their fear instead, as illustrated by the following quote: “I am afraid of getting it…one of my greatest fears is that I will get dementia. I think the fear of getting dementia is great for me. I am really afraid of not being able to look after myself.” Another participant agreed by saying, “I hope to God that I don’t get it. If you know you got it, it must feel dreadful.”

The second (rational) group, consisting mainly of men, included those who rationally estimated their likelihood of dementia by comparing their own behaviour and characteristics (what they do or do not do and what they have or do not have) against the risk factors: “…I don’t drink a great deal and I don’t smoke a lot…I’m not particularly intellectually active but probably about average. I would rate my chance probably less than 50% but it’s only a guess.” However, not everyone in the rational group calculated their chance of developing dementia correctly because of incorrect information they held, “The longer you live without it I think, the less chance you have getting it. You know, once you get to about 70 or 75 or something (your chance is slimmer).”

The third (cynical) group included people who did not believe in risk factors. Instead, they believed that luck played a part and that there were no guarantees whether they would or would not develop dementia. This reflected their uncertainty about the cause of dementia, “I think it is a bit like a bus around
the corner. You might be hit by the bus, but chances are you won’t...and dementia
is around the corner.”

3.3.3 Motivators and Perceived Benefits to Lifestyle Change

Fear of developing dementia was the main motivator to lifestyle and
behavioural changes, “If someone says to me if you don’t change your lifestyle
you are going to be dead in 5 years (with dementia) I would say OK I would
change it.”

Groups also believed that education and having more information
available on the media that increases peoples’ awareness of, and understanding of
dementia, rather than simply telling people what they have to do, would motivate
people to change: “Education is the only way, education through TV or
whatever...every avenues possible...increase understanding, not just blasting
people with this is what you should do.”

Other motivators for behavioural and lifestyle changes that were cited as
having worked in the past included social pressure and banning smoking in office
buildings: “Social pressure can cause you to change your lifestyle like in your
working environment. It became unacceptable to smoke in your office.”

Work place and family support were also identified as motivators to
change health behaviour and lifestyle:

What would motivate me to drop my bad habits...I think being able
to have opportunities to work part-time and what they call transition
to retirement...that would make me do more gentle exercises and
probably encourage me to go and swim...having the opportunities in
time to do something little more gentle, yes I would like to be able
to...if the workforce was more accepting of (transition).

3.3.4 Perceived Barriers to Lifestyle Change

The most commonly identified barrier to behavioural and lifestyle
changes from the focus groups was lack of knowledge about dementia.

...all the signs have been there for years but they just haven’t
realized what it was...I think a lot of people either don’t recognize
the symptoms or they are in denial. They just say she is a bit
forgetful or little bit difficult...I am a great campaigner for
Alzheimer’s disease or dementia awareness because I think if people
are more aware of symptoms and what they could do to help
themselves and the person they are dealing with, the whole thing
would be happier a place...I’ve got to hand it to Hawke (former
Australian prime minister) who came out and said Hazel (former
PM’s wife) got it and this is what we’re doing...because I think
when a high profile person like that and their family comes out and
talks about it, it’s really good for the rest of population.

Participants also pointed to research findings that do not provide clear
relationships between causes and dementia as another barrier: “I think if it is
clearly defined which activities contribute toward preventing it, I would have no trouble at all giving up the ones we are at and adopting the one we ought.”

Another participant also stated that “if you can clearly see (the cause and effects) you immediately change your behaviours. But you can’t.”

Participants also have shown distrust in experts, which discourages them from following experts’ recommendations to make behavioural and lifestyle changes:

...experts do not agree on what we should do to prevent the onset of dementia. That’s why people like you are still doing the research...I would like to be more aware of more definite things about dementia. It’s all so vague.

Giving up enjoyment such as drinking was also reported as barriers along with having poor physical conditions: “…but (with things) I really enjoy...like food...that would be much harder (to change/give up).” Another participant added: “…if you give up smoking and booze and everything else and you’re miserable, what’s the point?”

Younger participants who are currently working and have children living with them stated that having responsibilities of having to take care of family members and not having support from family and work place were barriers, “Well I am not sure how much more I can reduce (my risk of dementia) because of certain circumstances get in the way, for example caring bits”.

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3.4 Discussion

The present qualitative study is the first of its kind to give a voice to potential consumers of dementia risk reduction interventions. Findings suggest that high dementia literacy was shown in participants at the group level, with the ability to correctly identify all of known risk and protective factors for dementia. This is in line with a previous study which examined dementia literacy of Australians (Low & Anstey, 2009). However, the evidence of high dementia literacy shown at the group level might have been because of a few knowledgeable participants in each group as the range of data generated through the social interaction of the group are often deeper and richer than those obtained from one to one interviews (Thomas, MacMillan, McColl, Hale, & Bond, 1995).

The majority in each group lacked knowledge about dementia and dementia risk factors. In particular, participants seemed to lack knowledge on what dementia was. Some considered Alzheimer’s disease (AD) different from dementia although AD is the most common type of dementia (Alzheimer’s Association, 2009). In addition, some were not aware that there are many types of dementia such as vascular dementia, drug induced dementia, and frontal lobe dementia. This result highlights the importance of educating the public and suggests that in depth education on dementia targeting the broader population is required.

It should also be noted that a participant’s ability to list risk factors associated with dementia did not necessarily mean that they had good knowledge of how these risk factors impact on them. Some participants expressed their
uncertainty about their responses saying that they thought they had heard it from
the media, but were unsure. Their responses were not profound and were
frequently based on their indirect experiences of dementia through demented
family members or friends.

Of all the listed risk factors, old age, genetics and lack of mental
stimulation were thought to contribute the most to a person developing dementia.
Our findings are congruent with a previous dementia literacy survey (Low &
Anstey, 2009), that showed the most frequently suggested methods for dementia
risk reduction were mental exercise, eating healthily, physical exercise and
socializing.

In the current study, it was suggested that the majority of participants
feared developing dementia, which is contradictory to the findings of Yeo and his
colleagues (2007), where they found that most responders (69%) did not worry
about developing dementia. Personal experience with a relative who has dementia
increases personal vulnerability (Williams, Tappan, Rosselli, Keane, & Newlin,
2010) and almost all participants in the current study had indicated that they had
an indirect experience of dementia through either family members or friends. The
participants in the current study therefore might have had high awareness of what
it is like to have dementia. Yeo and colleagues also found that 72% of responders
did not have family members with dementia but if responders had a family
member with dementia, they were more likely to think of dementia. This
correlated with our study findings.
The main barrier for behavioural and lifestyle change identified by participants was the participants' lack of knowledge. This again highlights the importance of public-health education regarding dementia and what can be done to reduce their risk of developing dementia. This is because inaccurate information can play a big role in making a decision on whether to make behavioural and lifestyle changes to prevent dementia. The main motivators for changing health behaviour and lifestyle for dementia risk reduction were education and the fear of developing dementia. It seems that when the fear of developing dementia is larger than the pleasure of doing something that might heighten their risk of dementia (e.g., smoking), changes might occur towards a positive and healthier lifestyle. However, it has to be noted that the identified motivators and barriers in this study are for intentions to change lifestyle and health behaviours and may not be for actual lifestyle and health behavioural changes. Future studies therefore should examine the actual behavioural and lifestyle changes individuals make to see if the motivators and barriers for changes are similar to the motivators and barriers for intentions to change identified in this study. In addition, future studies should also investigate how fear and education plays a role in health behavioural and lifestyle changes for dementia risk reduction.

Consumers are not however a homogenous group and have different barriers and motivators as well as different levels of knowledge on dementia. This should be considered when developing interventions. Individually tailored interventions therefore would be more successful than a “one size fits all”
approach as they address the factors most relevant to a given individual. Previous research on HIV prevention targeting men who have sex with men supported the efficacy of the individually tailored intervention used (Chesney et al., 2003). Their results reinforced the importance of a tailored approach in which structured modules are selected and implemented in a manner consistent with individuals’ unique characteristics which predisposed them to engage in risk behaviour. In addition, because media coverage of health topics can frame and heighten the salience of health related issues that impact the public’s health beliefs, attitudes, and behaviours (Viswanath, 2005), public awareness campaigns might be an important channel to enhance people’s knowledge on dementia.

We have to be aware that although both barriers and motivators identified by participants for lifestyle and health behaviour changes for dementia risk reduction point to educating the public, enhancing knowledge might not be sufficient enough to change actions. For example, current smokers continue smoking when they have good knowledge of its negative effect on chronic obstructive pulmonary disease, one of the most widespread chronic lung diseases worldwide (Eklund, Nilsson, Hedman, & Lindberg, 2012). In addition, behaviour cannot be determined by one simple factor because it is a very complex task we carry out in our lives. Different behaviour change models suggest different components of behaviour changes and these models should be examined thoroughly to deepen our understanding on behaviour changes required for dementia risk reduction. Different behaviour change models should also be
compared with each other noting specific strengths and weaknesses in order to find the most suitable model for dementia risk reduction.

In interpreting the results of this qualitative research, several study limitations should be noted. The participants in the current study had high education levels (mean years of education was 14.5 years) and were mainly women. Participants' higher than average level of education might have led to higher than average level of general health knowledge in the sample. Therefore, the findings in this study might not be as accurate a representation of the Australian population as it would perhaps be. In addition, findings presented in this exploratory study were developed based on free discussions among participants. It is important to stress that these results are restricted to the associations the participants made in this context, and the group studied. Furthermore, although the data saturation was considered to have been achieved with the current participants, a larger number of participants from different backgrounds might have been more representative of the broader public. The recruitment method used in this study meant that it might have only attracted participants who were concerned about developing dementia or had a friend or family member with dementia. Participants might therefore have been eager to learn about dementia risk reduction and eager to change accordingly. Therefore, a population representative sample with different degrees of dementia interest should be sought in future recruitment. Information on cultural background was also not collected from the current participants. Cultural differences may have contributed to the knowledge and attitudes toward dementia. Participants' physical
and psychological health should have also been included as exclusion criteria as these might influence participants' ability to be engaged in lifestyle interventions necessary for dementia risk reduction.

Despite these limitations, these results offer insights into potential consumers of community-based interventions. The current study is an essential first step because it provides a greater understanding of the barriers and motivators to change health behaviours and lifestyle for dementia risk reduction. The information gathered from these focus groups can identify determinants for behaviour and lifestyle changes for dementia risk reduction. The results will also help in the development of interventions to assist people who are not amenable to lifestyle changes. This information can then be used to compare against different behavioural change models/theories to find the most suitable theory for dementia risk reduction. These findings will also be used in developing effective and personalized community-based interventions as different techniques will address different causal determinants of behaviour change. Greater public health promotion and education regarding risk and protective factors for dementia are also necessary to increase dementia health literacy and to reduce overall dementia prevalence.
CHAPTER 4: A Comparison of Behaviour Change Models for dementia risk reduction

Synopsis

This chapter evaluates widely used behaviour change models and compares them against potential consumers’ perceptions about dementia and dementia risk reduction in focus groups (Chapter 3). The models included in this chapter are Health Belief Model, Health Locus of Control, Theory of Reasoned action/Theory of Planned Behaviour, Self-efficacy theory, Stages of Change/Transtheoretical Model of Change, and Common Sense Model of Self-regulation. The models were also compared against each other taking into account their strengths and weaknesses. From this comparison, the Health Belief Model emerged as the most suitable model to guide the investigation of what predicts intention of, and actual behaviour and lifestyle changes. The Health Belief Model was chosen because of its overlap with the constructs of the Self-efficacy theory, and the Health Locus of Control. In addition, the chosen model also had a better fit compared to the rest of the models with dementia risk reduction. It is also more comparable with what potential consumers of dementia prevention intervention indicated on dementia risk reduction in Chapter 3.
4.1 Introduction

It is believed that in industrialised countries, a large proportion of deaths is due to particular lifestyle and health habits, and that these lifestyle and health habits are modifiable (Stroebe & Stroebe, 1995). It is increasingly recognised that individuals can make major contributions to their own health and well-being through the adoption of particular health enhancing behaviours (e.g. exercise) and the avoidance of other health compromising behaviours (e.g. smoking) (Conner & Norman, 1995). The identification of the factors that contribute to ‘health behaviours’ has become the focus of research in psychology and other health-related disciplines in the past few decades (Adler & Matthews, 1994). Dementia is no exception. Research on modifiable risk factors for dementia has been actively conducted and these were examined in Chapter 2.

Chapter 3 explored the barriers and motivations to lifestyle and behavioural changes. However, in depth understanding of what, why and who will change their behaviour still remains unknown. Theories provide a helpful basis for designing interventions to change behaviour (Michie et al., 2008). Therefore, the most widely used and studied behaviour change models will be examined in this chapter to guide the investigation of predictors of intention to change lifestyle, and health behaviours for dementia risk reduction, as well as predictors of actual lifestyle and health behaviour changes. These include the: Health belief model (HBM; Janz & Becker 1984); health locus of control (Wallston, 1991); theory of reasoned action (TRA)/theory of planned behaviour (TPB; Ajzen, 1991; Ajzen & Fishbein, 1980); self-efficacy theory (Bandura, 1977); stages of
change/Transtheoretical model of change (TMC; Prochaska & Diclemente, 1984), and common sense model of self-regulation (Leventhal, Meyer, & Nerenz, 1980).

Theoretical frameworks as well as practical uses of each model using empirical studies implementing these models will be outlined below. In addition, the method in which each model can be applied to dementia interventions will be examined using findings from the qualitative study in Chapter 3. The best suited behaviour change model will then be chosen based on their strengths and weaknesses as well as their comparability of what potential consumers have identified as reasons for making behaviour and lifestyle changes for dementia risk reduction.

4.1.1 The Health belief model

The health belief model (HBM) is perhaps the oldest and most widely used social cognition model in health psychology. It attempts to explain and predict health behaviours by focusing on the attitudes and beliefs of individuals (Champion, 1984; Rosenstock, Strecher, & Becker, 1988). According to the model, the motivation to undertake healthy behaviour is influenced by perceived susceptibility, perceived severity, perceived benefit, and perceived barriers. Perceived susceptibility refers an individual’s assessment of the potential risk of developing a disease. Perceived severity refers to an individual’s belief about the effect that a disease or condition will have on him/her. Perceived benefits refer to an individual’s belief about the efficacy of performing a certain behaviour to reduce the risk or the seriousness of the impact of a disease (e.g. enjoying healthier life for longer). Perceived barriers are the tangible and psychological
costs for performing the behaviour (e.g. inconvenience) (Janz & Becker, 1984). General health motivation or ‘readiness to be concerned about health matters’, cues to actions; range of the factors that prompt targeted action, which may be internal (e.g. physical symptom) or external (e.g. mass media campaign, advice from others) to the individual, and confidence were later added to the original HBM (Champion, 1999; Gözüm & Aydin, 2004).

The health belief model has been applied to a broader range of health behaviours including preventive health behaviours, sick role behaviours, and clinical use (Sheeran & Abraham, 1995). However, this chapter focuses only on applications of the health belief model on preventive behaviours such as breast cancer screening (Champion, 1999; Parsa, Kandiah, Mohd Nasir, Hejar, & Nor Afiah, 2008), cervical cancer and pap smear testing (Guvenc, Akyuz, & Acikel, 2011), colorectal cancer screening (J. Sung, J., Choi, & Chan, 2008), and bicycle helmet use (Lajunen & Rasanen, 2004).

The HBM has also been used to investigate the intentions to have a cognitive status examination for dementia and memory loss (Galvin, Scharff, Glasheen, & Fu, 2006; Werner, 2003). Werner (2003) used measures derived from the HBM to examine the factors influencing the intentions to seek a cognitive status evaluation in the presence of memory problems. She found that participants’ intention to be examined were higher when presented with scenarios describing family history of AD. Perceived barriers and cues to action were significant predictors of intention, accounting for 24% of the variance. These findings suggested the need to develop effective educational programs to improve
knowledge about AD and decision-making concerning cognitive status examinations. However, because this study was a cross sectional study, it was not able to examine relationships between intentions and actual behaviour changes.

Questionnaires based on constructs from the Health Belief Model were also developed to explore factors that may directly and indirectly influence dementia screening behaviour of older community dwelling adults (Galvin et al., 2006) and to explore the attitudes of primary care patients about dementia screening (Boustani et al., 2008). Both questionnaires had good internal consistency and construct validity. However, there have not been any studies examining people's intention to change their lifestyle and health behaviours for dementia prevention.

The HBM's strengths lie in the fact that it was developed by researchers working directly with health behaviours. Many of the concepts also possess face validity for those working in this area (Browning & Thomas, 2005). The HBM also provides an easy understanding of why people do or do not engage in healthy activities. However, there are criticisms, mainly related to the original HBM, that the HBM ignores the influence of emotional factors on behaviour even though HBM theorists have suggested that emotional elements may have a greater impact on behaviour than cognition (Rosenstock, 1966). Another criticism of the HBM is that this model ignores social and economic factors. In addition, health behaviour is not always rational and there are possibilities that alternative factors may also predict health behaviour (Schwarzer, 1992; Seydel, Taal, & Wiegman, 1990).
4.1.2 Health Locus of Control (HLC)

The Health Locus of Control (HLC) is one of the most widely researched constructs in relation to the prediction of health behaviour (Wallston, 1992). The origins of the HLC construct came from Rotter's (1954) social learning theory, where he developed the locus of control construct, making the distinction between internal and external locus of control orientations.

The HLC has three dimensions: internal HLC (belief that one's state of health depends on one's own behaviours and actions); powerful others HLC (belief that one's state of health depends on powerful others – mainly professionals); and chance HLC (belief that one's state of health is a matter of chance or fate) (Cohen & Azaiza, 2007). The last two dimensions are often classified as external HLC, in contrast to the internal dimension. According to HLC, those with an internal locus of control can be expected to be more likely to exert efforts to control their environment, to take responsibility for their action, to seek out and process relevant information, to exhibit better learning and to show more autonomous decision-making. Therefore, those with internal HLC would be more likely to modify their behaviour and lifestyle in order to reduce their risk of dementia compared to those with an external locus of control.

The HLC has been applied to health related behaviours such as physical activity participation (Rabinowitz, Melamed, Weisberg, Tal, & Ribak, 1992), alcoholism (Norman, 1990), AIDS-related behaviour (St Lawrence, 1993), breast self-examination (Bundek, Marks, & Richardson, 1993), and smoking cessation (Segall & Wynd, 1990).
Studies examining the association between the performance of preventive health behaviour and locus of control belief produced a mixed set of results. Some studies have found a positive relationship between internal HLC beliefs and indices of preventive health behaviour (Waller & Bates, 1992; Weiss & Larsen, 1990) whereas others have failed to find such a relationship (Norman, 1995). However, the overall evidence indicates a weak relationship between the internal health locus of control beliefs and global indices of preventive health behaviour. This could be because the locus of control theory may be too narrow to explain health behaviour adequately (Wurtele, Britcher, & Saslawsky, 1985) and the need to consider variables from other theoretical approaches will be apparent.

4.1.3 Theory of planned behaviour/Theory of Reasoned Action

The theory of planned behaviour (TPB) has been widely applied to a variety of behaviours, both health and non-health related. It incorporated perceived behavioural control (influenced by skills, information and barriers) as an added component to the theory of reasoned action (TRA; Fishbein & Ajzen, 1975). The TPB is based on the premise that humans are rational and individuals make behavioural decisions based on carefully considered information (Browning & Thomas, 2005). It suggests that the proximal determinants of behaviour are one's intention to engage in that behaviour and one's perception of control over that behaviour.

Intentions are determined by two attitudes: a person's attitude toward the behaviour concerned and a person's beliefs about whether significant others think that he or she should engage in that behaviour (Conner & Sparks, 1996).
Perceived behavioural control on the other hand is a person's expectancy that performance of the behaviour is within his or her control and whether the performance of the behaviour is easy or difficult.

Therefore, according to the theory of planned behaviour, individuals are likely to follow a particular health action if they believe that the behaviour will lead to outcomes which they value. Similarly, if individuals believed that people whose views they value think they should carry out the behaviour, and if they feel that they have the necessary resources and opportunities to perform the behaviour, it is likely that they will follow a particular health action.

TPB has been applied to the number of health behaviours, including cessation of smoking (Marin, Marin, Perez-Stable, Otero-Sabogal, & Sabogal, 1990), oral contraceptive use (Doll & Orth, 1993), condom use (Chan & Fishbein, 1993), exercise (Norman & Smith, 1995), and breast/testicle self-examination (McCaul, Sandgren, O'Neill, & Hinsz, 1993). Hardeman and colleagues (2002) examined interventions using TPB and have shown that two thirds of the interventions were effective in changing behaviour but concluded that the evidence for the usefulness of the model is limited. In addition, like the HBM, a criticism of the TPB is that it is unable to explain behaviour which may be under affective control as they do not adequately take into account emotional factors, such as fear in decision making (Bish, Sutton, & Golombok, 2000).

4.1.4 Self-efficacy models

Self-efficacy models are based on the self-efficacy theory by Bandura (1977), where self-efficacy describes the confidence one has in achieving a
specific outcome (Browning & Thomas, 2005). Bandura argued that self-efficacy is the critical link between the application of knowledge and actual behavioural change and is one of the most effective predictors of health behaviour (Bandura, 1982; Bandura, 1994; Ralf. Schwarzer & Fuchs, 1995).

Health behaviour change interventions that incorporate self-efficacy focus on convincing the person that they have the personal resources required to act in the required manner (Locke & Latham, 1990). If people believe that they can take action to solve a problem instrumentally, they become more inclined to do so and feel more committed to this decision. Hence, individuals with high self-efficacy choose to perform more challenging tasks and set themselves higher goals and stick to them.

Changing self-efficacy for a particular behaviour, however, needs to be done in small steps: you need to ask them what they are 100% confident of achieving in a given week (high self-efficacy) and then increase the difficulty of tasks each week. This procedure is repeated over successive weeks and as success occurs, self-efficacy increases (Browning & Thomas 2005). If the self-efficacy beliefs are applied in the current project, especially for those who believe it is too hard or time consuming to change their lifestyle and behaviours, it would be more efficient giving them a task of making a small change first. Subsequently, once their self-efficacy is high, making bigger changes can then be suggested.

Self-efficacy has been applied to safer sex practice (Kasen, Vaughn, & Walter, 1992), physical exercise (McAuley, 1993), weight control (Hofstetter, Sallis, & Hovell, 1990) and other addictive behaviours (Schwarzer and Fuchs,
However, self-efficacy is no longer really distinct from other approaches since it is now included in numerous theories of health behaviour (Noar, 2005; Noar & Zimmerman, 2005).

Many studies of health behaviours have demonstrated that the predictive strength of self-efficacy exceeds that of any other variable (Baghurst, Pinembe, Henderson, Reddin, & Antoniou., 2007; Delahanty, Conroy, & Nathan, 2006). However, even though self-efficacy has turned out to be the most powerful single resource factor, self-efficacy alone cannot predict behaviour changes.

4.1.5 Stages of change/Transtheoretical model of change (TMC)

The Transtheoretical Model of Change has stood as one of the most prominent psychological models of behaviour change (Sutton, 2001). The TMC posits that individuals progress through five stages of change on their way toward adopting a healthy behaviour or toward cessation of an unhealthy behaviour (Noar et al., 2007). These stages include pre-contemplation (not intending to change), contemplation (intending to change in the foreseeable future), preparation (planning to change very soon and currently taking measurable steps to change), action (changed in the past 6 months), and maintenance (changed and sustained the behaviour change for 6 months or more). The TMC however, describes the change process as cyclical rather than linear, as individuals may move forward through stages, backslide, and then continue cycling and recycling through the stages of change.

The transtheoretical model of behavioural change explains the process of behaviour changes and one of the behaviours that TMC has applied to is the
smoking behaviour (Callaghan & Herzog, 2006; Ruggiero, Tsoh, Everett, Fava, & Guise, 2000). Ruggiero and her colleagues examined patterns and differences on constructs of the Transtheoretical Model between low-income culturally diverse pregnant and non-pregnant female smokers. They found that pregnant smokers as a group were similar to their non-pregnant peers on their readiness for quitting.

Callaghan and Herzog (2006) on the other hand, examined the theoretical predictions of the TMC regarding process use and progressive stage transition in relation to smoking behaviour. They found that those making the transition from the pre-contemplation stage to the contemplating stage showed a heightened use of experiential processes of change from the baseline measurement to the 2 year follow up, while those remaining in the pre-contemplation stage reported no differences across time in their ratings of experiential and behavioural processes of change. Contrary to Transtheoretical model’s claims however, smokers moving from the contemplation stage to the preparation stage over the 2 year period did not manifest an increasing use of experiential or behavioural processes over time in comparison to their counterparts remaining in the contemplation stage.

The TMC also suggests that because individuals’ attitudes, strategies, and skills differ at varying stages of the change process, interventions should be uniquely tailored to those stages, to be the most effective in moving individuals forward through the stages (Prochaska, Diclemente, Velicer, & Rossi, 1993). However, although stages of change help researchers understand how behaviour change occurs, it does not give an explanation of behaviour.
4.1.6 Self-regulation Model (SRM)

Leventhal and his colleagues (1980) developed a framework for understanding the self-regulation experience. This model posits that individuals create their own understanding of an illness or health threat (i.e. illness representation), which determines coping responses, judgement-based health behaviour and finally psychological well-being (C. D. Llewellyn, McGurk, & Weinman, 2007; van Oostrom et al., 2007).

According to the model, an individual processes the health threat presented by an illness via two parallel pathways that interact as the individual adapts to the illness: cognitive and emotional representation of the illness (O’Connor, 2008). Illness representation has five main components: identity, which includes the label and perceived symptoms of the illness such as pain and fatigue; the perceived cause of illness and exacerbations/remissions; the time line or whether the illness is expected to be acute, episodic or chronic; the perceived consequences of the illness for the person’s life such as loss of independence; and the beliefs about the curability/controllability of the illness (Pimm & Weinman, 1998), which create a personal model of the illness that guides coping, mood and adaptation (Hamilton-West, Milne, Chenery, & Tilbrook, 2010).

The SRM has been applied to a wide range of medical conditions, including diabetes, hypertension, multiple sclerosis, arthritis and cancer (Hagger & Orbell, 2003; van Oostrom et al., 2007) and mental illnesses, such as depression and schizophrenia (Godoy-Izquierdo, Lopez-Chicheri, Lopez-Torrecillas, Velez, & Godoy, 2007). Some researchers have also suggested that the
SRM may be useful for understanding illness perceptions, and coping in people with early stage dementia (Clare et al., 2006; Harman & Clare, 2006).

Hamilton-West and her colleagues (2010) examine the potential utility of the common sense model of illness representations for understanding lay perceptions of dementia and predicting intentions to seek help in relation to possible signs and symptoms. Results indicated that cognitive deficits were more readily identified as dementia than non-cognitive symptoms. Participants were more likely to indicate an intention to seek professional help if they identified the problem in the vignette as dementia, perceived symptoms as severe and having serious consequences, and likely to be permanent. Participants were less likely to indicate an intention to seek professional help if they identified the problem as stress or attributed symptoms to psychological causes. This study therefore suggest that help-seeking may be prevented by inaccurate illness representations or misattribution of symptoms. However, the participants were undergraduate psychology students who may not be the most suitable participants for a dementia study. Therefore, replicate studies with older participants will be needed to be more conclusive. In addition, this model seems more suitable for managing illness or for understanding people’s beliefs rather than promoting preventive behaviours: it may work better with individuals who already have an illness or at least symptoms of one.
4.2 Application of the behaviour change models in dementia risk reduction

Motivators and barriers for health behaviour and lifestyle changes for dementia risk reduction identified in Chapter 3 were used to examine how well each behaviour change models can be applied in dementia risk reduction.

The components of the HBM were shown in the qualitative study conducted in Chapter 3. Participants stated that they would change their lifestyle and behaviour according to professionals’ recommendations because they viewed dementia as a severe illness they wanted to avoid. In addition, participants also believed that their likelihood of developing dementia was high due to their family history of dementia or their lifestyle. It was also suggested that the change in their lifestyle and behaviour would be more evident if the fear of developing dementia was greater than the enjoyment of risky behaviours. In other words, if participants believed that giving up enjoyable yet risky behaviours benefitted them, they would change their lifestyle and health behaviours. The illustration of the model using the responses from the focus groups can be found in Figure 4.1.

One of three groups of people addressed in Chapter 3 were cynical about risk reduction due to their belief that developing dementia would depend on luck and had nothing to do with choices they made about their lifestyle and behaviour. This group can be seen as having an external locus of control if the HLC was applied. On the other hand, those who rationally evaluate their risk of dementia could be seen as having an internal locus of control. When this is applied to the outputs from the focus groups study, Figure 4.2 can be drawn.
The theory of planned action can be applied to dementia risk reduction. Majority of participants from the focus groups in Chapter 3 reported that they were willing to change their health behaviour and lifestyle because they believed that they were expected to adopt a healthier lifestyle (social norm), and that changing their lifestyle and health behaviours would prevent them from developing dementia (attitude). They also believed that they were capable of making recommended changes (see Figure 4.3). An exception was those who did not believe in risk factors and believed that it was out of their control whether they would develop dementia.

From the focus groups, it is reasonable to assume that participants were in different stages of change. Perhaps all of them were at least in the contemplation stage as they participated in this study because they were concerned about developing dementia and because they hoped to learn ways to reduce their risk of developing dementia. Many of participants were also in the later stages of change as they reported making lifestyle changes by engaging in physical exercise, reducing level of alcohol consumption, quitting smoking and having a healthier diet. However, knowing the stages in which participants sit does not explain why they will make the necessary health behaviour and lifestyle changes for dementia risk reduction.
Figure 4.1. Health Belief Model (HBM) for predicting intention to change lifestyle and health behaviour for dementia risk reduction
Figure 4.2. Health Locus of Control (HLC) model for predicting behaviour and lifestyle changes for dementia risk reduction.
Adopting healthier lifestyle would prevent me from developing dementia

I am expected to have healthier lifestyle

I can change my health behaviour and lifestyle

Attitude toward the behaviour

Subjective norm

Perceived behavioural control

Behavioural intentions

Behaviour

Figure 4.3. Theory of planned behaviour/Theory of Reasoned Action for predicting health behaviour and lifestyle changes for dementia risk reduction
Lastly, if the SRM was applied to dementia prevention, it can be argued that individuals with the following characteristics and beliefs are more likely to be engaged in dementia preventive behaviour: individuals who a) are forgetful; b) are aware that dementia is a chronic disease; c) believe that being forgetful is an early sign of dementia; d) believe they will develop dementia in the near future; and e) believe that they can reduce their risk of dementia.

4.3 Conclusion

This chapter examined the six most commonly used behaviour change models. In considering which model was the most suitable for dementia intervention, strengths and limitations for each model were taken into consideration. In addition, the suitability of how well each model fitted with the current project was also taken into account. Incorporation of variables from different models rather than choosing one specific behaviour change model was also considered because it is common in practice and a number of studies have argued that combining constructs can achieve the best explanation of behaviour (Conner & Norman, 1994; Quine, Rutter, & Arnold, 1998).

Previous research that have compared theories, mainly the Theory of Planned Behaviour and Health Belief Model, have shown that the models perform at a similar level, suggesting that there may be little to choose between them (Ali, Haidar, Ali, & Maryam, 2011; Lajunen & Rasanen, 2004; Norman & Conner, 1995; Simsekoglu & Lajunen, 2008). This may be a result of a considerable overlap between the constructs included in the models. For example, confidence
in the HBM is similar to self-efficacy in the self-efficacy model. Constructs of the internal locus of control is also similar to self-efficacy/confidence, believing he/she has control over the consequence, which in this case, is developing dementia. In addition, the HLC believes that the health value should be viewed as a moderator of the relationship between internal locus of control beliefs, and the performance of health behaviour since the locus of control beliefs should only predict health behaviour when people value their health (Norman & Bennett, 1995). This fits well with the general health motivation component in the HBM.

Furthermore, the HBM was chosen over TPB because the HBM was reported to be more economical and parsimonious than the TPB in terms of the questions employed (Mullen, Hersey, & Iverson, 1987). The TMC was not the best model for dementia prevention because it explains how the behaviour change occurs but does not provide the causative explanation of behaviour, which is the interest of the current research. The SRM was also not the best model because the model seemed more suitable for managing dementia rather than preventing dementia. Therefore, the HBM was chosen as the most suitable model out of these six models mentioned above to explain intentions to change lifestyle and health behaviour for dementia risk reduction. To overcome the weaknesses of the original HBM identified in the earlier section, HBM with seven components can be applied addressing social and emotional factors to the model. By adding cues to action (social factor) to the model, health behaviour can be triggered when appropriate beliefs are held (when general health motivation is high) (Rosenstock, 1966). Perceived susceptibility can also represent an emotional factor (the fear of
developing dementia) of the HBM. The following chapter will map out the design of a questionnaire based on the components of the HBM and evaluate the use of the HBM in dementia risk reduction.
CHAPTER 5: Development of the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale

Synopsis

It is not yet understood how attitudes surrounding dementia risk may affect motivation to change health behaviours and lifestyle. This study was designed to develop a reliable and valid theory-based measure to understand beliefs underpinning the lifestyle and health behavioural changes needed for dementia risk reduction. Six hundred and seventeen participants aged 50 years and older completed a theory-based questionnaire, The Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale. The scale consisting of 53 items, reflecting seven subscales of the Health Belief Model (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, health motivation, cues to action, and self-efficacy) was developed. Confirmatory factor analysis (CFA) was performed and revealed that a seven factor solution with 27 items fitted the data (CFI= .920, RMSEA= .047) better than the original 53 items. Internal reliability ($\alpha=.608 - .864$) and test-retest reliability ($\alpha=.552 - .776$) were moderate to high. Measurement of invariance across gender and age was also demonstrated. These results suggest that the MCLHB-DRR is a useful tool in assessing the beliefs and attitudes of males and
females from 50 years of age towards dementia risk reduction. This measure can be used in the development and evaluation of interventions aimed at dementia prevention.

5.1 Introduction

In the past few decades research has focused on the identification of health behaviours that contribute to disease, and on interventions designed to improve health behaviours (Adler & Matthews, 1994; Smith, Orleans, & Jenkins, 2004). Of specific interest here, research has identified numerous lifestyle factors that play a major role in reducing the risk of dementia, which are addressed in Chapter 2.

Nevertheless, reduction of dementia prevalence cannot be achieved by the identification of risk factors alone. What is needed are theoretically and empirically driven interventions targeting optimisation of the known health behaviours and lifestyle. Behavioural change theories provide a helpful basis for the design of interventions to change lifestyle and health behaviours through the understanding of structural and psychological determinants of behaviours (Michie et al., 2008; Painter, Borba, Hynes, Mays, & Glanz, 2008). Within a health behaviour change model, successful interventions designed to address dementia risk behaviours include addressing attitudes and beliefs surrounding health and lifestyle behaviours and dementia risk in the population. We are, however, unaware of any studies using a behavioural change model as a theoretical framework that examines attitudes regarding motivation for behaviour and lifestyle changes for the prevention of dementia. The development of a scale examining the motivations and beliefs surrounding behavioural and lifestyle change specifically for dementia risk reduction is therefore needed.
In the current study, the Health Belief Model (HBM) is used as a conceptual model to develop a measurement of motivation for behavioural and lifestyle change for dementia risk reduction for middle-aged and older Australians. The HBM is one of the most commonly used theories explaining health related behaviours and health promotion (Glanz, Rimer, & Lewis, 2002; Guvenc et al., 2011). The premise of the HBM is that the identification of beliefs and motivations related to health behaviours can inform the development of interventions designed to increase desirable health behaviours (Champion, 1984). This model was initially introduced with four main concepts: perceived susceptibility, perceived seriousness/severity, perceived benefits and perceived barriers (Champion, 1999; Gözüm & Aydin, 2004). Three additional concepts; cues to action, general health motivation and confidence (self-efficacy) were later added to the original HBM to enrich the model and to address some criticisms of the earlier model of the HBM (Reynolds, Metz, & Unger, 2007). These criticisms were that: 1) health behaviour are not always rational; 2) HBM only focuses on the individual and ignores social and environment factors; 3) the role of emotional factors is not duly considered; and 4) alternative factors may predict health behaviour, such as outcome expectancy and self-efficacy (Schwarzer, 1992; Seydel et al., 1990). Although, introducing these three additional components to the HBM does not address all its weaknesses, the HBM with seven concepts was chosen as the best suited model for dementia risk reduction after careful consideration of six different behaviour change models (Health Belief Model, Health Locus of Control, Theory of Reasoned Action/Theory of Planned
Behaviour, Self-efficacy Theory, Stage of change/Transtheoretical Model of Change, and common sense model of self-regulation) against the outcome of a qualitative study in Chapter 3.

According to the HBM, health promoting behaviour is more likely to occur if the individual feels threatened by her/his current behavioural patterns through perceived susceptibility and severity, and believes that a specific behavioural change will result in a valued outcome at an acceptable cost where perceived benefits outweigh perceived barriers. Moreover, an internal or external stimulus to change behaviours (cues to action), desire to achieve an outcome (general health motivation), and confidence in being able to perform the desired behaviours (self-efficacy) are needed (Janz et al., 2002).

The HBM has not been applied to the examination of behavioural changes for dementia risk reduction specifically. However, a small number of studies have used the HBM to understand intention to have a cognitive status examination for dementia and memory loss, and have shown that factors from the HBM (especially perceived barriers and cues to action) were significant predictors of intention (Galvin et al., 2006; Werner, 2003).

The purpose of this study is to develop and evaluate a new instrument based on the HBM, the Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR), designed to assess beliefs and attitudes about lifestyle and health behavioural changes for dementia risk reduction among middle-aged and older Australians.
5.2 Methods

5.2.1 Development of the Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR) Scale

The items included in the MCLHB-DRR were constructed based on focus group interviews conducted with 34 middle-aged and older Australians in Chapter 3 and by modifying items from existing literature on the HBM applied to breast cancer screening (Champion, 1999) and cognitive status examination (Werner, 2003) (see Appendix B). Some items were derived from the existing scale with modifications of topic to dementia, such as “My chances of getting breast cancer are great” to “My chances of developing dementia are great”. On the other hand, some items were derived from comments which arose during the focus groups, that is unique to dementia, such as “Dementia is a natural process of ageing for a lot of people”.

The scale included seven sub-scales that reflected the seven concepts of the HBM: perceived susceptibility (participants’ perceived risk for developing dementia during their lifetime); perceived severity (how anxious and stressed they would feel if they developed dementia); perceived benefits (participants’ perceptions regarding possible benefits associated with changing lifestyle and health behaviour to reduce dementia risk); perceived barriers (participants’ perceptions regarding possible barriers associated with changing lifestyle and health behaviour to reduce dementia risk); cues to action (participants’ perceptions regarding the social influence to change lifestyle and health behaviour for dementia risk reduction); general health motivation (how much they value their
general health and wellbeing); and self-efficacy (confidence in changing lifestyle and health behaviour for dementia risk reduction), comprising 53 items. All items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

The HBM typically predicts one specific type of health behaviour. However, multi-domain interventions may be more effective than single-domain interventions in dementia prevention (Barnes & Yaffe, 2011). Therefore, any health behaviour and lifestyle that individuals are engaged in to reduce their risk of developing dementia should be considered as a dementia preventing behaviour. As identified in Chapter 2, these behaviours include: participating in cognitively stimulating leisure activities; participating in regular physical activity; drinking at light to moderate levels; quitting smoking; maintaining body mass index (BMI) within the normal range; increasing fish consumption; and engaging in high level of social engagement.

Before the questionnaire was distributed to participants, the 53 items were assessed for their clarity of expression and content validity by all my panel supervisors and me. Minor revisions (rephrasing of items) were made based on this process.

5.2.2 Participants and data collection

Six hundred and fifty nine Australians, recruited from a survey company, Qualtrics (www.qualtrics.com)’s panels, took part in an online survey on motivations to change health and lifestyle behaviours for dementia risk reduction. These panellists were recruited either from the homepage of Qualtrics’ partner
website or via pop-ups that were distributed across a network. Once panellists had been verified and registered with a panel, they received invitations to participate in the surveys. Panellists who met the inclusion criteria were invited to take part in the current study. The criteria for inclusion were: a minimum age of 50 years and not having previously been diagnosed with dementia. Forty two people who did not agree with the terms and hence did not give their consent to participate in the study and those who were under 50 years were not included, leaving 617 people for data analysis. The study was approved by the Australian National University Ethics committee and all participants provided a written informed consent to participate. Participants had also provided consent to being recontacted within a 3 week period for re-examination.

On the website, participants were required to read an information sheet and approve a consent form before proceeding to the questionnaire. The sociodemographics questionnaire (age, gender, education level, marital status, employment status and income level) was provided prior to the completion of the MCLHB-DRR.

The participants ranged in age from 50 to 96 years (M=61.08, SD=7.61) and 59.6% of total participants were female. The majority of participants were married or in de facto relationships (67.3%), lived in New South Wales (33.7%), had secondary school education (43.1%), and were retired (45.4%). Three hundred and five people (49.4%) also reported that they had relatives or friends who suffer/suffered from dementia and 110 (17.8%) cared for a relative or friend with dementia. See Table 5.1 for more detailed demographics.
To examine the test-retest reliability of the questionnaire, a random subsample from the original 617 participants (N=108; response rate of 17.5%) were asked to return to the survey website within approximately three weeks to complete the questionnaire again.

5.2.3 Statistical analysis

As the scale was theory driven and developed based on pre-existing conceptual findings from our qualitative study and literature, pre-determined categories or grouping of the items were used. To validate and refine this structure, a series of confirmatory factor analyses (CFA) were conducted. We allowed for improvements and modifications in the form of error covariances and removal of poor performing items (i.e., low factor loading of value below .45 or significant cross-loading) (Byrne, 2010) to maximize future use of the scale and minimize participant burden. Items were permitted to load only on the construct they theoretically represented. Error covariances identified by modification indices were only examined further if (a) they would reduce large residuals and significantly improve the fit of a poor fitting model and (b) made theoretical or conceptual sense.
Table 5.1 Characteristics of the sample (%)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-59 (N=85)</td>
<td>60-69 (N=118)</td>
</tr>
<tr>
<td>Marital status – Married / de facto</td>
<td>62.4</td>
<td>72.9</td>
</tr>
<tr>
<td>Education – High school</td>
<td>41.2</td>
<td>28.0</td>
</tr>
<tr>
<td>Currently working</td>
<td>51.8</td>
<td>28.8</td>
</tr>
<tr>
<td>Income – less than $52,000</td>
<td>50.6</td>
<td>60.2</td>
</tr>
<tr>
<td>Born in Australia</td>
<td>82.4</td>
<td>75.4</td>
</tr>
<tr>
<td>Area of residency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Australian Capital Territory</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>- New South Wales</td>
<td>22.6</td>
<td>36.8</td>
</tr>
<tr>
<td>- Victoria</td>
<td>33.3</td>
<td>23.1</td>
</tr>
<tr>
<td>- Queensland</td>
<td>21.4</td>
<td>23.1</td>
</tr>
<tr>
<td>- South Australia</td>
<td>13.1</td>
<td>7.7</td>
</tr>
<tr>
<td>- Western Australia</td>
<td>4.8</td>
<td>7.7</td>
</tr>
<tr>
<td>- Northern Territory</td>
<td>2.4</td>
<td>0</td>
</tr>
<tr>
<td>- Tasmania</td>
<td>1.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Relatives/friends with dementia</td>
<td>38.8</td>
<td>52.5</td>
</tr>
<tr>
<td>Cared for relatives/friends with dementia</td>
<td>11.8</td>
<td>17.8</td>
</tr>
</tbody>
</table>
We used the following multiple fit indices to evaluate model fit: $\chi^2$ (and the respective degrees of freedom, df), goodness of fit index (GFI), comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). The CFI and GFI values between .90 and .95 or above suggest good to excellent fit (Hu & Bentler, 1995, 1999; Joreskog & Sorbom, 1993) and RMSEA values <.05 suggest good model fit (Brown & Cudeck, 1993).

Reliability and internal consistency for each subscale were assessed using correlation analysis (Cronbach’s alpha and item-total correlation) and the stability of the measures was examined through test-retest reliability assessment via intra-class correlation coefficients. Construct validity was not evaluated due to unavailability of a similar measurement to the MCLHB-DRR.

To examine whether the scores obtained from the MCLHB-DRR were generalizable between age and gender, tests of measurement invariance were conducted. Data were analysed with SPSS and AMOS version 20.
5.3 Results

5.3.1 Confirmatory factor analyses

Two models (see table 5.2) were tested where the first model was a seven factor model in which all 53 items were used. The analysis showed that this model was not a good fit of the data. All fitted indices were less than the accepted value of 0.9 (CFI=0.668, GFI=0.713). The RMSEA (0.063) was also outside the accepted value of .05 or less.

The second model (see figure 5.1) was a seven factor model using the 27 remaining items (Appendix C) after deleting items demonstrating low correlations with their respective scales (value below .45) and items loading on more than one factor. This model resulted in a better fit than the first model, with all fit indices larger than .90 (GFI=0.916, CFI=0.920) and smaller than .05 (RMSEA=0.047). Chi-square was 718.6 with degrees of freedom=302, p=.000. The standardized coefficients of the perceived susceptibility items (4 items), perceived severity (5), perceived benefits (5), perceived barriers (4), cues to action (4), general health motivation (4), self-efficacy (2) ranged from .366 to .852 and were all statistically significant (p < .001). The correlations between factors were statistically significant for most factors (Table 5.3).
<table>
<thead>
<tr>
<th>Goodness of fit indices</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>GFI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>5810.62</td>
<td>1682</td>
<td>.713</td>
<td>.668</td>
<td>.063</td>
</tr>
<tr>
<td>Model 2</td>
<td>718.65</td>
<td>302</td>
<td>.916</td>
<td>.920</td>
<td>.047</td>
</tr>
</tbody>
</table>

Note: \( \chi^2 \) (chi square), df (degree of freedom), GFI (Goodness of fit index), CFI (Comparative fit index), RMSEA (Root-mean-square error of approximation).
Figure 5.1 Confirmatory factor analysis model with 27 items
Note: Sus (Perceived susceptibility), Sev (Perceived severity), Benefit (Perceived benefit), Barrier (Perceived barrier), Cues (Cues to action), Health M (General health motivation), SE (Self efficacy).
Table 5.3 Covariance coefficients for subscale factors

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>1. Perceived Susceptibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perceived Severity</td>
<td>.453***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived benefits</td>
<td>.021</td>
<td>.205***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Perceived barriers</td>
<td>.114</td>
<td>.152**</td>
<td>-.463***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Cues to action</td>
<td>.368***</td>
<td>.489***</td>
<td>.863***</td>
<td>-.202***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. General health motivation</td>
<td>.248***</td>
<td>.362***</td>
<td>.559***</td>
<td>-.183**</td>
<td>.541***</td>
<td></td>
</tr>
<tr>
<td>7. Self-efficacy</td>
<td>.064</td>
<td>-.105</td>
<td>-1.008***</td>
<td>.529***</td>
<td>-.751***</td>
<td>-.433***</td>
</tr>
</tbody>
</table>

* p < 0.01, ** p < 0.005, *** p < 0.001
5.3.2 Reliability and internal consistencies

Correlation analyses were conducted using the 27 items from the final confirmatory factor analysis. Correlation analysis indicated that all item scores were positively correlated with the total scale score. The correlation coefficients varied from .743 to .875 (p < 0.01 for all) for the perceived susceptibility, from .606 to .752 for perceived severity, from .648 to .787 for perceived benefits, from .728 to .796 for perceived barriers, from .642 to .765 for cues to action, from .589 to .779 for general health motivation, and .861 to .866 for self-efficacy. The Cronbach Alpha values varied from .608 to .864 (Table 5.4) for general health motivation and perceived susceptibility respectively showing good internal consistency.

Test-retest reliability was evaluated with a representative subset of the original sample (108 people) approximately 3 weeks later. The retest participants did not significantly differ from the remaining members of the sample on demographic factors or any other variables examined in this study. The factor scores demonstrated moderate test-retest reliabilities for all subscales, the Cronbach Alpha values ranged from .552 to .776 (see Table 5.4).
<table>
<thead>
<tr>
<th>Subscales</th>
<th>No. of items</th>
<th>Cronbach Alpha</th>
<th>Test-retest</th>
</tr>
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<tr>
<td>Perceived Susceptibility</td>
<td>4</td>
<td>.864</td>
<td>.776</td>
</tr>
<tr>
<td>Perceived Severity</td>
<td>5</td>
<td>.725</td>
<td>.726</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>4</td>
<td>.694</td>
<td>.645</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>4</td>
<td>.740</td>
<td>.651</td>
</tr>
<tr>
<td>Cues to action</td>
<td>4</td>
<td>.684</td>
<td>.552</td>
</tr>
<tr>
<td>General health motivation</td>
<td>4</td>
<td>.608</td>
<td>.596</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2</td>
<td>.658</td>
<td>.602</td>
</tr>
</tbody>
</table>
5.3.3 Gender and age differences

Tests of measurement invariance were performed to examine the generalizability of the MCLHB-DRR across gender and age groups. Traditionally, the $\Delta \chi^2$ has been used as the index of difference in fit. However, because $\Delta \chi^2$ has been found to be overly sensitive to sample size, Cheung and Rensvold (2002) recommended using $\Delta$CFI with values higher than .01 as an indication of measurement invariance not being found.

The results from measurement invariance tests indicated that the fit of this model to be consistent with that of the configural model for both gender (male and female) and age groups (50-64 years old: pre-retirement, and 65 and over: post-retirement) (see Table 5.5). Both $\Delta \chi^2$ and $\Delta$CFI argued for invariance where the differences were not statistically significant.

In addition, a table describing the means for each subscale for the MCLHB-DRR across different gender and age groups is recorded in Table 5.6. Fifty to fifty nine year old males had significantly higher level of perceived susceptibility ($p=.036$) and perceived barriers ($p=.022$) than 70 years old and older males. Fifty to fifty nine year old males also had significantly higher level of health motivation than 60-69 year old males ($p=.014$). On the other hand, no significant age difference was shown in females.
Table 5.5 Results of the Measurement Invariance Tests

<table>
<thead>
<tr>
<th>Model description</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta df$</th>
<th>Statistical significance</th>
<th>CFI</th>
<th>$\Delta$CFI</th>
</tr>
</thead>
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<tr>
<td><strong>Gender</strong></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Configural model</td>
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<td>604</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.910</td>
<td>-</td>
</tr>
<tr>
<td>(no equality constraints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>imposed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement model</td>
<td>1112.1</td>
<td>631</td>
<td>34.3</td>
<td>27</td>
<td>ns</td>
<td>.910</td>
<td>.000</td>
</tr>
<tr>
<td>(all factor loadings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>constrained equal)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configural model</td>
<td>1095.2</td>
<td>604</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.908</td>
<td>-</td>
</tr>
<tr>
<td>(no equality constraints</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Measurement model</td>
<td>1114.2</td>
<td>625</td>
<td>19</td>
<td>21</td>
<td>ns</td>
<td>.908</td>
<td>.000</td>
</tr>
<tr>
<td>(all factor loadings</td>
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<td></td>
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</tr>
<tr>
<td>constrained equal)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: $\chi^2$ (chi square), df (degree of freedom), $\Delta \chi^2$ (change in chi square), $\Delta df$ (change in degree of freedom), CFI (Comparative fit index), $\Delta$CFI (change in comparative fit index), ns (not significant).
Table 5.6 Mean and SD for the MCLHB-DDR subscales for different age and gender groups

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-59</td>
<td>60-69</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>11.2±2.3 (4-17)</td>
<td>10.9±2.6 (4-19)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>14.9±2.9 (9-24)</td>
<td>14.9±3.3 (5-25)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>13.8±2.5 (4-20)</td>
<td>14.0±2.1 (9-20)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>10.5±2.9 (4-20)</td>
<td>9.8±2.3 (4-15)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>12.4±2.5 (4-20)</td>
<td>12.2±2.2 (8-18)</td>
</tr>
<tr>
<td>Health motivation</td>
<td>15.0±2.6 (4-20)</td>
<td>15.9±2.1 (10-20)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>5.3±1.2 (2-8)</td>
<td>5.1±1.3 (2-8)</td>
</tr>
</tbody>
</table>
5.4 Discussion

This paper describes the development and evaluation of the psychometric properties of a new scale (MCLHB-DRR) designed to measure beliefs and motivations of behaviours to reduce dementia risk for middle aged and older Australians. The seven factor model reflected dimensions of the HBM (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, general health motivation, and self-efficacy) on lifestyle and health behavioural changes for dementia risk reduction.

The confirmatory factor analysis showed a model with 27 (of the original 53) items as the best fit for the data. The internal consistencies for the seven subscales were moderate to high and the test-retest reliability for the scale was moderate after an approximate three weeks interval. Lower test-retest reliability could be due to fluidity of the beliefs as MCLHB-DRR measures a construct of value that can change with experiences or knowledge. The findings also indicated that all items designed to measure motivation to change lifestyle and health behaviours for dementia risk reduction were operating equivalently across the two groups of age and gender. Overall, these results demonstrated the soundness of the psychometric properties of the MCLHB-DRR, and the suitability of the HBM in characterizing beliefs and motivations regarding behavioural and lifestyle changes critical for dementia risk reduction.

One interesting finding from this study was that three out of the five final perceived severity items were emotionally driven items that addressed fear (the thought of dementia scares me; when I think about dementia my heart beats faster;...
and when I think about dementia I feel nauseous). This is in contrast to the construct of the initial items (from the original 53 item scale) that addressed perceived severity of developing dementia in terms of its relation to finance, relationship and other effects on the person. Having these emotionally driven items was not, however a surprise as Pfizer, (2010) reported that almost two out of three Australians (63%) over the age of 18 feared developing dementia. This suggests that fear of developing dementia may be a motivating factor for health and lifestyle behavioural changes and this can be examined closely in future research. However, the items for other subscales were all in line with typical HBM constructs in that individuals report that they are more likely to change lifestyle and health behaviour if they believe that they have a high chance of developing dementia; that they will benefit from changing lifestyle and health behaviours; that they have few barriers; that they have internal and/or external cues to change; that they value general health; and that they believe they are capable of making changes.

This study had a number of limitations. The main aim was to develop a scale to measure beliefs about dementia preventing behaviours, which was very broad in terms of the possible changes participants could have thought about when answering the questions. More than one lifestyle and behavioural changes were implied for dementia risk reduction. Consequently, it was not clear which behavioural change individuals were reflecting on when they were considering the implication of behavioural change for dementia risk. In addition, if participants did not know what changes were required to reduce their risk of developing
dementia (e.g. they did not know that smoking is correlated to high risk of
developing dementia), they might not have understood what changes the questions
were referring to. Moreover, the benefit of behavioural change might not have
been clearly established due to participants' lack of awareness. Therefore, future
studies providing information on dementia preventing behaviours and lifestyle
before the completion of the scale should be sought. In addition, future studies
examining how these subscales could predict the intention to change lifestyle and
health behaviours and whether this intention would be followed by behaviour
change itself should also be conducted.

The current study used a convenience sample, which may not be
completely representative of the population. Therefore, the psychometric
properties of this scale should be further examined in community samples. In
addition, having no objective assessment of cognition could not guarantee that all
participants were free from dementia or cognitive impairment. Hence, future
research should address this limitation and carry out a cognitive testing that is
concise and relevant to this age group to ensure that the research was testing the
scale on 50 years and older dementia/cognitive impairment free individuals.

Despite these limitations, the current study has contributed to the literature
by providing the MCLHB-DRR, which is a first step towards developing more
specific instruments to assess particular domains/type of changes. Moreover, as
intervention studies based on the HBM have shown increased rates in positive
behaviours such as breast cancer screening (Champion, 1999; Vietri, Poskitt, &
Slaninka, 1997), the MCLHB-DRR scale may also be used in future intervention
studies to increase health promoting behaviours and lifestyle changes for dementia risk reduction.

The scale can also provide useful information for developing effective interventions. The current study can assist researchers to not only identify people who would benefit most from the intervention but also tailor intervention programs based on an individual’s particular motivations and beliefs. It is likely that different individuals would score differently on each subscale thus by identifying specific HBM domains relevant to each person, tailored interventions are possible, and even desirable (Krebs, Prochaska, & Rossi, 2010). For instance, for someone who is low on perceived susceptibility and high on perceived benefits, education focused on the prevalence of dementia may be more effective for changing behaviours and lifestyle than education targeted at the benefits of performing preventive behaviours.

This is the first study that develops and assesses the psychometric properties of a scale attempting to understand the beliefs of health and lifestyle behaviours specifically aimed at preventing dementia. The analysis of the psychometric properties of the MCLHB-DRR scale are encouraging and suggest that it is a useful tool to assess beliefs about lifestyle and behavioural changes for dementia risk reduction among middle aged and older Australians. This tool could be used in intervention studies and surveys aimed at dementia prevention.
CHAPTER 6: Understanding intentions to change lifestyle and health behaviour for dementia risk reduction: A study based on the health belief model

Synopsis

Guided by the Health Belief Model (HBM), the aim of this chapter was to examine the factors influencing intentions to change lifestyle and health behaviour for dementia risk reduction among Australian men and women. Two hundred and fifty two participants aged 50 to 87 years across Australia completed the anonymous online survey comprising a dementia literacy questionnaire and the Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR) scale. Participants were also randomly assigned to one of three conditions (control, fear and education) and received different information on dementia risk reduction. Regression analyses showed that perceived benefits, cues to action, health motivation and self-efficacy were significantly associated with intentions to change lifestyle and health behaviours for dementia risk reduction with some gender differences. However, the assigned conditions were not significantly associated with intentions to change behaviours. This chapter validated the use of the HBM in dementia risk reduction and demonstrated that intentions to change lifestyle and health behaviours for dementia prevention were high when a) males believed that changing lifestyle and
health behaviour were beneficial in preventing dementia, and b) they believed they were capable of making changes. For female participants however, the intentions to change lifestyle and health behaviours for dementia risk reduction were high when a) they believed that changing lifestyle and health behaviour were beneficial in preventing dementia, b) they had more internal and/or external triggers to change lifestyle and health behaviour, and c) they valued general health.
6.1 Introduction

Prevalence and the costs associated with dementia cannot be lowered without the knowledge on modifiable risk and protective factors being translated to the public through effective interventions. Accurate public knowledge regarding dementia may promote lifestyle changes (Rodda & Carter, 2012). Limited research has been conducted on dementia literacy and have found that the majority of American subjects recognised dementia as not a normal part of ageing although they had a poor understanding on dementia risk factors, especially cardiovascular factors (Rodda & Carter, 2012). The Australian public did not differ greatly from the American samples. The majority of Australian samples could accurately recognise the symptoms of dementia and thought dementia risk could be reduced (Low & Anstey, 2009). However, most of them did not know about the association between dementia and cardiovascular factors. Additionally, a qualitative study from Chapter 3 that examined people’s knowledge on dementia and investigated barriers and motivations of behavioural and lifestyle changes for dementia risk reduction argued that there was a need for educating the population on dementia and what they can do to reduce their risk of developing dementia. Studies explaining other chronic diseases have also shown that well informed patients were more successful in maintaining a good control of the risk factors (Rachmani, Slavacheski, Berla, Frommer-Shapira, & Ravid, 2005).

In addition, the severity of the disease and its lack of treatment/cure creates a fear of developing dementia in people. Survey results have shown that
almost two out of three Australians fear developing dementia, second only to cancer (Pfizer, 2011) and dementia was the biggest fear in later life, ahead of cancer, among UK adults (Sniehotta et al., 2005). The fear of developing dementia was also found to be a key factor that was associated with people’s intention to change their lifestyle and health behaviours in Chapter 3.

Being aware of risk factors alone however does not lead to a decline in dementia prevalence if the intention to adapt healthier lifestyle and health behaviours for dementia risk reduction is absent. In other words, people may know the ‘secrets’ to reducing the risk of developing dementia, but only those who are willing to make changes in their lifestyle and health behaviour can reduce their risk of developing dementia. Therefore, research identifying individuals who would be more likely to make these changes and what their characteristics were, as well as how people can be encouraged to change their lifestyle and health behaviour for dementia risk reduction should be conducted. Only when this information is obtained, can effective interventions be provided to help people adopt healthy lifestyles and behaviours which would ultimately lead to a reduction in the prevalence of dementia.

In the current study, the Health Belief Model (HBM) with seven concepts; perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, general health motivation, and self-efficacy, will be used as a conceptual model to understand intentions to change lifestyle and health behaviours for dementia risk reduction. Within the HBM, health promoting behaviour is more likely to occur if the individual has a greater threat (perceived
susceptibility and perceived severity); believes that a specific behavioural change will result in a valued outcome (perceived benefits) at an acceptable cost (perceived barriers); has an internal or external stimulus to change behaviours (cues to action); has the desire to achieve an outcome (general health motivation); and has the confidence in being able to perform the desired behaviours (self-efficacy) (Janz, Champion, & Strecher, 2002).

The HBM has not been applied to the examination of lifestyle and behavioural changes for dementia risk reduction specifically although a small number of studies have used the HBM to understand intention to have a cognitive status examination for dementia and memory loss. These studies have shown that factors from the HBM (especially perceived barriers and cues to action) were significant predictors of intentions to screen for dementia (Galvin et al., 2006; Werner, 2003). It is however, uncertain if domains from the HBM, especially perceived barriers and cues to action, will play similar significant roles in behavioural and lifestyle changes for dementia risk reduction.

Furthermore, these two studies did not investigate possible gender differences. Instead, they assumed that the determinants of intention to be screened for both men and women were the same and no gender analyses were conducted. However, there is vast evidence from all fields of health research that gender-based inequalities are present with regard to their biology, their access to and control over resources, their decision-making power in the family and community, and the roles and responsibilities that society assigns to them (Arber & Ginn, 1993; Macintyre, Hunt, & Sweeting, 1996; Ostlin, Eckermann, Mishra,
Nkowane, & Wallstam, 2007). Therefore gender, often with socioeconomic circumstances, influence exposure to health risks, access to health information and services, health outcomes and the social and economic consequences of ill-health. These arguments on gender differences were backed up by a previous study that have found that men consistently underutilised preventive health care services compared to women (Bertakis, Azari, Helms, Callahan, & Robbins, 2000; Green & Pope, 1999). This could have been due to the role of masculinity and social norms (Addis & Mahalik, 2003; Courtenay, 2000). In addition, women reported to be more interested in general health (Green & Pope, 1999).

Due to the current study being the first of its kind in investigating the determinants of intentions to change health behaviour and lifestyle for dementia risk reduction, no relevant literature is currently available. However, studies examining other preventive behaviour for health promotion have shown gender differences in intentions to perform disease preventing behaviours. Davis and her colleagues examined gender associations in cancer screening beliefs, behaviours, and willingness to participate (Davis, Buchanan, Katz, & Green, 2012). They found that men were less willing to participate in a cancer screening compared to women. However, men were susceptible to participate in a variety of cancer screening events when given more information about the screening.

Another example of gender difference was observed in a study where they applied the HBM to identify gender-specific predictors of colorectal cancer (CRC) screening in an Asian population (Wong et al., 2013). Wong and colleagues found that not all items from the HBM were significantly associated with CRC screening.
for both men and women. Some items in perceived benefits and cues to action were only significantly associated with either men or women, suggesting predictors of CRC screening differed between genders.

The current study therefore investigates the gender differences in factors of the HBM associated with intentions to change lifestyle and health behaviour for dementia risk reduction among older Australian men and women. Furthermore, as education and fear of developing dementia are the key factors that influence people's decision on behaviour and lifestyle changes, the effects of these two factors on intention to change lifestyle and health behaviours for dementia will also be examined in this current study.

It is hypothesised that perceived barriers and cues to action would play significant roles in behavioural and lifestyle changes for dementia risk reduction in comparison to other constructs of the HBM. It is also hypothesised that perceived benefit would be a significant determinant of high intentions to change lifestyle and health behaviour for dementia risk reduction among males whereas cues to action would be a significant determinant of intentions to change lifestyle and health behaviour for dementia risk reduction among females. Lastly, it is hypothesised that the determinants of intentions to change lifestyle and health behaviour for dementia risk reduction for participants in a control group would be different from those in two experimental groups.
6.2 Methods

6.2.1 Participants

Participants (N=252, 74.6% female) were recruited through an advertisement titled ‘Dementia risk reduction study’ in a community newspaper distributed to homes in all eight states and territories in Australia. Advertisements were also posted in both online and offline communities nationwide through Council on the Ageing (COTA), University of the third age (U3A), and Alzheimer’s Australia (AA). Potential participants were aware that the study was about dementia and that they would be asked about their knowledge and perceptions of dementia.

6.2.2 Materials

6.2.2.1 Intentions to change lifestyle and health behaviour

Participants were asked to report their willingness to change lifestyle and health behaviours for dementia risk reduction (see appendix D for the full questionnaire). Two items measuring intentions were administrated: one measuring general intentions to change lifestyle and health behaviours for dementia risk reduction, and another measuring timeframe of intentions and how soon they are willing to make changes for dementia risk reduction (within a week, within a month, within 6 months, within 12 months, within more than 12 months, and never).
6.2.2.2 Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR)

The MCLHB-DRR scale, based on the Health Belief Model that was developed in Chapter 5 was used. This scale consisted of 27 items measuring beliefs underpinning the lifestyle and health behavioural changes needed for dementia risk reduction.

6.2.2.3 Dementia literacy questionnaire

Participants’ knowledge of dementia was measured with the dementia literacy questionnaire, originated from Low and Anstey (2009)’s study, with minor modification (removal of “don’t know” as a response option). Participants were asked what was wrong with the person in the vignette (see Appendix D), whether they thought the risk of dementia could be reduced, and what they thought contributed to the development of dementia (risk factors).

6.2.2.4 Socio-demographic variables

Socio-demographic variables included gender, age, education level, income, marital status, area of residency, country of born, employment status, and whether they have known and taken care of friend/relative with dementia.

6.2.3 Procedures

Anyone interested in participating was advised to either go to the website directly, which was indicated on the advertisements, or contact the primary investigator by email or phone. The consent form appeared on the given website before proceeding to the anonymous questionnaire and by clicking “I agree”
participants were assumed to have given their consent to use the information that they were about to give.

Participants were randomly assigned by the survey program to one of two experimental groups or a control group before completing the MCLHB-DRR scale. The first experimental group was given information on dementia and dementia risk reduction (education group). The second experimental group was given information on dementia that was intended to enhance their fear of developing dementia (fear group). The control group was given a list of risk factors for dementia without any extended information (see Appendix D for the full questionnaire). One of this information was given to participants prior to completing the scales.

6.2.4 Analysis

For descriptive purposes, the mean and standard deviation were calculated for the HBM constructs by gender and age groups. Two sets of hierarchical linear multiple regression were used to examine the association of intention to change lifestyle and health behaviours for dementia risk reduction and seven domains from the MCLHB-DRR. General intentions and timeframe of intentions were dependent variables for these regressions. Analyses were conducted separately for males and females in order to examine the gender differences in determinants of the intentions for lifestyle and health behaviour changes for dementia risk reduction. Domains of the MCLHB-DRR were entered together; the overall test of model 1 indicates their combined effect. The experimental condition (education and fear) was then added to assess its independent contribution (model 2).
Dementia literacy (knowledge) on dementia risk factors and the ability to recognize dementia/Alzheimer's disease from the given vignette were entered in model 3 and finally, age, partner status, education, employment status, and having family member or friend with dementia were entered for adjustment (model 4). Coefficients for these control variables are not reported in the tables although the effect of their inclusion on the total variance explained is provided.
6.3 Results

6.3.1 Characteristics of participants and dementia literacy

Participants' socio-demographic characteristics and dementia literacy are presented by gender in Table 6.1. Female participants were significantly younger (M=62.62, SD=7.49) and had lower income (41.9% earning between $15,600 and $52,000) than male participants (M=66.86, SD=8.84; 34.9% earning between $52,000 and $104,000). For both males and females, the majority of participants were married or in a de-facto relationship (81% for males and 62% for females), lived in the ACT (52.4% for males and 36.8% for females), had a bachelor degree (40.6% for males and 29.8% for females), and were not working (35.9% for males and 46.8% for females). The majority of participants (81.3% for males and 87.8% for females) also reported that they had relatives or friends who suffer/suffered from dementia and significantly more females (50.6%) than males (33.3%) cared for a relative or friend with dementia.

In terms of dementia literacy, 46.9% and 54.3% of males and females respectively could correctly recognise the vignette character as having dementia and/or Alzheimer's disease and only 15.6% of males and 14.4% of females believed the condition was due to old age. Almost all (98.4% of males and 95.7% of females) participants believed that they could reduce the risk of developing dementia and many were able to correctly identified risk factors (see Table 6.1). More females were able to recognise cholesterol and omega 3 as risk and protective factors than compared to males.
6.3.2 Participants' intentions to change lifestyle and health behaviour for dementia risk reduction

Participants’ mean intentions to change lifestyle and health behaviour were quite high (M=3.42, SD=1.11 for males and M=3.74, SD=.86 for females) where a higher score represented stronger intentions on a 5 point-likert scale. Almost one third of male participants (30.2%) and almost half of female participants (47.8%) indicated that they were willing to change their lifestyle and health behaviour for dementia risk reduction within one week.

6.3.3 Gender and age difference in the MCLHB-DRR scale

There were no significant gender differences on subscales except for two subscales; perceived severity and cues to action. There was a statistically significant difference in scores for perceived severity for males (M=14.14, SD=3.03) and females (M=16.16, SD=3.29; t (250) = -4.33, p=.000 (two-tailed)). The magnitude of the differences in the means (mean difference = -2.02, 95% CI: -2.91 to -1.13) was moderate (eta squared = .07). Statistically significant difference in scores were also found in cues to action between males (M=13.05, SD=3.04) and females (M=14.09, SD=2.67; t (250) = -2.61, P=.01 (two-tailed)). The magnitude of the differences in the means (mean difference = -1.04, 95% CI: -1.83 to -.25) was small (eta squared = .03).

A one-way ANOVA was used to test for differences among three age groups (50-59, 60-69, and 70 and over). Age differences were present for perceived barriers subscale. Perceived barriers differed significantly across three age groups, F (2,249) = 3.44, p =.034. Tukey post-hoc comparisons of the three
groups indicate that the 50-59 years old group (M=8.63, 95% CI (8.11, 9.16)) reported significantly higher perceived barriers than the 60-69 years old group (M = 7.90, 95% CI (7.55, 8.25)), \( p = .039 \). Comparisons between 70 and over group (M=7.91, 95% CI (7.38, 8.44)) and the other two groups were not statistically significant at \( p < .05 \). A table describing the means and standard deviation for each subscale for the MCLHB-DRR across different gender and age groups is shown in Table 6.2.
Table 6.1. Participants’ characteristics (N=252)

<table>
<thead>
<tr>
<th></th>
<th>N (%)</th>
<th>N (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64 (25.4%)</td>
<td>188 (74.6%)</td>
<td></td>
</tr>
<tr>
<td>Socio-demographic characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, M (SD)</td>
<td>66.86 (8.84)</td>
<td>62.62 (7.49)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian Capital Territory</td>
<td>33 (52.4%)</td>
<td>67 (36.8%)</td>
<td>.139</td>
</tr>
<tr>
<td>New South Wales</td>
<td>7 (11.1%)</td>
<td>36 (19.8%)</td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>6 (9.5%)</td>
<td>17 (9.3%)</td>
<td></td>
</tr>
<tr>
<td>Queensland</td>
<td>10 (15.9%)</td>
<td>33 (18.1%)</td>
<td></td>
</tr>
<tr>
<td>South Australia</td>
<td>2 (3.2%)</td>
<td>16 (8.8%)</td>
<td></td>
</tr>
<tr>
<td>Western Australia</td>
<td>5 (7.9%)</td>
<td>7 (3.8%)</td>
<td></td>
</tr>
<tr>
<td>Northern Territory</td>
<td>0 (0%)</td>
<td>5 (2.7%)</td>
<td></td>
</tr>
<tr>
<td>Tasmania</td>
<td>0 (0%)</td>
<td>1 (.5%)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>1 (1.6%)</td>
<td>9 (4.8%)</td>
<td>.099</td>
</tr>
<tr>
<td>Married, De facto</td>
<td>51 (81.0%)</td>
<td>116 (62.0%)</td>
<td></td>
</tr>
<tr>
<td>Separated, divorced or widowed</td>
<td>11 (17.5%)</td>
<td>62 (33.2%)</td>
<td></td>
</tr>
<tr>
<td>Country of born</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>44 (69.8%)</td>
<td>129 (69.4%)</td>
<td>.943</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td>8 (12.5%)</td>
<td>36 (19.1%)</td>
<td>.345</td>
</tr>
<tr>
<td>Trade certificate</td>
<td>5 (7.8%)</td>
<td>12 (6.4%)</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>12 (18.8%)</td>
<td>42 (22.3%)</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>26 (40.6%)</td>
<td>56 (29.8%)</td>
<td></td>
</tr>
<tr>
<td>Honour’s degree or higher</td>
<td>13 (20.3%)</td>
<td>42 (22.3%)</td>
<td></td>
</tr>
<tr>
<td>Currently working</td>
<td>23 (35.9%)</td>
<td>88 (46.8%)</td>
<td>.131</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$15,600</td>
<td>2 (3.2%)</td>
<td>13 (7.3%)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>$15,600 – 52,000</td>
<td>19 (30.2%)</td>
<td>75 (41.9%)</td>
<td></td>
</tr>
<tr>
<td>Income Level</td>
<td>Care for Family/Friend with Dementia</td>
<td>Care for Family/Friend with Dementia</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------</td>
<td>--------------------------------------</td>
<td></td>
</tr>
<tr>
<td>$52,000 – 104,000</td>
<td>22 (34.9%)</td>
<td>59 (33.0%)</td>
<td></td>
</tr>
<tr>
<td>&gt;$104,000</td>
<td>20 (31.7%)</td>
<td>32 (17.9%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Care for Family/Friend with Dementia</th>
<th>Care for Family/Friend with Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family/friend with dementia</td>
<td>52 (81.3%)</td>
<td>165 (87.8%)</td>
</tr>
<tr>
<td>Care for family/friend with dementia</td>
<td>21 (33.3%)</td>
<td>91 (50.6%)</td>
</tr>
</tbody>
</table>

### Dementia Literacy

<table>
<thead>
<tr>
<th>Category</th>
<th>Care for Family/Friend with Dementia</th>
<th>Care for Family/Friend with Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>30 (46.9%)</td>
<td>102 (54.3%)</td>
</tr>
<tr>
<td>Due to old age</td>
<td>10 (15.6%)</td>
<td>27 (14.4%)</td>
</tr>
<tr>
<td>Risk reduction</td>
<td>63 (98.4%)</td>
<td>178 (95.7%)</td>
</tr>
</tbody>
</table>

### Risk Factor

<table>
<thead>
<tr>
<th>Category</th>
<th>Care for Family/Friend with Dementia</th>
<th>Care for Family/Friend with Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>51 (79.7%)</td>
<td>155 (82.4%)</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>40 (62.5%)</td>
<td>132 (70.2%)</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>30 (46.9%)</td>
<td>122 (64.9%)</td>
</tr>
<tr>
<td>Omega3</td>
<td>34 (53.1%)</td>
<td>128 (68.1%)</td>
</tr>
<tr>
<td>Physical activity</td>
<td>56 (87.5%)</td>
<td>168 (89.4%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>42 (65.6%)</td>
<td>141 (75.0%)</td>
</tr>
<tr>
<td>Social engagement</td>
<td>58 (90.6%)</td>
<td>168 (89.4%)</td>
</tr>
<tr>
<td>Healthy weight</td>
<td>37 (57.8%)</td>
<td>117 (62.2%)</td>
</tr>
<tr>
<td>Mental activity</td>
<td>61 (95.3%)</td>
<td>177 (94.1%)</td>
</tr>
</tbody>
</table>
Table 6.2. Mean and SD for the MCLHB-DDR subscales for different age and gender groups

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male (N=64)</th>
<th>Female (N=188)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-59 (n=14)</td>
<td>60-69 (n=23)</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>12.36 (2.73)</td>
<td>11.09 (2.59)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>14.93 (3.08)</td>
<td>13.78 (2.09)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>14.21 (2.22)</td>
<td>14.74 (1.86)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>8.57 (2.47)</td>
<td>7.48 (1.56)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>13.21 (3.47)</td>
<td>13.00 (3.13)</td>
</tr>
<tr>
<td>Health motivation</td>
<td>16.21 (1.85)</td>
<td>16.09 (2.07)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>7.43 (1.40)</td>
<td>7.35 (1.34)</td>
</tr>
</tbody>
</table>
6.3.4 Intentions to change lifestyle and health behaviours for dementia risk reduction

Two sets of multiple linear regression analyses were conducted to examine the HBM model. The first had intentions to change lifestyle and health behaviour for dementia risk reduction as the dependent variable (Table 6.3). The second examined timeframe of intentions to change lifestyle and health behaviour for dementia risk reduction (Table 6.4).

Multiple linear regression analyses showed that perceived benefits and cues to action were significantly associated with intentions to change lifestyle and health behaviours for dementia prevention for both males (p<.005 and p<.05 respectively) and females (p<.05 for both) (model 1 in Table 6.3). The association between self-efficacy and intentions was significant only for males (p<.05) and the association between health motivations with intentions was significant for females (p<.05) only. Model 1 explained larger variance for males (58.6% variance explained) than females (35.1% variance explained). Experimental conditions (model 2) shared an independent 1.3% and 1.1% variance with intentions for males and females respectively, which were not statistically significant. The effect of dementia knowledge added an independent 2.2% significant variance to the model for females in model 3. After adjusting for age, education, partner status, employment status, and knowing a family member or friend with dementia, these coefficients changed. Cues to action was no longer significantly associated with intentions to change behaviours and lifestyle for males (p=.093) and dementia risk factor knowledge was no longer significantly
associated with intentions to change health behaviours and lifestyle for females (p=.927).

Multiple linear regression analyses for timeframe of intentions also showed clear gender differences. Cues to action were significantly associated with intentions to change lifestyle and health behaviours for dementia risk reduction for both males (p<.05) and females (p<.001) (model 1 in Table. 6.4). Perceived benefits were significantly associated with intentions only for males (p<.01). Experimental conditions (model 2) and dementia literacy (model 3) did not add a significant variance to the model for both males and females although the ability to recognise dementia from the vignette (p<.05) and knowledge on dementia risk factors (p<.05) were significantly associated with intentions to change lifestyle and health behaviours for males and females respectively. After adjusting for socio-demographic characteristics, perceived benefits was the only factor statistically significantly associated with timeframe of intentions for males (p<.005) whereas only cues to action was significantly associated with how fast females intended to change their lifestyle and health behaviour for dementia risk reduction (p<.001).
Table 6.3. Unstandardised Regression coefficients (standard error) for intention to change lifestyle and health behaviours for dementia risk reduction by gender

<table>
<thead>
<tr>
<th></th>
<th>Male Model 1</th>
<th>Male Model 2</th>
<th>Male Model 3</th>
<th>Male Model 4</th>
<th>Male Model 1</th>
<th>Male Model 2</th>
<th>Male Model 3</th>
<th>Male Model 4</th>
<th>Female Model 1</th>
<th>Female Model 2</th>
<th>Female Model 3</th>
<th>Female Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptibility</td>
<td>-.054 (.050)</td>
<td>-.037 (.054)</td>
<td>-.036 (.056)</td>
<td>-.038 (.060)</td>
<td>.013 (.018)</td>
<td>.009 (.018)</td>
<td>.013 (.018)</td>
<td>.010 (.018)</td>
<td>-.013 (.018)</td>
<td>-.013 (.018)</td>
<td>-.019 (.018)</td>
<td>-.010 (.018)</td>
</tr>
<tr>
<td>Severity</td>
<td>-.013 (.039)</td>
<td>-.021 (.041)</td>
<td>-.021 (.041)</td>
<td>-.022 (.044)</td>
<td>-.021 (.018)</td>
<td>-.020 (.018)</td>
<td>-.020 (.018)</td>
<td>-.019 (.018)</td>
<td>-.020 (.018)</td>
<td>-.020 (.018)</td>
<td>-.020 (.018)</td>
<td>-.019 (.018)</td>
</tr>
<tr>
<td>Benefits</td>
<td>.185** (.053)</td>
<td>.192** (.054)</td>
<td>.209*** (.056)</td>
<td>.202** (.064)</td>
<td>.106* (.018)</td>
<td>.102* (.018)</td>
<td>.091* (.042)</td>
<td>.094* (.042)</td>
<td>.013 (.018)</td>
<td>.013 (.018)</td>
<td>.013 (.018)</td>
<td>.013 (.018)</td>
</tr>
<tr>
<td>Barriers</td>
<td>.042 (.053)</td>
<td>.049 (.054)</td>
<td>.052 (.055)</td>
<td>.042 (.061)</td>
<td>-.010 (.025)</td>
<td>-.009 (.025)</td>
<td>-.011 (.025)</td>
<td>-.013 (.025)</td>
<td>-.011 (.025)</td>
<td>-.011 (.025)</td>
<td>-.011 (.025)</td>
<td>-.013 (.025)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>.104* (.052)</td>
<td>.105* (.052)</td>
<td>.104 (.053)</td>
<td>.107 (.062)</td>
<td>.073* (.030)</td>
<td>.077* (.030)</td>
<td>.063* (.030)</td>
<td>.065* (.030)</td>
<td>.069* (.027)</td>
<td>.069* (.027)</td>
<td>.069* (.027)</td>
<td>.069* (.027)</td>
</tr>
<tr>
<td>Health Motivation</td>
<td>-.053 (.058)</td>
<td>-.042 (.060)</td>
<td>-.036 (.065)</td>
<td>-.035 (.072)</td>
<td>.058* (.027)</td>
<td>.058* (.027)</td>
<td>.069* (.027)</td>
<td>.069* (.027)</td>
<td>-.013 (.05)</td>
<td>-.013 (.05)</td>
<td>-.013 (.05)</td>
<td>-.013 (.05)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.245* (.094)</td>
<td>.230* (.095)</td>
<td>.233* (.096)</td>
<td>.230* (.104)</td>
<td>.093 (.054)</td>
<td>.091 (.054)</td>
<td>.086 (.054)</td>
<td>.086 (.054)</td>
<td>-.115 (.265)</td>
<td>-.097 (.266)</td>
<td>-.075 (.285)</td>
<td>-.125 (.128)</td>
</tr>
<tr>
<td>Condition – Education</td>
<td>.200 (.232)</td>
<td>.216 (.246)</td>
<td>.216 (.260)</td>
<td>.217 (.260)</td>
<td>.093 (.128)</td>
<td>.086 (.127)</td>
<td>.111 (.128)</td>
<td>.111 (.128)</td>
<td>-.032 (.056)</td>
<td>-.032 (.060)</td>
<td>-.062* (.025)</td>
<td>.042 (.026)</td>
</tr>
<tr>
<td>Condition - Fear</td>
<td>-.115 (.265)</td>
<td>-.097 (.266)</td>
<td>-.075 (.285)</td>
<td>.093 (.128)</td>
<td>.093 (.128)</td>
<td>.086 (.127)</td>
<td>.111 (.128)</td>
<td>.111 (.128)</td>
<td>-.032 (.056)</td>
<td>-.032 (.060)</td>
<td>-.062* (.025)</td>
<td>.042 (.026)</td>
</tr>
<tr>
<td>Dementia literacy</td>
<td>.216 (.209)</td>
<td>.217 (.220)</td>
<td>.217 (.220)</td>
<td>.217 (.220)</td>
<td>.007 (.104)</td>
<td>.010 (.106)</td>
<td>.007 (.104)</td>
<td>.010 (.106)</td>
<td>-.032 (.056)</td>
<td>-.032 (.060)</td>
<td>-.062* (.025)</td>
<td>.042 (.026)</td>
</tr>
<tr>
<td>- Recognition</td>
<td>R2</td>
<td>.586</td>
<td>.599</td>
<td>.611</td>
<td>.615</td>
<td>.351</td>
<td>.362</td>
<td>.384</td>
<td>.406</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ΔR²</td>
<td>.013</td>
<td>.013</td>
<td>.004</td>
<td>.011</td>
<td>.011</td>
<td>.022*</td>
<td>.022</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Model effect</td>
<td>11.3***</td>
<td>8.95***</td>
<td>7.44***</td>
<td>4.70***</td>
<td>13.92***</td>
<td>11.22***</td>
<td>9.97***</td>
<td>7.31***</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Adjusted for age, education, partner status, employment status, and family member/friend with dementia. 2. Wald F statistic (degrees of freedom).

Significance levels: *p< .05 , ** p< .005, *** p<.001
Table 6.4. Unstandardised Regression coefficients (standard error) for timeframe of intention to change lifestyle and behaviours for dementia risk reduction by gender

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th></th>
<th>Male</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>.038 (.096)</td>
<td>-.043 (.101)</td>
<td>-.087 (.102)</td>
<td>-.057 (.106)</td>
</tr>
<tr>
<td></td>
<td>(101)</td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Severity</td>
<td>-.048 (.075)</td>
<td>-.006 (.075)</td>
<td>-.015 (.074)</td>
<td>-.023 (.078)</td>
</tr>
<tr>
<td></td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Benefits</td>
<td>-.276**</td>
<td>-.292**</td>
<td>-.333***</td>
<td>-.347***</td>
</tr>
<tr>
<td></td>
<td>(.101)</td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Barriers</td>
<td>.102 (.102)</td>
<td>.072 (.100)</td>
<td>.101 (.100)</td>
<td>.115 (.108)</td>
</tr>
<tr>
<td></td>
<td>(.101)</td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>-.231* (.098)</td>
<td>-.234* (.095)</td>
<td>-.201* (.095)</td>
<td>-.179 (.109)</td>
</tr>
<tr>
<td></td>
<td>(.101)</td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Health</td>
<td>-.171 (.111)</td>
<td>-.223* (.110)</td>
<td>-.157 (.117)</td>
<td>-.131 (.125)</td>
</tr>
<tr>
<td></td>
<td>(.101)</td>
<td>(.099)</td>
<td>(.100)</td>
<td>(.111)</td>
</tr>
<tr>
<td>Motivation</td>
<td>-.199 (.179)</td>
<td>-.166 (.174)</td>
<td>-.195 (.171)</td>
<td>-.202 (.182)</td>
</tr>
<tr>
<td></td>
<td>(.179)</td>
<td>(.174)</td>
<td>(.171)</td>
<td>(.182)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>-.468 (.427)</td>
<td>-.722 (.442)</td>
<td>-.642 (.456)</td>
<td>-.305 (.268)</td>
</tr>
<tr>
<td></td>
<td>(.427)</td>
<td>(.442)</td>
<td>(.456)</td>
<td>(.268)</td>
</tr>
<tr>
<td>Condition - Education</td>
<td>.685 (.487)</td>
<td>.614 (.477)</td>
<td>.736 (.499)</td>
<td>-.360 (.266)</td>
</tr>
<tr>
<td>Condition - Fear</td>
<td>-.088 (.099)</td>
<td>-.122 (.104)</td>
<td>-.360 (.266)</td>
<td>-.113* (.052)</td>
</tr>
<tr>
<td>Dementia literacy - Risk factors</td>
<td>-.767* (.373)</td>
<td>-.720 (.383)</td>
<td>.037 (.218)</td>
<td>-.004 (.223)</td>
</tr>
<tr>
<td>R2</td>
<td>.574</td>
<td>.617</td>
<td>.648</td>
<td>.669</td>
</tr>
<tr>
<td>AR^2</td>
<td>.042</td>
<td>.031</td>
<td>.021</td>
<td>.021</td>
</tr>
<tr>
<td>Model effect^2</td>
<td>10.61****</td>
<td>9.48****</td>
<td>8.52****</td>
<td>5.81****</td>
</tr>
<tr>
<td></td>
<td>(7,55)</td>
<td>(9,53)</td>
<td>(11,51)</td>
<td>(16,46)</td>
</tr>
<tr>
<td></td>
<td>13.22****</td>
<td>10.52****</td>
<td>9.18****</td>
<td>6.52****</td>
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<tr>
<td></td>
<td>(16,46)</td>
<td>(9,176)</td>
<td>(11,174)</td>
<td>(16,169)</td>
</tr>
</tbody>
</table>

Note: 1. Adjusted for age, education, partner status, employment status, and family member/friend with dementia. 2. Wald F statistic (degrees of freedom).
Significance levels: *p<.05, **p<.01, ***p<.005, ****p<.001
6.4 Discussion

In this chapter, the association between the Health Belief Model constructs and intentions to change lifestyle and health behaviour for dementia risk reduction among older Australian men and women was examined. Overall, participants indicated moderate to strong intentions to change lifestyle and health behaviour for dementia risk reduction. The findings also suggested that older people’s intention to adopt a healthier lifestyle and behaviour differed between genders. It demonstrated that males’ intentions to change lifestyle and health behaviours for dementia prevention were high when a) they believed that changing lifestyle and health behaviour were beneficial in preventing dementia, and b) they believed they were capable of making changes. Females’ intentions to change lifestyle and health behaviours for dementia risk reduction however were high when a) they believed that changing lifestyle and health behaviour were beneficial in preventing dementia, b) there were some social influences to make these changes, and c) they valued their general health.

When it came to the timeframe of intentions to change lifestyle and health behaviours for dementia risk reduction, males intended to change lifestyle and health behaviours sooner if they thought these changes would bring benefits to them. On the other hand, females intended to change lifestyle and health behaviour for dementia risk reduction sooner when there were cues for them to change.
These outcomes were different from a previous study that examined the intentions to screen for dementia where they found that intentions to screen were significantly associated with perceived barriers and cues to action (Werner, 2003). Although cues to action was a significant predictor of intentions to change lifestyle and health behaviour for dementia risk reduction for females, this means that those who were willing to go through the screening process for dementia may not necessarily be the same people who are willing to change their lifestyle and health behaviours to reduce their risk of developing dementia. This result was also inconsistent with findings from studies examining other preventive behaviours, which found that perceived barriers predicted behaviour more than perceived benefits (Brenes & Paskett, 2000). The difference in results however could have been due to previous research not examining males and females separately.

A gender difference was found in scores for the subscales where females tended to have significantly higher perceived severity and cues to action scores than males. Higher perceived severity could be due to higher dementia literacy shown in females (see Table 6.1) and higher cues to action score could be due to the fact that they have cared for more family members/friends with dementia.

Age differences were also present in the current study. The younger group (aged 50-59) perceived higher barriers in lifestyle and health behavioural changes than 60-69 years old group. This could be due to the fact that those belonging to the younger group were not at the official retirement age and were possibly still in the work force, hence increased work commitments. They were also more likely to have younger children who were still living with them and needing their care.
Therefore, the younger participants might not have had enough time solely for themselves. However, the relationship between having more responsibilities and higher perceived barriers can only be confirmed by future studies examining this relationship.

Attempt to increase participants’ fear of dementia or their dementia literacy through the brief interaction however did not significantly contribute to higher intentions. This could be due to the fact that fear cannot be created or enhanced in a short period of time, with the methods used here. It could also be because participants’ understanding and knowledge of dementia were already high due to a large proportion of participants having family members with dementia. Interestingly though, the current participants had a lower recognition of dementia in the vignette than the sample reported by Low & Anstey (2009). Furthermore, unlike the previous qualitative study reported in Chapter 3, perceived susceptibility, which was the HBM component that contained the fear factor, was not significantly related to willingness to change lifestyle and health behaviours for dementia prevention. This was similar to Werner (2003)’s study where the threat component of the HBM did not correlate with the intention to seek a cognitive status examination.

The present study had limitations. Firstly, all data analyses were cross-sectional, consequently only the association, not the causal relationship, between HBM constructs and intentions can be inferred. In addition, because of its cross-sectional nature, examination of relationships between intentions and actual behaviour changes was not possible. Future longitudinal studies should examine
these relationships since high intentions do not necessarily mean behaviour changes (intention-behaviour gap) (Sniehotta et al., 2005). Moreover, individuals may become more willing to change their lifestyle and health behaviours with further education about the risks. Therefore, an intervention educating the public may be beneficial.

Secondly, the proportion of males and females was not even. Therefore, gender differences shown in this study might not be the true representation of gender differences but rather the representation of different sized groups. Future studies with equivalent number of males and females should be sought to examine the true gender differences.

Lastly, this current study did not ask if participants had risk factor(s) for dementia. Therefore, it would be interesting for future studies to examine those with risk factors and to investigate if these dimensions of the HBM contribute to lifestyle changes in the same way for people who have a high risk of developing dementia. In addition, whether people with more risk factors would be more willing to change their lifestyle and health behaviours in comparison to those with fewer risk factors should be examined. This will enable researchers to investigate if an increased risk would encourage people to make appropriate lifestyle and health behavioural changes.

The current study also has its strengths and merits. It contributes new information to the limited research in dementia and health behavioural changes. This study provides a better understanding of the key components of the HBM that are significantly correlated with the intentions to change lifestyle and health
behaviour for dementia risk reduction. Recognising gender inequalities is also crucial when designing health promotion strategies (Ostlin, 2002). Without gender differences in mind, effectiveness of interventions may be jeopardised. Given the gender difference found in the determinants of intentions to change lifestyle and health behaviours for dementia risk reduction, strategies or interventions to promote lifestyle and health behaviour changes for dementia risk reduction should therefore be gender specific.

In conclusion, this study has supported the positive but modest relationship between HBM dimensions and intentions to change behaviours. Moreover, this study suggests that interventions using gender specific approaches to dementia risk reduction is warranted since different aspects of the HBM play significant roles in their intentions to change lifestyle and health behaviours for dementia risk reduction.
 CHAPTER 7: Comparison of attitudes and beliefs about dementia and other chronic diseases in Australians and South Koreans

Synopsis

Dementia is the third leading cause of death in Australia and 9th in Korean Women (Australian Institute of Health and Welfare, 2012; Statistics Korea, 2012). However, it is not being treated and recognised as a chronic disease and is often seen as a part of normal ageing. The purpose of this chapter was to explore and compare the understanding and beliefs of dementia in comparison with other chronic diseases in the Australian and South Korean population. In addition, the chapter aimed to examine dementia stigma and literacy between the two cultures of Australia and Korea to better understand cultural influences of how people define, perceive, and respond to dementia and chronic disease. A cross-sectional online survey of 244 participants, aged 18 to 64 years (122 Australian and 122 Korean), was conducted. The dementia literacy, dementia stigma as well as attitude on chronic diseases questionnaires were administered. Results showed that Australians were highly concerned about developing dementia and think that they are highly likely to develop dementia. In comparison, Koreans were highly concerned but did not think they were likely to develop dementia when compared to other chronic diseases. There were no significant differences in the ability to
recognise dementia symptoms in a vignette and in levels of dementia stigma between Australians and Koreans. Results also revealed that Koreans had a significantly higher level of intention to change lifestyle and health behaviour for dementia risk reduction. This high intention was related to having a high level of stigma and concerns about developing dementia for Korean men and having lower level of education for Korean women. These findings suggest that previously found racial/ethnic differences in stigma and literacy was not present when minority status was removed. However, attitudes towards dementia remain different between Australians and Koreans.
7.1 Introduction

Dementia is a chronic disease affecting over 35 million people worldwide (Alzheimer's Disease International, 2013). It has not only features that are common with other chronic disease but also some unique features that make it different from other chronic diseases in the way it is perceived by the community. These features are that: 1) dementia is not perceived as a chronic disease; 2) it has a strong stigma attached to it; 3) understanding on the condition is lacking among the general public; and 4) it is a feared condition. However, these features have not yet been compared against other chronic diseases, especially in a cross national context. In addition, how these features can play a role in the intention to make health behaviour and lifestyle changes have also not been examined. To address these issues, the present study investigates and compares dementia with other chronic diseases in relation to people’s attitudes and knowledge as well as intentions to change their health behaviour and lifestyle for risk reduction in Australians and South Koreans.

7.1.1 Dementia: a neglected chronic disease

Despite the potential to be delayed or prevented, dementia has not received much attention from media, policy makers and the general public when compared to other chronic diseases such as cancer, cardiovascular diseases and diabetes (Khairudin, Nasir, Zainah, Fatimah, & Fatima, 2011). In fact, dementia is not being treated and recognised as a chronic disease. Dementia is often mistakenly assumed to be a natural part of normal ageing that only affects older adults, rather than a serious disease that can affect adults younger than 65 years (Clare et al.,
2006). Consequently, people's awareness and knowledge on dementia may be lacking and they may miss out on their chance of risk reduction by not making the appropriate lifestyle and health behaviour changes.

7.1.2 Dementia stigma and literacy

Another prominent feature about dementia that is less evident in other chronic diseases is that dementia has a strong stigma associated with it. There are many medical conditions that can have a major impact on people’s lives just like dementia but are not stigmatised in the same way as dementia (Nuffield Council on Bioethics, 2009). The strong stigma associated with dementia is closer to that of other mental illnesses where the symptoms of dementia are regarded as both fearful and shameful. People who have dementia therefore are not only challenged by the symptoms of the condition, but by the negative attitudes surrounding it. This may create a problem as it has the potential to adversely impact on help seeking behaviours, missing out from early diagnosis and utilisation of health and social services (Corrigan, 2004). Previous studies have also shown that people avoid seeking dementia diagnosis because they do not want the label (Low & Anstey, 2007).

It was indicated that culturally associated beliefs about dementia are a barrier to seeking dementia care among minority ethnic group members (Sayegh & Knight, 2013). This may suggest cultural differences in the basis of stigma stereotypes and discrimination regarding dementia and sufferers of dementia. A limited number of studies have examined dementia stigma and literacy across different races or cultural backgrounds. Asians were significantly less
knowledgeable about Alzheimer’s disease (AD) than Anglo Americans (Ayalon & Arena, 2004). However, there has been a contradictory argument which is that Asian Americans have a tendency to regard dementia as part of normal ageing, leading to less stigma in that community (Liu, Hinton, Tran, Hinton, & Barker, 2008). Another study found that Korean Americans immigrants had a strong stigma about Alzheimer’s disease (Lee et al., 2010). Moreover, Korean Americans also interpreted dementia as ‘insanity’, despite tending to ‘normalise’ dementia and memory loss as a part of the ageing process. They lacked knowledge about the treatment, diagnosis and cause of AD and this poor knowledge was shown to be more likely among those who were less acculturated and less exposed to AD.

One study on dementia literacy carried out in Australia examining Italian, Greek and Chinese Australians in comparison with third generation Australians (Low et al., 2010) found that third generation participants (85%) were more likely to recognise dementia symptoms in a vignette in comparison to Italian (61%), Greek (58%) and Chinese (72%) participants. This suggests that the racial and ethnic minority groups had more negative attitudes about persons with dementia and that stigma is very much embedded within cultural norms and expectations and therefore is culturally sensitive.

Previous research on dementia stigma however has focused on minority groups in Western countries and lower level of dementia knowledge among minorities in the USA or Australia. Hence, some results may have been due to the participants’ difficulty in understanding English. Therefore, it is unclear how these culture-related beliefs about dementia contribute to the attitudes toward behaviour
changes for dementia risk reduction. Examination in dementia stigma and
dementia literacy in Australia and South Korea will overcome the potential bias of
responses from a minority group, which occurs when ethnic minorities are examined.

7.1.2.1 Australia vs South Korea

Statistics on dementia in Australia and South Korea (hereafter Korea) are
presented in Table 7.1. Dementia is the third leading cause of death in Australia,
accounting for 6% of all deaths (Australian Institute of Health and Welfare, 2012).
On the other hand, dementia is ninth leading cause of death in Korean women (but
not for Korean men)(Statistics Korea, 2012). Dementia prevalence is projected to
soar and subsequently place a heavy economic burden on both Australian and
Korean societies (Australian Institute of Health and Welfare, 2012; National

However, perspectives of dementia and people with dementia in Korea are
quite different from that of Australia. In Asian culture, stigma is attached not only
to the affected individual but often to the individual’s family as well (Lin &
Cheung, 1999; Okazaki, 2000). Therefore, having a family member with a mental
illness negatively reflects on family lineage and brings dishonour to the family
name (Jang et al., 2009). Korean elders and family caregivers who are caring for
aged family members suffering from dementia are seeking less external help due
to their fear of stigma, familism and lack of information (Watari & Gatz, 2004).
Almost half of Korean elders still believe that caregiving is the family’s solid
responsibility to the elders and there is also a high expectation for the government
to facilitate those responsibility in family caregiving in the Korean society (Chun, 2006; Gupta & Pillai, 2000; S. Y. Lee, 2006; K. Sung, 2000).

7.1.2.2 Gender differences

Gender difference has been found in beliefs and knowledge about dementia (Werner, Goldberg, Mandel, & Korczyn, 2013). An Israeli study (Werner, et al.) with 632 lay persons indicated that female participants reported higher levels of perceived susceptibility, worry, fear, and knowledge about AD than their male counterparts. This gender difference was also supported in a limited number of studies where women tended to worry more than men about developing dementia (Low & Anstey, 2009; Yeo et al., 2007). However, not all studies supported this difference (Chung et al., 2009).
### Table 7.1 Statistics on dementia in Australia and Korea

<table>
<thead>
<tr>
<th></th>
<th>Australia (22.3 million)</th>
<th>Korea (49.8 million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cause of death</strong></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; in women</td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>298,000 (1.3% of population)</td>
<td>312,000 (0.6% of population)</td>
</tr>
<tr>
<td><strong>Projection in 2050</strong></td>
<td>900,000 (3.4%)</td>
<td>2,127,000 (4.1%)</td>
</tr>
<tr>
<td><strong>Expenditure in 2011</strong></td>
<td>$A 4.9 billion</td>
<td>₩999 billion ($A 1.4 billion adjusted for PPP)</td>
</tr>
</tbody>
</table>

*Note: PPP= Purchasing power parity*
7.1.3 Fear of developing dementia

Due to a lack of knowledge and strong stigma imbedded within the condition, dementia is also a widely-feared condition. Previous studies have shown that people over the age of 55 fear dementia more than any other condition replacing cancer as the most feared disease (Bond & Corner, 2001) in UK and USA (MetLife Foundation, 2011; YouGov, 2012) and is followed closely by cancer in Australia (Alzheimer's Australia NSW, 2010; Pfizer, 2011).

Individuals’ knowledge and attitude about an illness is generally linked to their illness-related behaviours (Lee et al., 2010). It is suggested that individuals attempt to understand their symptoms based on their knowledge about an illness, which in turn, affects their illness-related behaviours such as recognition, help-seeking, management and prevention (Jorm, 2000; Jorm et al., 2000; Werner, 2003 and 2004). It is also believed that ignorance is often seen as the basis of stigma and discrimination, and education as a priority in combating it (Benbow & Jolley, 2012). Therefore, assessing an individuals’ knowledge about an illness, integrating it into educational materials for the general public and intervention strategies for health care professionals is the first step in promoting appropriate illness–preventing behaviours. A study conducted in Hong Kong found that brief exposure to information led to a reduction in stigma (Cheng et al., 2011). They argued that community education had a potentially useful role in reducing stigma and facilitating early detection and diagnosis. Therefore, enhancing dementia literacy and encouraging help-seeking by raising the awareness of dementia would

However, little is known about the attitudes and beliefs of the elderly towards dementia, especially in comparison to other chronic diseases. Moreover, there have been no comprehensive studies conducted in a cross cultural context that have systematically explored the nature and or, the extent of stigmatising attitudes and beliefs towards dementia or people living with dementia. This research project aims to address this gap in literature.

7.1.4 Study aims and hypotheses

The purpose of this study is therefore to explore and compare attitudes as well as intentions to perform health behaviours to specifically reduce the risk of dementia in comparison with other chronic diseases in Australian and Korean men and women. It also aims to examine dementia stigma and dementia literacy and how they may affect the intention to change lifestyle and health behaviours.

It is predicted that: 1) dementia would be ranked highly in terms of people concerned with developing dementia and their likelihood of developing the disease compared to other chronic diseases, especially in Australia; 2) knowledge about risk factors and risk reduction (literacy) for dementia will be poorer than for other chronic illnesses in both countries; 3) an individual's intention to change their lifestyle and health behaviour will be higher for other chronic diseases than for dementia due to the lack of awareness of dementia risk factors and risk reduction in both countries; 4) the level of stigma and literacy in Korea and Australia will not be significantly different due to both samples being the majority
ethnic group in their own country where they can gain knowledge without language barriers; 5) Koreans will have a lower level of intentions for lifestyle and health behavioural changes than Australians due to dementia not being one of the main causes of death in Korea; and 6) females will be more knowledgeable about dementia risk factors, and they will rank highly on their level of concern with, and likelihood of developing dementia.

7.2 Methods

Ethics approval was obtained from the Australian National University Human Research Ethics Committees before commencement of the project. Informed consent was obtained by agreeing with the terms stated online.

7.2.1 Participants

Two hundred and forty one participants (119 Australian and 122 Korean) were recruited through a survey company, Qualtrics. Participants took part in an anonymous online survey. The sample size was determined by a power analysis based on previous reported effect sizes (A priori). Inclusion criteria provided to the Qualtrics was anyone aged 18 years and older who identified themselves as either Australian or Korean in the respective countries. This age group was selected to be comparable with previous studies conducted on dementia stigma and literacy (Liu, Hinton, Tran, Hinton, & Barker, 2008; Lee et al., 2010; Low et al., 2010).
7.2.2 Materials

7.2.2.1 Predisposing variables

Socio-demographic variables included age, gender, education level, marital status, employment status and income level. Participants also reported if they had known someone with dementia and, if so, whether they had cared for someone with dementia (see Appendix E).

7.2.2.2 Perception on dementia and other chronic diseases

Participants were asked to rank chronic diseases that they were most concerned about developing and thought that they would likely develop (1 being most concerned/likely and 5 being least concerned/likely). Chronic diseases that they had an option to rank were cancer, dementia, type 2 diabetes, cardiovascular disease, depression and respiratory disease.

They were also asked if they were currently doing anything to prevent these chronic diseases and to identify all relevant risk factors for each chronic disease from the list provided (see Appendix E).

7.2.2.3 Intention to change lifestyle and health behaviour

Participants were asked to report their willingness to change lifestyle and health behaviours for dementia and other chronic diseases. The six likert type scale ranged from ‘never’ to ‘I have already made changes’.

7.2.2.4 Dementia literacy

Participants’ knowledge of dementia was measured with the dementia literacy questionnaire, originated from Low and Anstey (2009)'s study, with minor modification (removal of “don’t know” as a response option). Participants read a
vignette describing (see Appendix E) mild symptoms and behaviours of a person with dementia. The character had symptoms meeting Diagnostic and Statistical Manual, fourth edition (DSM-IV) criteria for Alzheimer’s disease, with the exception of the exclusion of other medical conditions. Participants were asked to name condition(s) the person described might have and whether they believed that dementia risk can be reduced by engaging in specific health behaviours to test their knowledge on dementia risk factors.

7.2.2.5 Dementia stigma

Participants’ level of stigma about people with dementia was measured with a component of the Family Stigma in Alzheimer’s disease Scale (FS-ADS), developed by Werner and colleagues (Werner, Goldstein, & Heinik, 2011). In the current study, only one dimension out of the original three (lay person’s stigma) was used to measure the lay person’s level of stigma. It followed Corrigan’s (2000) conceptualization of stigma as a process in which cognitive or causal attributions (stereotypes) lead to emotional reactions (prejudice) and to behavioural consequences (discrimination). All the items were rated on a 5-point Likert-type scale from 1 (lowest point of the scale) to 5 (highest point of the scale).

The internal reliability of the final factors for the Lay Persons’ Stigma dimension in the FS-ADS is seen to be excellent for all the scales ranged between 0.81 to 0.99 (Werner et al., 2011). A minor modification was made in that the word ‘relative’ was replaced with ‘a person with dementia’ to suit the target
7.2.3 Procedure

Potential participants, who were 18 years and older and volunteered to be contacted regarding potential research participation, were invited to participate via email in a study of ‘Attitudes and beliefs about chronic diseases’ in which an anonymous online questionnaire was completed. Respondents were asked to go to the referred website to complete the questionnaire. On the website, participants were required to read an information sheet and approve a consent form before proceeding to the questionnaire. This survey study was carried out in October 2012.

The survey was originally drafted in English, then the Korean version of the questionnaire was developed using a back-translation method. The questionnaire was translated and back-translated by the researcher and accredited translator in Korean.

7.2.4 Analyses

Statistical analyses were conducted with SPSS statistics 20. A mean score of rank orders for each chronic disease was calculated and placed in order to see where dementia was ranked among other chronic diseases.

Chi square was used to examine differences between Australian and Korean males and females in their level of dementia literacy and stigma. Paired sample t-tests were applied to compare mean level of intention to change their
lifestyle and health behaviour for each chronic disease was also compared against countries.

Multivariate regressions were conducted to explore which predisposing (country, age, gender, education, marital status, and income level), enabling (knowing and caring for person with dementia) and attitude and knowledge variables (dementia literacy and dementia stigma) were associated with intention to change lifestyle and health behaviour for dementia risk reduction.

7.3 Results

7.3.1 Sample characteristics

One hundred and nineteen Australian and one hundred and twenty two Korean participated in an anonymous online survey. Descriptions of participants are presented by gender in Table 7.2. Compared to Australians (M=42.8, SD=13.2 for males and M=37.4, SD=12.8 for females; 38.3% for males and 27.1% for females), Koreans were younger (M=32.2, SD=9.6 for males and M=28.3, SD=8.1 for females) and more likely to be single (56.6% for males and 63.3% for females). Overall, there was almost an equal number of males and females and the gender distribution did not significantly differ between groups (50.4% males for Australians and 50.8% males for Koreans). Greater proportions of Koreans had a bachelor or higher degree than Australians, more than half of Korean male participants had a bachelor degree or higher. A majority of Australian males (40%) reported earning an income of between $52,000 and $104,000 whereas a majority
of Australian females (47.5%) and both Korean males (53.2%) and females (66.7%) reported their income being between $15,600 and $52,000.

Almost half of Australians males and females reported that they had relatives or friends who suffer/suffered from dementia whereas only a small proportion of Korean males (14.5%) and female (20%) reported having known family or friends with dementia. However, around 10% of both Australians and Koreans reported having cared for family or friends with dementia.

7.3.2 Perception on dementia

Results showed that Australians (especially Australian females) were concerned about developing dementia (ranked 4\textsuperscript{th} for Australian males and 1\textsuperscript{st} for females) and thought that they were highly likely to develop it (ranked 3\textsuperscript{rd} for Australian males and 2\textsuperscript{nd} for females). In contrast, Koreans were highly concerned (ranked 3\textsuperscript{rd} for Korean males and 2\textsuperscript{nd} for females) but did not think they were likely to develop dementia when compared to other chronic diseases (ranked 6\textsuperscript{th} for both males and females). Full details can be found in Table 7.3.

The proportion of participants who took actions to reduce their risk of developing each chronic disease is presented in Table 7.4. Dementia risk factor knowledge is also shown in the Table 7.4. The results suggested that both Australians and Koreans significantly lacked the knowledge on risk factors for dementia compared to risk factors for all other chronic diseases.
Table 7.2 Descriptive Statistics of participants by country and gender

<table>
<thead>
<tr>
<th></th>
<th>Australian (N=119)</th>
<th>Korean (N=122)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (50.4%)</td>
<td>Female (49.6%)</td>
</tr>
<tr>
<td></td>
<td>Male (50.8%)</td>
<td>Female (49.2%)</td>
</tr>
<tr>
<td>Age (M (SD), range)</td>
<td>42.8 (13.2), 18-64</td>
<td>37.4 (12.8), 18-64</td>
</tr>
<tr>
<td></td>
<td>32.2 (9.6), 18-53</td>
<td>28.3 (8.1), 18-50</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>38.3%</td>
<td>27.1%</td>
</tr>
<tr>
<td>Married, De facto</td>
<td>48.3%</td>
<td>62.7%</td>
</tr>
<tr>
<td>Separated, divorced or</td>
<td>13.3%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Widowed</td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or less</td>
<td>45.0%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Apprenticeship or</td>
<td>26.6%</td>
<td>35.6%</td>
</tr>
<tr>
<td>Diploma</td>
<td>28.3%</td>
<td>33.9%</td>
</tr>
<tr>
<td>Bachelor or higher</td>
<td>54.8%</td>
<td>36.7%</td>
</tr>
<tr>
<td>Employment status</td>
<td>58.3%</td>
<td>52.5%</td>
</tr>
<tr>
<td></td>
<td>72.6%</td>
<td>46.7%</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $15,600</td>
<td>11.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>$15,600 - $52,000</td>
<td>33.3%</td>
<td>47.5%</td>
</tr>
<tr>
<td>$52,000 - $104,000</td>
<td>40.0%</td>
<td>35.6%</td>
</tr>
<tr>
<td>$104,000 or more</td>
<td>15.0%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Known family member</td>
<td>43.3%</td>
<td>45.8%</td>
</tr>
<tr>
<td>with dementia</td>
<td>14.5%</td>
<td>20%</td>
</tr>
<tr>
<td>Care for family member</td>
<td>11.7%</td>
<td>6.8%</td>
</tr>
<tr>
<td>with dementia</td>
<td>12.9%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Table 7.3 Level of concern and likelihood of developing dementia against other common chronic diseases

<table>
<thead>
<tr>
<th>Concerned</th>
<th>Australia</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>1</td>
<td>Depression</td>
<td>Dementia</td>
</tr>
<tr>
<td>2</td>
<td>Diabetes</td>
<td>Respiratory</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory</td>
<td>Depression</td>
</tr>
<tr>
<td>4</td>
<td><strong>Dementia</strong></td>
<td>Diabetes</td>
</tr>
<tr>
<td>5</td>
<td>Cardiovascular</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>6</td>
<td>Cancer</td>
<td>Cancer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Australia</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>1</td>
<td>Depression</td>
<td>Respiratory</td>
</tr>
<tr>
<td>2</td>
<td>Respiratory</td>
<td><strong>Dementia</strong></td>
</tr>
<tr>
<td>3</td>
<td><strong>Dementia</strong></td>
<td>Diabetes</td>
</tr>
<tr>
<td>4</td>
<td>Diabetes</td>
<td>Depression</td>
</tr>
<tr>
<td>5</td>
<td>Cardiovascular</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>6</td>
<td>Cancer</td>
<td>Cancer</td>
</tr>
</tbody>
</table>
Table 7.4 Actions taken to reduce risk and knowledge on risk factors for chronic diseases.

<table>
<thead>
<tr>
<th></th>
<th>Australian</th>
<th></th>
<th>Korean</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Cancer</td>
<td>23.3%</td>
<td>27.1%</td>
<td>24.2%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Dementia</td>
<td>10.0%</td>
<td>16.9%</td>
<td>14.5%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>11.7%</td>
<td>40.7%</td>
<td>32.3%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>28.3%</td>
<td>32.2%</td>
<td>29.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Depression</td>
<td>21.7%</td>
<td>33.9%</td>
<td>19.4%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>16.7%</td>
<td>15.3%</td>
<td>9.7%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Knowledge on risk factors

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>.46 (.31)</td>
<td>.50 (.32)</td>
<td>.59 (.26)</td>
<td>.61 (.31)</td>
</tr>
<tr>
<td>Dementia</td>
<td>.26 (.22)</td>
<td>.23 (.24)</td>
<td>.28 (.19)</td>
<td>.30 (.22)</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>.48 (.28)</td>
<td>.51 (.29)</td>
<td>.55 (.26)</td>
<td>.58 (.25)</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>.59 (.32)</td>
<td>.54 (.38)</td>
<td>.55 (.30)</td>
<td>.59 (.33)</td>
</tr>
<tr>
<td>Depression</td>
<td>.44 (.38)</td>
<td>.51 (.41)</td>
<td>.38 (.24)</td>
<td>.39 (.23)</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>.77 (.43)</td>
<td>.73 (.45)</td>
<td>.79 (.41)</td>
<td>.72 (.45)</td>
</tr>
</tbody>
</table>
7.3.3 Dementia literacy and stigma

There were no significant differences in ability to recognise dementia symptoms in a vignette between Australians males (M=.88, SD=.32) and Korean males (M=.82, SD=.39); t (120) =.942, p=.348. No significant difference was also found between Australian females (M=.81, SD=.39) and Korean females (M=.90, SD=.30); t (117) = -1.346, p=.181.

Korean females (M=2.88, SD=1.035) were more likely to think of dementia as an inevitable part of normal ageing than Australian females (M=3.40, SD=.764); t (120) =.625, p<.005. This country difference was not found in males.

No significant country differences were found in both males and females in their level of dementia stigma. Furthermore, no significant gender differences were found in both countries in terms of dementia literacy and stigma.

7.3.4 Intention to change lifestyle and health behaviours for chronic diseases

Intention to change lifestyle and health behaviours for dementia was lower than other chronic diseases except for Korean females where their intention to change for dementia risk reduction was higher than their intention to change for cardiovascular disease, depression, and respiratory disease. However, these differences were not significantly different except for respiratory disease where Korean females’ intention to change for dementia (M=3.45, SD=.852) were significantly higher than their intention to change for respiratory disease (M=3.23, SD=.851); t (59)= 2.428, p<.05.

Multiple linear regressions were applied to examine if any socio-demographic variables, attitudes toward dementia, having known (and cared for) a
family member of friend with dementia, dementia literacy and stigma contribute to the level of intention to change lifestyle and health behaviour for dementia. The results showed that no variables were significantly associated with the intention to change for dementia except for high level of stigma ($\beta=.369, p=.01$) and having concerns about developing dementia ($\beta=.381, p<.05$) for Korean males, and having a lower level of education ($\beta=-.288, p<.05$) for Korean females. When the whole sample was used instead of dividing it into groups by country and gender, being of Korean descent was the only significant predictor of the intention to change for dementia risk reduction ($\beta=.311, p=.000$).
7.4 Discussion

This study explored and compared attitudes and knowledge of dementia risk reduction as well as intentions to perform health behaviours to reduce the risk of developing dementia in comparison with other chronic diseases in Australia and South Korea.

Previous research has shown that racial minority groups had poor dementia literacy in comparison to the majority group in countries where studies were conducted. However, this racial difference was not present in this study when both groups were majority racial groups in their countries where the information can be obtained without language barriers. However, attitudes towards dementia were different between Australians and Koreans. Results showed that Australians are both highly concerned about developing dementia and think that they are highly likely to develop it whereas Koreans are highly concerned but do not think they are likely to develop dementia when compared to other chronic diseases. This difference could be attributed to the Koreans’ lack of dementia knowledge at first glance. However, this is actually a correct reflection of these two societies as dementia is the third leading cause of death in Australia (Australian Institute of Health and Welfare, 2012) and ninth in Korean Women (Statistics Korea, 2012). However, dementia is not in the top 10 leading causes of death for Korean men.

Interestingly, Koreans were more likely to be a carer for someone with dementia if they have reported to have known someone with dementia. On the other hand, Australians reported to have known more family members or friends
with dementia but majority of them were not carers. This could be because dementia is considered a “family problem” in Korea and people may not know anyone with dementia unless they are direct family members and therefore had to look after them as a duty. In addition, it could also be due to negative connotations that the term ‘dementia’ derives in Korea. Chi-mae, a Korean word for dementia, brings shame to the family and the community. Consequently, Korean families may not disclose their loved ones’ illness to those whom they consider as outsiders out of respect for the elderly based on their Confucius teaching, “Hyo”. Koreans may view dementia as bad deeds that happen in the family that should not be disclosed to outsiders.

The lack of knowledge on risk factors for dementia was evident when compared to the knowledge possessed on other chronic diseases, although the ability to recognize dementia symptoms was high. This can also lead to low level of intentions to perform behaviours and changing lifestyle that may reduce the risk of developing dementia. As dementia is a chronic disease its risk can be reduced by modifying lifestyle and health behaviours. Increased media exposure on dementia is needed to educate the public about dementia in general and the importance of making lifestyle changes to reduce their risk. Previous studies have shown that brief exposure to information about dementia led to a statistically significant reduction in stigma regardless of whether the diagnostic label of dementia was included or not (Cheng et al., 2011). This shows that stigma can indeed be reduced by even a brief exposure or with the provision of a little information. Moreover, part of the drive to reduce stigma through information and
education will involve addressing the role of the media in perpetuating stigma (Benbow & Jolley, 2012).

Information and awareness campaigns, however, are only one part of the story. For dementia to be truly normalised, it needs to become an accepted, visible part of our society, in the same way that physical disabilities are increasingly being recognised as normal (Nuffield Council on Bioethics, 2009). People with dementia need to feel comfortable participating in the society in a similar way prior to developing dementia.

There are some limitations in this current study. Firstly, Korean participants were generally younger and not married (due to young age perhaps). There were only two Koreans (1 male and 1 female) aged 50 and over. Therefore, subgroup comparison between young and the old group was not possible. In future studies, more effort to match samples as close as possible would result in better samples for comparison. Future research is needed to better understand cultural factors that influence older adults’ willingness to change their lifestyle and health behaviour for dementia risk reduction with a bigger sample size and matched age group. In addition, race was not examined in this study. Instead, it was assumed that the participants were members of a majority group in their respective country. This might be an accurate assumption for Korea, which is relatively mono-cultured and is mono-racial society but not for Australia, which is a multi-cultural country. Therefore, race should be taken into account in future studies to clarify racial differences in addition to cultural or societal differences.
The findings from this study will contribute to the currently limited literature on dementia and country/cultural difference. It can be suggested that racial differences found in previous studies may have been mainly due to language barriers as a minority group living in a country with different language, rather than due to the cultural differences. This study has shown that when the information was available in a language that people could understand, there may not be any difference in the level of dementia literacy and stigma. This highlights the importance of providing information in different languages to suit people with culturally and linguistically diverse (CALD) backgrounds in multi-cultural countries such as Australia. Future studies should therefore investigate the efficacy of intervention programs where individuals with CALD backgrounds receive information on dementia in their own language that is culturally sensitive. If such interventions proved to be effective in enhancing dementia knowledge of people from CALD backgrounds, the gap in dementia stigma and literacy previously found between majority and minority groups will be narrowed. This will then encourage people from CALD backgrounds to seek early diagnoses and treatment and therefore can lead to a decline in dementia related expenses in societies. Therefore, providing information and making sure information is easily accessible may be the key to reducing dementia prevalence and costs associated it among minority group members in multi-cultural countries.
CHAPTER 8: Determinants of changing lifestyle and health behaviour for dementia risk reduction

Synopsis

Risk factors for dementia have been actively sought and identified in recent years. Unfortunately, people do not necessarily change their lifestyle and health behaviours accordingly to reduce their risk of developing dementia despite being aware of the risk factors. The aim of this chapter is to examine the factors that influence intentions to change lifestyle and health behaviour for dementia risk reduction (Study 1) as well as the actual behaviour changes for dementia risk reduction (Study 2). 176 participants (mean age = 55.5 (2.96), 52.8% female) from the ACT and the Queanbeyan region with an increased risk of developing dementia participated in the Body Brain Life (BBL) study. Regression analyses indicated that having higher scores on cues to action, a subscale of the MCLHB-DRR (p = .001) and not having depression (p < .05) were significant predictors of intentions to change lifestyle and health behaviour for dementia prevention amongst males. In contrast, having fewer perceived barriers and being able to recognise dementia from vignette (p < .005) were significantly associated with intentions to change lifestyle and health behaviours for females. Interestingly, it was found that increased risk and protective factors did not significantly influence intentions to change lifestyle and health behaviours. However, having fewer...
protective factors and an increased number of risk factors were significantly associated with behavioural and lifestyle changes for both males and females. On the other hand, higher scores on perceived severity and knowledge on risk factors at baseline were also significantly associated with behaviour and lifestyle changes for females. The findings of the current study support the phenomenon of 'intention-behaviour gap'.
8.1 Introduction

Chapter 2 identified risk and protective factors associated with developing dementia. However, identification and being aware of risk and protective factors do not necessarily lead to individuals showing willingness to make the necessary changes to reduce the risk and increase the protection against developing dementia. Researchers must therefore understand the reasons for making these lifestyle and health behaviour changes to reduce identified risk factors and increase protective factors. To obtain knowledge about why and when intentions to change health behaviour and lifestyle occur, the Health Belief Model (HBM) was used as a theoretical basis in Chapter 6. The results from chapter 6 demonstrated that males’ intentions to change lifestyle and health behaviours for dementia prevention was high when a) they believed that changing lifestyle and health behaviour were beneficial in preventing dementia, and b) they believed they were capable of making changes. Females’ intentions to change lifestyle and health behaviours for dementia risk reduction however were high when a) they believed that changing lifestyle and health behaviour was beneficial in preventing dementia, b) there were some social influences to make these changes, and c) they valued their general health. Furthermore, perceived benefits and cues to action were also significantly associated with the timeframe of intentions to change lifestyle and health behaviours for males and females respectively.

However, the extent to which these findings could explain causes of actual health behaviour and lifestyle changes could not be determined. Similarly,
previously identified determinants of intentions to change lifestyle and health behaviour in Chapter 6 for those who were in the high risk group were not identified.

Most people attempt to change an aspect of their health behaviour at some stage of their lives (Ogden et al., 2007). However, the outcome of the attempt can either be successful or unsuccessful. Some previous research has shown that intention to perform a behaviour can be translated successfully into actual behaviour, e.g., intention to attend cervical or breast screening practices predicts actual attendance (Sheeran & Orbell, 2000). This suggests that behavioural intention may be the key determinant of successful behaviour change (Ajzen, 1991). However, while intentions comprise a person’s motivation towards a goal in terms of direction and intensity, intentions alone are not sufficient to predict behavioural change (Sheeran, 2002) as they leave large amounts of behavioural variance unexplained. This phenomenon has been labelled the ‘intention-behaviour gap’ (Scholz, Schuz, Ziegelmann, Lippke, & Schwarzer, 2008).

Empirically, the intention-behaviour gap seems to emerge mainly in individuals who have intentions but who subsequently fail to act on them (Orbell & Sheeran, 1998). This indicates that forming intentions and intention implementation are different processes.

Reviews of the success of weight loss interventions illustrated that, although the percentage of people who initially lose weight has increased, a large majority of them regain this weight on five year follow up evaluations although a small minority do succeed in sustaining weight loss after 5 years (NHS Centre for
Reviews and Dissemination, 1997; Wadden, 1993; G. T. Wilson, 1995). This means that for the majority of people, the intentions result in actual behaviour change only for a short period of time (Ogden et al., 2007). In addition, Webb and Sheeran (2006)’s meta-analysis provided the estimate of the overall impact of changing behavioural intentions on subsequent behaviour change in experiments examining different type of behaviours. An integration of 47 experimental tests showed that a medium to large change in intentions led to only a small to medium change in behaviour. This result suggests that intentions do not always translate into behaviour changes and that the size differs between intention and actual changes. The important question that needs to be asked is who will make successful changes and how do they differ from those who fail to translate intention to behaviour change. In other words, what are the determinants of successful behaviour change.

Limited studies have sought explanations of successful transitions from intentions to behaviour changes. Some studies have proposed the stability of behavioural intention as a moderator of intention-health behaviour relationships (Conner & Godin, 2007; Dibonaventura & Chapman, 2005). These studies indicated that more stable intentions (intention stability) led to stronger intention-behaviour agreement. Planning (action and coping planning) was also suggested to be a mediator of the intention-health behaviour relationships (Scholz et al., 2008; Sniehotta et al., 2005; Wiedemann, Schuz, Sniehotta, Scholz, & Schwarzer, 2009). Action planning comprises of the when, where and how, of implementing behaviour. Coping planning involves the anticipation of barriers and ways to
overcome them (Scholz et al., 2008). These planning strategies can be addressed in an educational intervention where individuals are guided through examples of how to reduce their risk of developing dementia, what kind of barriers they might experience, and how they can overcome them.

Gender is an issue that is often neglected when planning and implementing health promotion and disease prevention strategies (Cristofides, 2001; Ostlin, 2002). Generally, there seems to be an assumption that intervention will be just as effective for men as for women and therefore, many health promotion programmes are gender blind (Ostlin et al., 2007). However, there is emerging evidence that integrating gender considerations into interventions has a positive effect on health outcomes across various domains (Boerder et al., 2004). A previous study examining gender differences in health status has shown that women are more likely than men to describe themselves as non-drinkers and non-smokers, yet are less physically active (Ross & Bird, 1994). Gender differences were also reported in determinants of physical activity (Kim, Kim, Park, & Kim, 2010). They found that men who had higher self-efficacy performed more physical activity whereas women who had higher self-efficacy and benefits and lower barriers participated more in physical activity. Therefore, the gender difference in determinants of behaviour and lifestyle changes for dementia risk reduction should be investigated.

The aim of this chapter is therefore to examine the factors that influence intentions to change lifestyle and health behaviour for dementia risk reduction among 50-60 year old men and women with a higher risk of developing dementia.
In addition, factors that influence actual behaviour and lifestyle changes for dementia risk reduction are also explored. The methods and results are presented as two studies. In the first study, intentions to change lifestyle and health behaviour are analysed. In the second study, actual behaviour and lifestyle changes are analysed.

It is hypothesised that males’ intentions to change lifestyle and health behaviours for dementia prevention will be high when there are high perceived benefits, and high self-efficacy. On the other hands, females’ intentions to change lifestyle and health behaviours for dementia risk reduction will be high when there are high perceived benefits, high cues to action, and high general health motivation. It is also hypothesised that high intention and stability of intention will be key determinant of actual behavioural and lifestyle changes.

8.2 Study 1 Methods

8.2.1 Study 1 Participants

One hundred and seventy six participants (see Figure 8.1) in this study came from the Body Brain Life (BBL) study which was a 12 week, single-blind randomized control trial of a behaviour change intervention targeting established risk factors for Alzheimer’s disease delivered to cognitively healthy adults aged 50 to 60 (Anstey, Bahar-Fuchs, Herath, Rebok, & Cherbuin, 2013). The BBL participants reside in Canberra and Queanbeyan region, Australia. They were recruited from the community through advertisements titled ‘Dementia Risk Reduction Project’ placed in local newspapers and radio, as well as advertising
fliers in community health centres, community clubs, and through word of mouth. Potential participants were aware that the study was about reducing risk factors for late-life dementia and they needed to be aged between 50-60 years; prepared to consider making changes to their lifestyle; and able to dedicate sometime over 12 weeks, although the project would be mostly conducted online.

Potential participants recruited from the community were screened against the inclusion criteria (see Appendix F). These criteria included residence in the Australian Capital Territory or surrounding areas of New South Wales; access to a computer and internet connection at home; fluency in English; and meeting a minimum of the following three risk factors (formal educational attainment at high school level or less, overweight or obese body mass index (BMI), a history of diabetes, hypertension, high cholesterol, mild to moderate traumatic brain injury, smoking, or depression) and a maximum of one protective factor for Alzheimer's disease (high level of physical activity, high consumption of fish, high cognitive or social engagement). Participants were also required to be able to attend the Centre for Research on Ageing, Health and Wellbeing at baseline and after 24 weeks for face to face evaluations. Participants were not eligible to enrol in the trial if they had a history of neurological or psychiatric conditions likely to substantially affect cognition, sensory deficits or mobility limitations that would prevent or substantially restrict the delivery of the assessment or intervention as well as other significant health problems. Participants were also required to obtain a score greater than 24 on the TELE instrument (a phone-based assessment of
mental status) (Gatz et al., 2002) to exclude the presence of global cognitive impairment.

8.2.2 Study 1 Materials

The questionnaires used for analyses were as below (see Appendix F).

8.2.2.1 Intentions to change lifestyle and health behaviour for dementia risk reduction

Intentions were measured with three items: general intention to change lifestyle and health behaviours for dementia risk reduction (strongly disagree to strongly agree in 5 likert type scale); what lifestyle and health behaviours they are intending to change; and how soon they were willing to make changes for dementia risk reduction (I have already made changes, within a week, within a month, within 6 months, within 12 months, within more than 12 months, and never).

8.2.2.2 Dementia literacy questionnaire

A dementia literacy questionnaire (Low & Anstey, 2009) was administered to measure participants’ ability to recognize dementia or Alzheimer’s disease symptoms and ability to recognize risk and protective factors for dementia. To measure dementia recognition, participants were asked what condition the person in the vignette might have. Participants were asked whether certain behaviours would increase, decrease or not make any difference to their chance of developing dementia. Together, these were used to measure knowledge on risk and protective factors.
Figure 8.1 Flowchart on BBL participants
8.2.2.3 Australian National University-Alzheimer's Disease Risk Index

The primary outcome measure was the ANU-ADRI. The Australian National University - Alzheimer’s Disease Risk Index (ANU-ADRI; Anstey, Cherbuin, & Herath, 2013) was developed following a synthesis of meta-analyses of various risk factors for Alzheimer's disease reported in the literature. The questionnaire (See Appendix F) covers several modifiable risk and protective factors and is based on self-report. Risk and protective factors of interest were overweight/obesity, diabetes, depression, high cholesterol, traumatic brain injury, pesticide exposure, fish consumption, low education, cognitive activity, physical activity, and social engagement (see Appendix G for the actual points attributed to each risk factor in the ANU-ADRI). Risk and protective factors were also summed to measure the total number of risk and protective factors.

Socio-demographic information included gender, age, education level, marital status and family history of dementia.

8.2.2.4 The MCLHB-DRR

The Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction scale (MCLHB-DRR) developed in Chapter 5 was used to understand beliefs on dementia preventing behaviour and lifestyle changes.

8.2.3 Study 1 procedure

Participants who called the study number were added to a database of those who have expressed an interest in the study. Potential participants were then contacted by phone or email and were provided with additional details regarding the study. Participants were also asked at this point to consent to undergo further
screening in the form of two brief phone interviews to further establish the presence of inclusion or exclusion criteria.

Two brief phone interviews (see Appendix F) conducted by research assistants with graduate psychology training using a written protocol were conducted with participants as part of the screening process. The first interview, which took approximately 5 minutes, focused on past and present medical conditions that form the study’s inclusion and exclusion criteria, while the second interview, which took approximately 10 minutes, focused on lifestyle factors.

Those who met the inclusion criteria were then invited to the Centre for Research on Ageing, Health, and Well-being for the baseline assessment. The baseline assessment consisted of ANU-ADRI, dementia literacy, the MCLHB-DRR and a physical assessment.

Those who met the inclusion criteria were also randomly assigned to either online only, online plus face to face, or active control groups. A permuted block randomization sequence comprising block sizes of 30 stratified by gender was used. The allocation sequence was generated by an independent researcher following the baseline assessments and was not known to the study team at the time of enrolment and baseline assessment. To prevent evaluation bias, research staff conducting the psychological, physical, and cognitive outcome assessments, as well as those involved in the analysis of pathology data remained blind to the participants’ group allocation. All participants were informed that they were being randomly allocated to one of three study groups and that one group may be more effective than others. They were also notified at the start of the study that one of
these groups involved several face-to-face sessions.

Participants in the online only group logged on to the trial website weekly to complete an online session lasting approximately 1 hour. The 12 week program was detailed elsewhere (Anstey, 2013). The second group, an online and face-to-face group participated in the online program in the same way as the online only group. In addition, they attended five face to face sessions conducted in small groups facilitated by a clinical psychologist. The content of the group sessions was organised around the themes of the corresponding online modules. The sessions include facilitated discussions of the various risk factors for dementia, goal setting, and barriers to behaviour change. Lastly, participants in the active control group did not have access to the trial website. Instead, participants in this group received weekly emails containing links to health-related websites, videos, news items, and so on.

8.2.4 Study 1 Analysis

For descriptive purposes the mean and standard deviation were calculated for intention and the HBM constructs. A set of hierarchical linear multiple regressions were used to examine the association of intention to change lifestyle and health behaviours and seven domains from the MCLHB-DRR as well as dementia literacy and risk and protective factors. This analysis was conducted separately for males and females, in order to examine the relative importance of gender influences. Domains of the MCLHB-DRR were entered in Model 1 to examine the effects knowledge and attitudes towards dementia and the impact it had on intentions to change lifestyle and health behaviours for dementia risk.
reduction. Dementia literacy was added to Model 2 to examine possible effect of dementia literacy in intentions to change lifestyle and health behaviour for dementia risk reduction. To investigate the effect of having risk and protective factors for dementia on intentions, thirteen risk and protective factors and a total number of risk and protective factors individuals had were added in model 3. Finally, age, partner status, and parents' history of dementia were entered for adjustments in model 4. Coefficients for these control variables are not reported in the tables although the effect of their inclusion on the total variance explained is provided.

An additional set of regression was conducted with timeframe of intentions as a dependent variable.

8.3 Study 1 Results

8.3.1 Description of sample characteristics

In the first study, baseline data was used. The total number of participants covered by the baseline data collection was 176 (M = 55.5, SD=2.96). The majority were either married or in de facto relationships (78.3% of males and 68.8% of females), had more than high school education (97.6% of males and 94.6% of females) and almost half were female and has (had) parents with dementia (53% of males and 55.9% of females). The majority of participants were also overweight or obese, engaged in medium to high physical activity level, had high social activity and low cognitive level; was a non-smoker; and had low fish consumption. In terms of dementia literacy, more than 75% of participants were
able to recognize dementia/AD symptoms and participants could correctly identify most risk factors. Few gender differences were found that females were more likely to have clerical and administrative occupation whereas almost half of males were professionals. Females (2.2%) were also less likely to be light to moderate drinkers than males (30.1%). A detailed description of participants by gender is shown in Table 8.1.

8.3.2 Intentions to change lifestyle and health behaviours for dementia risk reduction

Participants' mean intentions to change lifestyle and health behaviour were high (M=3.90, SD=.76 for males and M=4.03, SD=.83 for females) where higher scores represent stronger intentions on a 5 point likert type scale (see Figure 8.2). Almost one quarter of male participants (25.3%) and a smaller portion of female participants (18.5%) indicated that they were willing to change their lifestyle and health behaviour for dementia risk reduction within one week. However, more than 30% to 40% of males and females respectively, reported that they had already made changes (see 8.3). The type of health behaviours and lifestyles that most participants intended to change were their diet and physical and cognitive activity levels (see Table 8.1). No gender differences were found in intentions.
Table 8.1 Descriptions of participants by gender

<table>
<thead>
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<th>Female (n=93)</th>
<th>P value</th>
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<tbody>
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<td>Age (M, SD)</td>
<td>55.36 (3.04)</td>
<td>55.63 (2.90)</td>
<td>.543</td>
</tr>
<tr>
<td>Intervention group</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Online</td>
<td>28 (33.7%)</td>
<td>30 (32.3%)</td>
<td>.863</td>
</tr>
<tr>
<td>Face to face</td>
<td>27 (32.5%)</td>
<td>31 (33.3%)</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>28 (33.7%)</td>
<td>32 (34.4%)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married, De facto</td>
<td>65 (78.3%)</td>
<td>64 (68.8%)</td>
<td>.157</td>
</tr>
<tr>
<td>Separated, divorce, widowed or never married</td>
<td>18 (21.7%)</td>
<td>29 (31.2%)</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managers</td>
<td>20 (24.1%)</td>
<td>7 (7.5%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Professionals</td>
<td>40 (48.2%)</td>
<td>39 (41.9%)</td>
<td></td>
</tr>
<tr>
<td>Technical and trade workers</td>
<td>9 (10.8%)</td>
<td>1 (1.1%)</td>
<td></td>
</tr>
<tr>
<td>Community and personal service workers</td>
<td>5 (6.0%)</td>
<td>10 (10.8%)</td>
<td></td>
</tr>
<tr>
<td>Clerical and administrative workers</td>
<td>8 (9.6%)</td>
<td>35 (37.6%)</td>
<td></td>
</tr>
<tr>
<td>Machinery operators and drivers</td>
<td>1 (1.2%)</td>
<td>1 (1.1%)</td>
<td></td>
</tr>
<tr>
<td>Parent(s) with dementia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High education (&gt;12 years)</td>
<td>81 (97.6%)</td>
<td>88 (94.6%)</td>
<td>.317</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>14 (17.3%)</td>
<td>25 (28.1%)</td>
<td>.575</td>
</tr>
<tr>
<td>Overweight</td>
<td>43 (53.1%)</td>
<td>36 (40.4%)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>24 (29.6%)</td>
<td>28 (31.5%)</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>31 (38.3%)</td>
<td>31 (33.3%)</td>
<td>.500</td>
</tr>
<tr>
<td>Physical activity level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>39 (47.0%)</td>
<td>42 (45.2%)</td>
<td>.944</td>
</tr>
<tr>
<td>Medium</td>
<td>33 (39.8%)</td>
<td>40 (43%)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>11 (13.3%)</td>
<td>11 (11.8%)</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light to moderate drinker</td>
<td>25 (30.1%)</td>
<td>2 (2.2%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CESD&gt;16</td>
<td>18 (21.7%)</td>
<td>15 (16.1%)</td>
<td>.349</td>
</tr>
<tr>
<td>Cognitive activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>33 (39.8%)</td>
<td>34 (36.6%)</td>
<td>.665</td>
</tr>
<tr>
<td>Low</td>
<td>50 (60.2%)</td>
<td>59 (63.4%)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 (24.4%)</td>
<td>17 (18.5%)</td>
<td>.344</td>
<td></td>
</tr>
<tr>
<td>Pesticide exposure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 (30.1%)</td>
<td>23 (24.7%)</td>
<td>.426</td>
<td></td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smoker</td>
<td>55 (66.3%)</td>
<td>59 (63.4%)</td>
<td>.674</td>
</tr>
<tr>
<td>Past smoker</td>
<td>24 (28.9%)</td>
<td>32 (34.4%)</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>4 (4.8%)</td>
<td>2 (2.2%)</td>
<td></td>
</tr>
<tr>
<td>Social engagement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest</td>
<td>45 (54.2%)</td>
<td>53 (57.0%)</td>
<td>.301</td>
</tr>
<tr>
<td>Medium to high</td>
<td>20 (24.1%)</td>
<td>25 (26.9%)</td>
<td></td>
</tr>
<tr>
<td>Low to medium</td>
<td>12 (14.5%)</td>
<td>12 (12.9%)</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Lowest</td>
<td>Traumatic brain injury</td>
<td>Fish intake</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>6 (7.2%)</td>
<td>3 (3.2%)</td>
<td></td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>7 (8.5%)</td>
<td>4 (4.3%)</td>
<td>.252</td>
</tr>
<tr>
<td>Fish intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest</td>
<td>5 (6.0%)</td>
<td>5 (5.4%)</td>
<td>.181</td>
</tr>
<tr>
<td>Medium to high</td>
<td>10 (12.0%)</td>
<td>15 (16.1%)</td>
<td></td>
</tr>
<tr>
<td>Low to medium</td>
<td>57 (68.7%)</td>
<td>51 (54.8%)</td>
<td></td>
</tr>
<tr>
<td>Lowest</td>
<td>11 (13.3%)</td>
<td>22 (23.7%)</td>
<td></td>
</tr>
<tr>
<td>Dementia literacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition</td>
<td>66 (79.5%)</td>
<td>69 (75%)</td>
<td>.480</td>
</tr>
<tr>
<td>Risk factors (M, SD)</td>
<td>6.02 (1.82)</td>
<td>6.39 (2.08)</td>
<td>.217</td>
</tr>
<tr>
<td>Intention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>2 (2.4%)</td>
<td>0 (0%)</td>
<td>.287</td>
</tr>
<tr>
<td>Within more than 12 months</td>
<td>2 (2.4%)</td>
<td>3 (3.3%)</td>
<td></td>
</tr>
<tr>
<td>Within 12 months</td>
<td>4 (4.8%)</td>
<td>6 (6.5%)</td>
<td></td>
</tr>
<tr>
<td>Within 6 months</td>
<td>13 (15.7%)</td>
<td>10 (10.9%)</td>
<td></td>
</tr>
<tr>
<td>Within 1 month</td>
<td>16 (19.3%)</td>
<td>17 (18.5%)</td>
<td></td>
</tr>
<tr>
<td>Within 1 week</td>
<td>21 (25.3%)</td>
<td>17 (18.5%)</td>
<td></td>
</tr>
<tr>
<td>Have already made changes</td>
<td>25 (30.1%)</td>
<td>39 (42.4%)</td>
<td></td>
</tr>
<tr>
<td>Intention – Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>34 (41%)</td>
<td>44 (47.3%)</td>
<td>.906</td>
</tr>
<tr>
<td>Social activity</td>
<td>5 (6.0%)</td>
<td>6 (6.5%)</td>
<td>.920</td>
</tr>
<tr>
<td>Cognitive activity</td>
<td>12 (14.5%)</td>
<td>23 (24.7%)</td>
<td>.175</td>
</tr>
<tr>
<td>Diet/weight loss</td>
<td>30 (36.1%)</td>
<td>36 (38.7%)</td>
<td>.685</td>
</tr>
<tr>
<td>Reduce alcohol consumption</td>
<td>2 (2.4%)</td>
<td>3 (3.2%)</td>
<td>.856</td>
</tr>
<tr>
<td>Quit smoking</td>
<td>2 (2.4%)</td>
<td>1 (1.1%)</td>
<td>.427</td>
</tr>
</tbody>
</table>
Figure 8.2 Intention to change lifestyle and health behaviours for dementia risk reduction
Figure 8.3 Time frame of intention to change lifestyle and health behaviour for dementia risk reduction
8.3.3 Determinants of intention to change lifestyle and health behaviour for dementia risk reduction

Two sets of multiple linear regression analyses were conducted with intentions to change lifestyle and health behaviours for dementia risk reduction (Table 8.2) and timeframe of intentions as dependent variables. Gender differences in the determinants of high intentions to change lifestyle and health behaviours for dementia risk reduction were evident. The association between perceived benefits, cues to action and intentions were significant for males only and the association between perceived barriers with intentions was significant for females only. Model 1 demonstrated that a larger variance was explained for males (51%) than females (31%). Dementia literacy (model 2) added an independent 0.3% and 5.9% variance with intentions for males and females respectively and the ability to recognize dementia/Alzheimer’s disease from the vignette was significantly associated with higher intentions to change lifestyle and health behaviours for dementia prevention. Not having depression was a significant predictor (Model 3) of intentions to change lifestyle and health behaviour for dementia risk reduction for males. After adjusting for socio-demographic characteristics, having cues to action and not having depression were the only factors which were statistically significantly associated with intentions to change lifestyle and health behaviours for males. Perceived benefits were also no longer significantly associated with intentions. Having fewer perceived barriers and being able to recognise dementia from the vignette were
however, significantly associated with intentions to change lifestyle and health behaviour for dementia risk reduction for females.

Multiple linear regression analyses for timeframe of intentions also showed clear gender differences. After adjusting for socio-demographic characteristics, being able to recognise dementia from the vignette ($\beta = -.279$, $p < .05$) was a significant predictor of how fast males intended to change their lifestyle and health behaviour for dementia risk reduction. On the other hand, believing they are capable of making changes ($\beta = -.443$, $p < .01$) was significantly associated with how fast females intended to change their lifestyle and health behaviour for dementia risk reduction. Surprisingly, self-reported increased risk and protective factors did not significantly influence timeframe of intentions to change lifestyle and health behaviour for dementia risk reduction.
Table 8.2 Unstandardised regression coefficients (standard error) for intentions to change lifestyle and health behaviour for dementia risk reduction by gender

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>MCLHB-DRR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>-.016 (.029)</td>
<td>-.015 (.029)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>-.015 (.028)</td>
<td>-.014 (.028)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>.146** (.053)</td>
<td>.146** (.053)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>-.031 (.034)</td>
<td>-.031 (.034)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>.134*** (.042)</td>
<td>.133*** (.043)</td>
</tr>
<tr>
<td>Health motivation</td>
<td>.014 (.039)</td>
<td>.017 (.039)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.127 (.086)</td>
<td>.113 (.090)</td>
</tr>
<tr>
<td>Dementia literacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition</td>
<td>-.065 (.159)</td>
<td>-.122 (.186)</td>
</tr>
<tr>
<td>Risk factors</td>
<td>.017 (.037)</td>
<td>.022 (.044)</td>
</tr>
<tr>
<td>Risk factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.040 (.048)</td>
<td>.046 (.050)</td>
</tr>
<tr>
<td>Depression</td>
<td>-.265* (.118)</td>
<td>-.281* (.122)</td>
</tr>
<tr>
<td>Cognitive activity</td>
<td>-.027 (.051)</td>
<td>-.033 (.052)</td>
</tr>
<tr>
<td>Education</td>
<td>.004 (.167)</td>
<td>.016 (.172)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>-.012 (.081)</td>
<td>-.021 (.082)</td>
</tr>
<tr>
<td>Variable</td>
<td>No. protective factors</td>
<td>No. risk factors</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Fish intake</td>
<td>-.125 (.106)</td>
<td>-.135</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>-.088 (.080)</td>
<td>-.095</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>.025 (.087)</td>
<td>.026 (.088)</td>
</tr>
<tr>
<td>Physical activity</td>
<td>-.088 (.136)</td>
<td>-.118</td>
</tr>
<tr>
<td>Social engagement</td>
<td>-.020 (.054)</td>
<td>-.019</td>
</tr>
<tr>
<td>Smoking</td>
<td>-.081 (.111)</td>
<td>-.079</td>
</tr>
<tr>
<td>Alcohol</td>
<td>-.133 (.127)</td>
<td>-.122</td>
</tr>
<tr>
<td>Pesticide exposure</td>
<td>-.011 (.093)</td>
<td>-.013</td>
</tr>
<tr>
<td>No. protective factors</td>
<td>-.209 (.337)</td>
<td>-.235</td>
</tr>
<tr>
<td>No. risk factors</td>
<td>.049 (.143)</td>
<td>.063 (.147)</td>
</tr>
</tbody>
</table>

Note: Adjusted for age, partner status and parents' dementia history. 2. Wald F statistic (degrees of freedom).
5 males and 6 females had missing data and were excluded in this analysis.
Significance levels: *p<.05, ** p<.01, ***p<.005, ****p<.001
8.4 Study 1 Discussion

In this first study, we explored the association between the HBM constructs, dementia literacy, risk and protective factors and intentions to change lifestyle and health behaviour for dementia risk reduction among Australian men and women aged between 50 and 60. Overall, participants indicated strong intentions to change lifestyle and health behaviour for dementia risk reduction. The finding also suggested that reasons for people’s intention to adopt healthier lifestyle and behaviour differed between genders. Results showed that males’ intentions to change lifestyle and health behaviours for dementia prevention were high when a) they have social influences to change lifestyle and health behaviour for dementia risk reduction, and b) they do not have (had) depression. Females’ intentions to change lifestyle and health behaviours for dementia risk reduction however were high when a) they believed that they have fewer barriers to change lifestyle and health behaviour, and b) they have ability to recognise dementia symptoms. These determinants of intention to change lifestyle and health behaviour were somewhat different from determinants found in Chapter 6.

The determinants of how fast they intended to make changes also differed from those in Chapter 6. Males in this current study intended to change lifestyle and health behaviours sooner when there were cues for them to change whereas males in Chapter 6 intended to change sooner if they thought these changes would bring benefits to them. Females in this current study on the other hand intended to change lifestyle and health behaviours sooner if they believed they were capable
of making necessary changes whereas females in Chapter 6 intended to change sooner when there were cues for them to change.

The difference could be due to participants having a higher risk of developing dementia whereas the participants from Chapter 6 could have belonged to either high or low risk groups even though having risk and protective factors were not significantly associated with intentions except for not having depression for males. Another possible reason for the difference could be due to different participants’ age and gender ratio found in these two studies. The participants in this current study were younger (M = 55.5, SD=2.96) than those in Chapter 6 (M=63.7, SD=8.1) and almost half of them were males (47%).

However, for both males and females, a higher number of risk and protective factors for dementia were not strong determinants for intentions to change lifestyle and health behaviour. What in fact determined their intentions strongly, were beliefs and knowledge regarding dementia.

The determinants found in this study were however more in line with what previous study identified as determinants of intention to be screened for dementia. Werner (2003) found that intentions to screen were significantly associated with perceived barriers and cues to action. Considering Werner’s study did not examine males and females differently, it can be argued that the determinants of intentions to be screened for dementia may be the same as determinants of intentions to change lifestyle and health behaviours for dementia risk reduction.

An interesting finding from the current study was that participants expressed intentions to change their diet and the level of cognitive and physical
activity they engage in. This seems to be an accurate reflection of their risk factors as they had higher risks in relation to BMI and cognitive activity level. Interestingly, they were already engaging in medium to high levels of physical activity. Low level of intentions were placed on reducing alcohol and quitting smoking, which were also an accurate representation of the participants as they were reported to be non-smokers who consume no or light to moderate amounts of alcohol (Table 8.1).

The present study had limitations. The main limitation was that due to all participants demonstrating more than two risk factors and less than two protective factors for dementia, it was not possible to compare people at a higher risk against those with a lower risk of developing dementia. Therefore, participants with and without risk and protective factors should be examined in the future to support the argument that having risk and protective factors are not significantly associated with intentions to change lifestyle and health behaviour for dementia risk reduction. The second limitation was that participants in this study had high intentions to change lifestyle and health behaviour, which was not surprising since they were committed to participate in a 12-week intervention. This led to a ceiling effect and the results may not be representative of the general population. The majority of participants were also highly educated with almost half of them working as professionals. This may suggest that the findings from the current study can only be representative of those who are highly educated. Thus, a wider range of population sample with a larger sample size should be used in future
studies to investigate the determinants of intentions to change lifestyle and health behaviour for dementia risk reduction.

High intention however, does not necessarily mean that the actual behavioural change will follow. Therefore, an examination on whether intention leads to actual lifestyle and health behavioural changes should be conducted. This will be addressed in the following Study 2.
8.5 Study 2 Methods

8.5.1 Study 2 Participants

This study uses the same sample as in the previous study. However, 136 (77.3% of the baseline sample) and 135 (76.7%) completed a follow up after the 12-week intervention and at the 26 week follow up respectively. One hundred and twenty three (69.9%) participants completed both follow ups. Those who did not complete the follow ups were not significantly different from the baseline sample in terms of demographic and other characteristics except that those who did not complete all three assessments had higher perceived benefit (M=16.46, p=0.001) and self-efficacy (M=8.19, p=.008) than those who completed all three assessments (M=15.57 and M=7.71).

8.5.2 Study 2 Materials

The same questionnaires as baseline (study 1) questionnaires were administrated at both follow ups.

8.5.3 Study 2 Analysis

A repeated measure ANOVA was conducted to measure the mean differences between baseline and follow ups in HBM constructs, literacy and intentions to change lifestyle and health behaviour for dementia risk reduction. Mixed models were used to analyse the health behaviour and lifestyle changes measured by reduction in ANU-ADRI, protective and risk scores. Since dementia risk reduction is more effective when multiple lifestyle and health behaviours were targeted, this study did not examine individual lifestyle or health behaviour change. Instead, changes in total ANU-ADRI, total protective and risk scores were
used as dependent variables. These analyses were conducted separately for males and females in order to examine the relative importance of gender influences and all participants were included in the mixed model analyses including those who did not complete all three assessments. General intention and intention to change lifestyle and health behaviour for dementia risk reduction within 6 months were entered together in model 1 to investigate the intention-behaviour transition. Dementia literacy, domains of the MCLHB-DRR, and self-reported numbers of risk and protected factors at baseline were then added to assess their contribution (model 2). Change in intention, domains of the MCLHB-DRR, and dementia literacy at follow ups were entered in model 3 to examine the effect of intention stability as well as stability of attitudes, measured by the MCLHB-DRR. Finally, age, partner status, and parents' history of dementia were entered for adjustment (model 4). The BBL project randomly assigned participants into three groups: online only; online plus face to face; and active control. However, the current analyses were conducted without dividing participants into these groups since it was found that experimental groups were not significantly associated with behaviour and lifestyle changes (unpublished data). The focus of the current project was also not on the efficacy of the intervention. Instead, the aim of this study was to investigate determinants of health behaviour and lifestyle changes. Therefore, whether the intervention was successful or not was not examined here.
8.6 Study 2 Results

8.6.1 Change in sample characteristics

Scores on the HBM constructs, dementia literacy and intentions were compared between three assessment points (baseline, 13 weeks, 24 weeks) to examine if any changes were made between waves. It was found that there were significant improvements in male participants’ knowledge on risk factors, $F(2,199) = 26.25, p = .000$ (see Table 8.3). Tukey post-hoc comparisons of the three assessments indicated that for males, the dementia knowledge after the intervention ($M = 7.43, 95\% \text{ CI} [7.12, 7.75]$) and at the 26 weeks follow up ($M = 7.56, 95\% \text{ CI} [7.33, 7.79]$) were significantly higher than at the baseline ($M = 6.02, 95\% \text{ CI} [5.63, 6.42]$), $p = .000$.

On the other hand, females’ perceived susceptibility ($F(2, 242) = 4.39, p = .013$), dementia recognition ($F(2, 242) = 6.51, p = .002$), and knowledge on dementia risk factors ($F(2, 242) = 13.72, p = .000$) differed significantly across the three assessment times. It was indicated that female participants scored lower on perceived susceptibility at the 26 weeks follow up ($M = 10.86, 95\% \text{ CI} [10.18, 11.54]$) than at the baseline ($M = 12.25, 95\% \text{ CI} [11.63, 12.87]$), $p = .010$. Comparison between perceived susceptibility at post intervention ($M = 11.45, 95\% \text{ CI} [10.71, 12.20]$) and the other assessment times were not statistically significant, $p < .05$. Female participants improved in their ability to recognise dementia symptoms at post intervention ($M = .92, 95\% \text{ CI} [.86, .98]$) and at the 26 weeks follow up ($M = .91, 95\% \text{ CI} [.85, .98]$) than at baseline ($M = .75, 95\% \text{ CI} [.66, .84]$), $p < .01$. They also improved their knowledge on dementia risk factors.
at post intervention (M= 7.63, 95% CI [7.33, 7.92]) and follow up (M= 7.46, 95% CI [7.13, 7.80]) than at baseline (M= 6.39, 95% CI [5.96, 6.82]), p = .000.

8.6.2 Determinants of health behavioural and lifestyle change

Mixed model analyses were conducted to investigate determinants of health behaviour and lifestyle change for dementia risk reduction, using the total ANU-ADRI score as a dependent variable. The analyses were conducted separately for males and females. For males, it was demonstrated in model 1 (see Table 8.3) that baseline intentions were not significantly associated with behavioural and lifestyle changes for dementia risk reduction: $\beta=.58 (.81), p=.48$ and $\beta= -1.13 (2.10), p=.59$ for general intentions and intentions to change within 6 months respectively. Model 2 demonstrated that both dementia literacy and the MCLHB-DRR constructs at baseline were not significantly associated with behavioural changes. However, the numbers of protective and risk factors participants had at the baseline were associated with the behavioural and lifestyle changes. These associations remained after adding changes in the dementia literacy, and the MCLHB-DRR constructs to a regression model and after adjusting for age, partner status, and history of demented parents. Furthermore, the third model demonstrated that a smaller change in scores on perceived severity were also related to less behavioural changes for dementia risk reduction. Changes in the dementia literacy and the MCLHB-DRR constructs added an independent 6% variance to the model.

Determinants of health behavioural and lifestyle changes for females were somewhat different to those of males. Intentions were not significantly associated
with behavioural and lifestyle changes for dementia risk reduction for females as well: $\beta=.32 (.63)$, $p=.61$ and $\beta=.58 (1.73)$, $p=.74$ for general intentions and intentions to change within 6 months respectively. Higher scores on baseline perceived severity and on knowledge on dementia risk factors were also associated with an improvement of the ANU-ADRI total scores, indicating behavioural and lifestyle changes. Fewer numbers of protective and increased numbers of risk factors female participants had at baseline were also associated with behavioural and lifestyle changes. Changes in intentions, dementia literacy, and MCLHB-DRR constructs added 4% variance to the model. However, none of these additional variables were significantly associated with changes in health behavioural and lifestyle changes.
<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Females</th>
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<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
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<tr>
<td>Baseline Intentions</td>
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<tr>
<td>General intention</td>
<td>.58 (.81)</td>
<td>.56 (.70)</td>
<td>.34 (.75)</td>
<td>.33 (.78)</td>
<td>.32 (.63)</td>
<td>-.02 (.43)</td>
<td>.01 (.48)</td>
<td>.06 (.49)</td>
<td></td>
</tr>
<tr>
<td>Within 6 months</td>
<td>-1.13 (2.10)</td>
<td>-1.69 (1.31)</td>
<td>-1.59 (1.29)</td>
<td>-1.44 (1.36)</td>
<td>-.58 (1.73)</td>
<td>-2.22 (1.06)</td>
<td>-.05 (1.07)</td>
<td>-.05 (1.08)</td>
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<tr>
<td>Baseline Literacy</td>
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<tr>
<td>Recognition</td>
<td>-1.21 (.85)</td>
<td>-1.19 (.92)</td>
<td>-1.12 (.97)</td>
<td>.18 (.75)</td>
<td>.44 (.80)</td>
<td>.26 (.83)</td>
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</tr>
<tr>
<td>Risk factors</td>
<td>.32 (.20)</td>
<td>.48* (.23)</td>
<td>.43 (.24)</td>
<td>-.29 (.16)</td>
<td>-.36* (.18)</td>
<td>-.37* (.18)</td>
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<td>Baseline MCLHB-DRR</td>
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<tr>
<td>Perceived susceptibility</td>
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<td>.18 (.22)</td>
<td>.21 (.24)</td>
<td>.03 (.13)</td>
<td>-.06 (.17)</td>
<td>-.08 (.17)</td>
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<tr>
<td>Perceived severity</td>
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<td>-.37 (.20)</td>
<td>-.41 (.21)</td>
<td>-.30** (.11)</td>
<td>-.45** (.16)</td>
<td>-.45** (.16)</td>
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<tr>
<td>Perceived benefits</td>
<td>-.39 (.30)</td>
<td>-.39 (.33)</td>
<td>-.39 (.34)</td>
<td>-.27 (.30)</td>
<td>.05 (.34)</td>
<td>.11 (.35)</td>
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<tr>
<td>Perceived barriers</td>
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<td>-.36 (.23)</td>
<td>-.33 (.23)</td>
<td>.23 (.15)</td>
<td>.18 (.18)</td>
<td>.17 (.18)</td>
<td></td>
<td></td>
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<tr>
<td>Cues to action</td>
<td>-.23 (.24)</td>
<td>-.28 (.27)</td>
<td>-.27 (.28)</td>
<td>.22 (.21)</td>
<td>.19 (.23)</td>
<td>.19 (.24)</td>
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<tr>
<td>Health motivation</td>
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<td>-.19 (.29)</td>
<td>-.19 (.30)</td>
<td>.11 (.16)</td>
<td>.08 (.21)</td>
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<tr>
<td>Self-efficacy</td>
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<td>.97 (.53)</td>
<td>.93 (.54)</td>
<td>-.42 (.35)</td>
<td>.02 (.39)</td>
<td>.04 (.39)</td>
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<tr>
<td>Baseline Risk factors</td>
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<tr>
<td>No. protective factors</td>
<td>2.64**** (.27)</td>
<td>2.61**** (.26)</td>
<td>2.55**** (.27)</td>
<td>2.28**** (.24)</td>
<td>2.26*** (.24)</td>
<td>2.23**** (.25)</td>
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<tr>
<td>No. risk factors</td>
<td>-3.26**** (.46)</td>
<td>-3.56**** (.46)</td>
<td>-3.58**** (.47)</td>
<td>-2.93**** (.45)</td>
<td>-2.97**** (.45)</td>
<td>-2.96**** (.46)</td>
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<tr>
<td>Change in Intentions</td>
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<tr>
<td>Δ General intention</td>
<td>.34 (.53)</td>
<td>.33 (.54)</td>
<td></td>
<td>-.21 (.37)</td>
<td>-.20 (.37)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Changes in Literacy</td>
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</tr>
<tr>
<td>Δ Recognition</td>
<td>-.09 (.79)</td>
<td>-.15 (.80)</td>
<td></td>
<td>-5.5 (.68)</td>
<td>-5.7 (.68)</td>
<td></td>
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</tr>
</tbody>
</table>

Table 8.3 Standardised coefficients (standard error) for health behavioural and lifestyle changes for dementia risk reduction by gender.
<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Changes in MCLHB-DRR</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta ) Perceived susceptibility</td>
<td>( .06 (.18) )</td>
<td>( .06 (.18) )</td>
<td>( .55 )</td>
</tr>
<tr>
<td>( \Delta ) Perceived severity</td>
<td>( .60*** (.18) )</td>
<td>( .61*** (.18) )</td>
<td>( .61*** (.18) )</td>
</tr>
<tr>
<td>( \Delta ) Perceived benefits</td>
<td>( .03 (.23) )</td>
<td>( .05 (.23) )</td>
<td>( -.40 (.23) )</td>
</tr>
<tr>
<td>( \Delta ) Perceived barriers</td>
<td>( .21 (.20) )</td>
<td>( .19 (.20) )</td>
<td>( .19 (.20) )</td>
</tr>
<tr>
<td>( \Delta ) Cues to action</td>
<td>( -.14 (.21) )</td>
<td>( -.14 (.21) )</td>
<td>( -.14 (.21) )</td>
</tr>
<tr>
<td>( \Delta ) Health motivation</td>
<td>( .40 (.27) )</td>
<td>( .39 (.27) )</td>
<td>( .39 (.27) )</td>
</tr>
<tr>
<td>( \Delta ) Self-efficacy</td>
<td>( -.11 (.44) )</td>
<td>( -.13 (.44) )</td>
<td>( -.13 (.44) )</td>
</tr>
</tbody>
</table>

Note: Adjusted for age, partner status, and parents’ history of dementia.
Significance levels: *p<.05, **p<.01, ***p<.005, ****p<.001
Two more sets of mixed model analyses were conducted with protective and risk scores as dependent variables. It was shown that after adjusting for demographic variables, having higher perceived severity scores at baseline ($\beta=-.37 \ (.17)$, $p<.05$), increased number of risk factors ($\beta=-3.58 \ (.36)$, $p<.001$), fewer changes in perceived severity scores at follow ups ($\beta=.32 \ (.15)$, $p<.05$), and fewer changes in health motivation scores at follow ups ($\beta=.49 \ (.22)$, $p<.05$) were associated with behavioural and lifestyle changes related to identified protective factors among males.

For females, high intentions at baseline ($\beta=-.77 \ (.38)$, $p<.05$), and increased number of protective factors at baseline ($\beta=-3.43 \ (.35)$, $p<.001$) were associated with protective factors relating to behavioural and lifestyle changes for dementia risk reduction.

In terms of risk factors related to behavioural and lifestyle changes, risk scores for males were more likely to increase if they had a higher knowledge on dementia risk factors at baseline ($\beta=.35 \ (.15)$, $p<.05$), higher baseline self-efficacy scores ($\beta=1.19 \ (.34)$, $p<.001$), higher number of risk factors at baseline ($\beta=2.29 \ (.17)$, $p<.001$), less changes in their knowledge on risk factors ($\beta=-.33 \ (.13)$, $p<.01$), and more changes on their perceived severity scores ($\beta=.28 \ (.11)$, $p<.05$).

Female participants’ risk scores were more likely to increase if their intentions to change at baseline were high ($\beta=.83 \ (.34)$, $p<.05$); they had less knowledge on risk factors at baseline ($\beta=-.32 \ (.13)$, $p<.05$); they had lower scores on baseline perceived severity ($\beta=-.30 \ (.11)$, $p<.01$); they had higher scores on
baseline perceived barriers at baseline ($\beta=.26 (.13)$, $p<.05$); and a higher number of risk factors ($\beta=2.17 (.17)$, $p<.001$).

8.7 Study 2 Discussion

The aim of this study was to examine the factors that influence behaviour and lifestyle changes for dementia risk reduction among 50-60 year old men and women with a higher risk of developing dementia. This study also investigated whether intentions to change health behaviours and lifestyle would successfully translate into actual behavioural and lifestyle changes. The key finding indicated that determinants of actual behavioural changes differed between genders. This finding was similar to determinants of intentions to change and which might be the most distinguishable finding of the current study. Gender differences clearly demonstrated that males changed their health behaviour and lifestyle when a) they had fewer number of protective factors at baseline, b) they had more risk factors at baseline, c) their scores on perceived severity did not change much over the three assessment times (stability of perceived severity). On the other hand, females changed their health behaviour and lifestyle when a) they had fewer protective factors at baseline, b) they had more risk factors at baseline, c) they had higher knowledge on dementia risk factors at baseline, and d) they scored highly on perceived severity at baseline. These determinants of behavioural and lifestyle changes were different from the determinants of intentions found in both study 1 of current chapter and Chapter 6.
As stated in the introduction, gender is often neglected when developing interventions and understanding the health promoting behaviours (Ostlin et al., 2007). The Health Belief Model has been widely used to explain and predict health behaviours including preventive health behaviours, sick role behaviours and clinical use (Sheeran & Abraham, 1995). However, only a limited number of studies used the HBM as a theoretical model of the behaviour change model and examined possible gender differences and its effect on behaviour changes/health promotion. Gender difference was found in previous research on different health promoting behaviours such as physical activity (Kim et al., 2010). It was suggested that the physical activity level increased when men had higher self-efficacy and when women had higher self-efficacy and benefits and lower barriers. However, although physical activity level was included in the total ANU-ADRI score as well as in the total protective score, determinants of behaviour changes for dementia risk reduction were different from this previous study. Moreover, other domains of the HBM did not explain behaviour and lifestyle changes for dementia risk reduction. This might suggest that the HBM may not have been the best behaviour change model used to explain lifestyle and health behaviour changes for dementia risk reduction.

It was also found that both intentions at baseline and the stability of intentions over three assessment periods were not significantly associated with behavioural and lifestyle changes in my models. This suggests that high intentions do not lead to actual behavioural and lifestyle changes in dementia prevention. However, there was an exception where intention at baseline was significantly
correlated with protective and risk scores for female participants. The overall findings support previous research on the intention-behaviour gap suggesting that intention cannot solely predict behaviours and that the high intentions do not necessarily mean a higher chance of behaviours occurring. However, this finding also conflicts with previous research suggesting that intention stability led to stronger intention-behaviour agreement (Dibonaventura & Chapman, 2005). This may mean that intention stability plays an important role in behaviours when the target behaviour is a one off behaviour (e.g., flu vaccination) but loses its importance when the target behaviour is a more prolonged behaviour that requires longer term effort.

Behaviour change for dementia prevention may be especially challenging because all the known risk and protective factors do not guarantee the prevention of dementia. In some areas, the behaviour change has a clear relationship to disease prevention. For example, wearing a condom can prevent the transmission of sexually transmitted diseases (STDs; Van de Perre, Jacobs, & Sprecher-Goldberger, 1987). In contrast, adopting a healthy lifestyle and health behaviour does not give the same degree of guarantee in preventing dementia. There is a significant correlation between identified risk and protective factors for dementia risk reduction, and reduced risk of developing dementia (Elwood et al., 2013). However, with a cure for dementia being unavailable, there is no guarantee that changing lifestyle and health behaviour will prevent dementia development. This is unlike other risk behaviours leading to chronic diseases such as smoking and lung cancer: 90% of all lung cancer cases are directly attributed to smoking
Moreover, successful transitions found in previous research tended to occur in one-off behaviours like attending a screening for diseases (Sheeran & Orbell, 2000). Dementia preventing behaviours in this instance are different from one-off behaviours as behaviour changes for dementia prevention are lifelong commitments such as losing/maintaining weight and engaging in regular physical, social and cognitive activities.

There are a few limitations present in the current study. The main limitation was that participants were recruited for an intervention program. Although the experiment groups were found not to be significantly different from the active control group in terms of behaviour changes they made, it is not clear whether receiving information played an important role in behavioural and lifestyle changes. The active control group used in this current study received substantial information on dementia risk reduction. Therefore, future studies should include a control group in which participants do not receive any information to see if receiving information/intervention plays a moderator role in the behavioural and lifestyle changes for dementia prevention.

Another limitation was that all participants were in an increased risk group with high reported intentions demonstrated by the fact that they volunteered to participate in an intervention. Therefore, they might not have been representative of the general population. A wider population sample including increased and non-increased risk group with varied level of intentions to change should therefore be examined in future studies.
Despite the limitations stated above, the current study offers a valuable contribution to the current literature especially in dementia risk reduction where studies examining gender and behaviour changes in lifestyle intervention are currently lacking. This study argues that gender plays an important role in behaviour changes, health promotion and it cannot be assumed that men and women work the same way and that the same determinants will motivate them towards behaviour changes. This study also supports previous studies that high intentions do not always lead to behaviour changes. However, the findings from the current study suggest that being in an increased risk group is related to making health behaviour and lifestyle changes for dementia risk reduction.
8.8 Conclusion

This chapter presented two studies investigating the determinants of both the intentions of, and the actual behaviour and lifestyle changes for dementia risk reduction. This study has been the first of its kind to attempt to understand the determinants of health behaviour and lifestyle changes for dementia risk reduction among increased risk individuals for developing dementia. The main finding of this study suggests that the determinants of intentions and actual behavioural and lifestyle changes are different. Hence behavioural changes cannot be predicted with predictors of intentions to change.

Gender differences in dementia risk reduction and its determinants shown in this study also suggest the need for further investigations into gender differences to provide evidence-based, gender-specific multifaceted intervention to reduce dementia risk of older adults. Gender based interventions aimed at helping individuals change their health behaviours and lifestyle for dementia prevention would be a better way of promoting health behaviours (Keleher, 2004). For example, increasing dementia literacy might be a promising method of promoting healthy behaviours and lifestyle for females, whereas the same educational intervention might not be as helpful for males. More research is needed in this area to develop more effective interventions in dementia risk reduction.
CHAPTER 9: Summary

Synopsis

This chapter provides a summary of the research and key findings presented in this thesis. This chapter will conclude with an overview of the limitations, summary of the main implications of this thesis, and outlines avenues for future research on dementia risk reduction.
9.1 Introduction

The aim of this thesis was to understand potential consumers of dementia prevention interventions and to identify determinants of health behavioural and lifestyle changes for dementia risk reduction. To develop an effective population based lifestyle intervention for dementia prevention, it was necessary to first understand the targeted population in terms of their attitudes towards, and knowledge on dementia and dementia risk reduction. It was also important to compare these attitudes and knowledge of dementia against those of other common chronic diseases. Once this information was gathered, factors contributing to both intentions to change health behaviour and lifestyle and the actual behavioural and lifestyle changes needed for dementia risk reduction were investigated, utilising a well-established behaviour change model.

9.2 Summary of major findings

9.2.1 Voices of potential consumers of dementia risk reduction interventions

Chapter 3 addressed the first aim of this thesis, which was to understand potential consumers of the intervention. In that chapter, motivators and barriers to health behaviour and lifestyle changes to reduce dementia risk were reported among older adults without the diagnosis of dementia. The unique contribution of chapter 3 is it is the first study that gave a voice to potential consumers of dementia prevention interventions. This study attempted to identify motivators and barriers of lifestyle and health behaviour changes for dementia risk reduction as well as to explore potential consumers' attitudes and beliefs on dementia and
dementia risk reduction. The two main themes that emerged from the focus groups were 1) fear of developing dementia and 2) lack of knowledge on dementia. This finding points to a need for educating the public about dementia and dementia risk reduction although the high dementia literacy was evident in participants at the group level. This was in line with a previous study showing high level of dementia literacy in Australians (Low & Anstey, 2009). The findings from Chapter 3 were used to compare against different behavioural change models to find the most suitable theory or model for dementia risk reduction, which was the Health Belief Model.

9.2.2 Development of the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale

Having identified motivators and barriers for intentions to change lifestyle and health behaviours for dementia risk reduction from the focus group, a further study was developed investigating the best suited behavioural change model for dementia risk reduction. The Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale was then developed based on the Health Belief Model (HBM) to understand how attitudes surrounding dementia risk may affect motivation to change health behaviours and lifestyle. The scale was simplified to 27 items, fitting the data better than the original 53 items. It had moderate to high internal and test-retest reliability and measurement of invariance across gender and age was also demonstrated.
9.2.3 Comparison of attitudes towards dementia and other chronic diseases

The cross national study, presented in Chapter 7, explored and compared attitudes and intentions to perform health behaviour and lifestyle changes for dementia risk reduction in comparison with other chronic diseases among Australians and South Koreans. Results from this study demonstrated that, unlike previously suggested (Ayalon & Arena, 2004; S. E. Lee et al., 2010), racial or cultural differences were not present between Australians and South Koreans in terms of their level of dementia stigma and literacy. This may have been due to the fact that participants from these two countries were the majority racial groups in their own countries where they have easy access to information without language barriers. Their level of concern and the reported likelihood of developing dementia were an accurate reflection of the relative importance of dementia rate in their own country in terms of prevalence and mortality. In comparison to other chronic diseases, it was suggested that people lack knowledge on dementia risk factors although they were able to recognise the dementia symptoms from a vignette. A need for more media exposure on dementia and public education was again emphasised in this quantitative study.

9.2.4 Determinants of intentions to change lifestyle and health behaviours for dementia risk reduction

Chapter 6 and 8 investigated the determinants of intentions to change lifestyle and health behaviours for dementia risk reduction, using constructs from the HBM. The difference between Chapter 6 and study 1 of Chapter 8 was the profile of the participants. Chapter 6 involved older adults across Australia who
may or may not have risk and protective factors for dementia whereas the study in
Chapter 8 involved older adults in the ACT and surrounding areas with less than
two protective factors and more than two risk factors for dementia. Results from
the study in Chapter 6 were somewhat different from that of Chapter 8 in relation
to determinants although both studies indicated different determinants across
gender. The study, reported in Chapter 6, demonstrated that males’ intentions to
change lifestyle and health behaviours for dementia risk reduction were high
when a) they believed that changing lifestyle and health behaviour were beneficial
in preventing dementia, b) they believed they were capable of making changes.
On the other hand, females’ intentions to change lifestyle and health behaviours
for dementia risk reduction were high when a) they believed that changing
lifestyle and health behaviour were beneficial in preventing dementia, b) there
were some social influences to make these changes, and c) they valued their
general health.

Results from the study in Chapter 8 on the other hand, indicated that
males’ intentions to change lifestyle and health behaviours for dementia risk
reduction were high when a) they had social influences to change lifestyle and
health behaviour for dementia risk reduction, and b) they did not have depression.
Females’ intentions to change lifestyle and health behaviours for dementia risk
reduction were high when a) they believed that they have fewer barriers to change
lifestyle and health behaviours, and b) they had an ability to recognise dementia
symptoms. The different results found in Chapter 8, compared to that in Chapter
6, could be due to participants in Chapter 8 being younger and having a higher
risk of developing dementia. The determinants found in study 1 of Chapter 8 were however, more in line with what a previous study identified as determinants of intention to be screened for dementia (Werner, 2003).

9.2.5 Determinants of health behavioural and lifestyle changes for dementia risk reduction

One of the main aims of this thesis was to identify the determinants of health behavioural and lifestyle changes for dementia risk reduction. The second study in Chapter 8 reported the intention-behaviour gap, which meant that intentions did not always translate into behavioural changes. The intention-behaviour gap was also found in Chapter 8 among older Australians with a higher risk of developing dementia.

The determinants of behavioural and lifestyle changes for dementia risk reduction was different from the determinants of intentions to change lifestyle and health behaviour for dementia risk reduction. Males changed their health behaviour and lifestyle when a) they had fewer numbers of protective factors at baseline, b) they had more risk factors at baseline, and c) their scores on perceived severity did not change much over follow ups. Females on the other hand, changed their health behaviour and lifestyle when a) they had a fewer number of protective factors at baseline, b) they had more risk factors at baseline, c) they had a higher knowledge on dementia risk factors at baseline, and d) they scored highly on perceived severity at baseline.
The results indicated that intentions did not contribute to behavioural and lifestyle changes as much as attitudes and knowledge on dementia, and the number of protective and risk factors individuals have. However, even these factors do not wholly explain the behavioural and lifestyle changes, therefore other contributing and confounding factors that might significantly contribute to behavioural and lifestyle changes need to be further investigated.
<table>
<thead>
<tr>
<th>Intentions to change lifestyle and health behaviour for dementia risk reduction</th>
<th>Intentions to change lifestyle and health behaviour for dementia risk reduction among people with increased risk</th>
<th>Health behavioural and lifestyle changes for dementia risk reduction among people with increased risk</th>
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</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>High perceived benefit</td>
<td>High perceived benefit</td>
<td>High cues to action</td>
</tr>
<tr>
<td>High self-efficacy</td>
<td>High cues to action</td>
<td>No depression</td>
</tr>
<tr>
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<td>High general health motivation</td>
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<td></td>
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</tbody>
</table>
9.3 Limitations

Conceptual and methodological limitations of each of the five studies conducted in this thesis have been noted in detail in the relevant chapters. As a result, only the major limitations will be recapped in this section. One of the major limitations of the research was the recruitment method used in studies throughout the thesis. Participants were recruited through advertisements in newspapers, on and off-line communities, and from a participant pool from the survey company, Qualtrics. Therefore, the studies in this thesis attracted only those who were concerned about developing dementia due to having family members or friends with dementia or due to their fear of developing dementia. This was evident in high intentions to change health behaviours and lifestyle. Having high intentions can lead to a ceiling effect and the results may not have been representative of the general population. Participants from studies involved in this thesis were generally highly educated beyond the secondary education level. Highly educated participants might therefore have had a higher level of dementia literacy and intentions. The future studies should therefore be conducted with individuals with a lower education and lower intentions to change lifestyle and health behaviours for dementia as these are the individuals who would be less prone to behavioural and lifestyle changes. A higher level of education is also a known protective factor for dementia risk reduction (Bruandet et al., 2008).

Another limitation was that the scope of behavioural and lifestyle changes needed for dementia risk reduction was very broad as it involved multi-domain
behaviours rather than one specific behaviour or lifestyle. Therefore, the
determinants of behaviour changes as well as intentions for behaviour and
lifestyle changes for dementia risk reduction may have been different depending
on specific behaviours in question. The exception was participants involved in the
study in Chapter 8 where they received a substantial amount of information on
dementia and dementia risk reduction as a part of intervention. Future research
therefore should address multiple behaviours involved in dementia risk reduction
in depth prior to investigating individuals’ attitudes and knowledge about
dementia and dementia risk reduction.

Lastly, gender differences were found throughout this study. Therefore, it
might have been better to consider gender differences when choosing the most
suitable behaviour change model in Chapter 4. Gender was underestimated in
Chapter 4 and two different models might have been more suitable for males and
females separately. It was predicted that the seven domains of the Health Belief
Model (perceived susceptibility, perceived severity, perceived benefits, perceived
barriers, cues to action, general health motivation, and self-efficacy) would
provide the best model to explain behaviour changes in dementia prevention.
However, a lack of the majority of the HMB domains (all domains except
perceived severity) as significant predictors of health behaviour and lifestyle
changes for dementia risk reduction might have been due to the fact that gender
was not considered when deciding the most suitable model to explain behaviour
changes for dementia risk reduction. A different model might have been a better
suited model if the difference in genders were taken into consideration.
This is the first study that developed and assessed the psychometric properties of a scale attempting to understand the beliefs of health and lifestyle behaviours specifically aimed at preventing dementia. The MCLHB-DRR can be used to increase health promoting behaviours and lifestyle changes for dementia risk reduction which is similar to the intervention studies based on the HBM showing increased breast cancer screening rate (Champion, 1999; Vietri et al., 1997). The MCLHB-DRR scale can also provide useful information for developing effective interventions by tailoring intervention programs based on an individual’s particular motivations and beliefs.

The comparison study showed a lack of knowledge on dementia compared to other chronic diseases although no cross-national differences were found in dementia literacy and stigma levels. Public education is therefore a necessity, especially those with culturally and linguistically diverse (CALD) backgrounds in Australia. Considering 23% of approximately one million Australian aged over 65 (The Department of Health, 2012) are from CALD backgrounds, interventions targeting the enhancement of dementia literacy and reduction in dementia stigma among CALD people will be beneficial to society in the long term. This may reduce the socio-economical gap between the majority and minority groups that currently exist in Australian society.

The results obtained from this thesis have also helped to identify factors contributing to behavioural and lifestyle changes for dementia risk reduction. Determinants for behavioural and lifestyle changes for dementia risk reduction
were found to be different from the determinants for intentions to change lifestyle and health behaviour for dementia risk reduction. This suggests that behaviour changes are different from having the intentions to make lifestyle and health behaviour changes. Importantly, intentions do not necessarily predict behaviour changes.

With further research, the investigations reported here hold the promise of enhancing dementia literacy, lowering dementia stigma, and promoting necessary health behavioural and lifestyle changes for dementia. In addition, most countries have limited resources allocated by government to health promoting activities compared to investments in medical care (McGinnis, Williams-Russo, & Knickman, 2002). Therefore, it is of extreme important to focus on investing these limited funds in preventive activities that will ensure high potential for success and cost-effectiveness (Ostlin et al., 2007). Health promotion policies or interventions that take women’s and men’s different determinants of health behaviour and lifestyle changes into account are therefore more likely to be successful and cost-effective in dementia risk reduction compared to interventions that are not concerned with such differences.
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Appendix A: Letter to participants, Information sheet, Consent form, and Questionnaire used for the focus groups in Chapter 3
Participant’s address

Dear ________

RE: Dementia Risk Reduction study

Thank you for your interest in participating in the above study. We are pleased to invite you to the Centre for Mental Health Research (CMHR) at the Australian National University to attend a focus group at ____ on ____. Refreshments will be provided.

CMHR is located on Eggleston Road. For your convenience, we have included a map of the area surrounding the centre with the CMHR building marked with a red X.

Driving
Please park in the car park outside the centre, where there will be parking spaces made available. Once you have parked, the reception area is through the main sliding doors and up the ramp to your right. You will need to collect a visitor parking permit from our receptionist once you have arrived.

Public Transport
We have included the weekly timetable for Action bus service number 3, which makes regular trips both from the City Centre and Belconnen Centre to near the CMHR building. Ask the driver to let you off at the stop on the corner of Garran and Eggleston Roads (D on the schedule). Our building is only a short walk up Eggleston Rd from this stop, on the left. If you would like us to meet you at the bus stop please phone ahead to let us know which bus you will be on.

Also included is a short demographic questionnaire. Please fill out the questionnaire and bring it with you. If you have any further questions, please do not hesitate to contact us on 02) 6125 0713. Thank you for your support for our ongoing research.
Yours sincerely,

Sarang Kim

Ageing Research Unit
Centre for Mental Health Research
Australian National University
PARTICIPANT INFORMATION STATEMENT

You are warmly invited to voluntarily participate in the Behaviour and lifestyle changes for Dementia Risk Reduction study. As a participant in this study, we are asking that you:

1. Attend a focus group at the centre for mental health research at ANU, where you will be asked about your opinions regarding changing behaviour and lifestyle for dementia risk reduction. This will take approximately 1 hour and be recorded by audiotape.

What is the purpose of this research?
We are interested in the examining the importance of the individuals’ perception of dementia risk and their motivation towards lifestyle and behavioural changes on the efficacy of a community based online intervention. From the focus groups, we are interested in identifying facilitators of and barriers to dementia risk reduction.

Are there any risks to participating?
We do not anticipate that there will be any negative effects of participating.

Possible benefits of participating:
While we do not expect any immediate personal benefits to participants in the focus groups, it is hoped that this study will benefit future persons who are concerned about their own risk of dementia or the risk of a friend or family member.

What about confidentiality?
The results of the study may be published or disclosed to other people in a way that will not identify you (such as in scientific publications or presentation in scientific meetings). Results from your participation will be collated with all other participants and the findings may be published in research reports, journal articles and conference papers. Results will only be used in summary form, so that no individual responses can be identified. Questionnaires will be stored securely in a
locked filing cabinet at the Centre for Mental Health Research and computer files will be password protected.

We ask all participants in the focus groups to keep fellow participants’ names and privacy confidential.

If I agree to participate, can I withdraw at a later time?
Yes. If you decide to take part in the study, you can withdraw at any time, with no detrimental effect to yourself.

Any further questions?
If you have any further questions about the study, feel free to contact the Research Investigator or Research Supervisor:

Sarang Kim  
Centre for Mental Health Research  
Ph. 02) 6125 0713

Prof. Kaarin Anstey  
Centre for Mental Health Research  
Ph. 02) 6125 8410

If you have any concerns or questions regarding the ethical conduct of this study contact please contact:

Human Research Ethics Committee  
(02) 6125 3427
PARTICIPANT CONSENT FORM

I, ____________________________

(Name of Participant)

of ____________________________

(street) (suburb/town) (state & postcode)

have been invited to consent to participation in a research project, Behavioural and lifestyle changes for Dementia Risk Reduction:

In relation to this project I have read the Information Sheet and have been informed of the following points:

1. The aim of the project is to investigate and identify facilitators of and barriers to dementia risk reduction as well as perceived risk of dementia.

2. I understand that participation in this study involves participating in a focus group, which will take approximately 1 hour and will be recorded by audiotape.

3. Should I have any problems or queries about the way in which the study was conducted, and I do not feel comfortable contacting the research staff, I am aware that I may contact the Australian National University Human Ethics Committee.

4. I understand that I can refuse to take part in this project or withdraw from it at any time but my contribution before withdrawal cannot be deleted.

5. I understand that the results of the research will be made accessible in summary form to the research team and participants who are interested to obtain them.
6. I understand that my involvement in this project and any information I provide will be kept confidential as far as the law allows.

7. I understand that all participants will be asked to respect fellow participants’ confidentiality, but it is not guaranteed.

After considering all these points, I accept the invitation to participate in this project.

Signature: ___________________________  Date: ____________
(of participant/volunteer)

Witness’s Name: ____________________________

Signature: ___________________________  Date: ____________

Researcher’s Name: ____________________________

Signature: ___________________________  Date: ____________
Questionnaire for Focus Groups Participants

1. Gender: male/female
2. Age: _______ (years)
3. Ethnicity: _______________
4. Years of education: _________
5. What is your current marital status?
   - Never married
   - Married, de facto
   - Separated, divorced or widowed
6. Are you currently working? Yes/No
   If yes, are you working full time or part time?
   - Full time
   - Part time
   If no, which best describes your employment status
   - Looking for work
   - Retired
   - Housewife/househusband
Appendix B Information sheet, consent form and questionnaire used for Chapter 5
Dementia Risk Reduction study

What is the purpose of this research?
We are interested in examining the influence of people’s perception of dementia on their intention to change their lifestyle and behaviours to reduce their risk of developing dementia. Two sets of questionnaire will be involved and those who complete the first survey will be recontacted for the second survey.

Are there any risks to participating?
We do not anticipate that there will be any negative effects of participating.

Possible benefits of participating:
Even though participants will not benefit from participating directly, we hope this study will benefit those who are concerned about their own risk of dementia or the risk of a friend or family members in the future.

What about confidentiality?
The results of the study may be published or disclosed in a way that will not identify participants (such as in scientific publications or presentation in scientific meetings). Results from all participants will be aggregated and the findings may be published in research reports, journal articles and conference papers. Results will only be used in summary form, so that no individual responses can be identified. Computer files will be password protected.
If I agree to participate, can I withdraw at a later time?
Yes. If you decide to take part in the study, you can withdraw at any time, with no detrimental effect to yourself.

Any further questions?
If you have any further questions about the study, feel free to contact the Research Investigator or Research Supervisor:

Sarang Kim
Centre for Research on Ageing, Health and Wellbeing
Ph. 02) 6125 0713

Prof. Kaarin Anstey
Centre for Research on Ageing, Health and Wellbeing
Ph. 02) 6125 8410

If you have any concerns or questions regarding the ethical conduct of this study contact please contact:

Human Research Ethics Committee
(02) 6125 3427

Thank you for your support for our ongoing research.

Yours sincerely,
Sarang Kim

Dementia Collaborative Research Centres
Centre for Research on Ageing, Health and Wellbeing
Australian National University
PARTICIPANT CONSENT FORM

I have been invited to consent to participation in the research project, Dementia Risk Reduction:

In relation to this project I have been informed of the following points:

1. The aim of the project is to examine the influence of the individuals’ perception of dementia on their intention to change health behaviour and lifestyle.

2. I understand that participation in this study involves filling out a questionnaire, which will take approximately 15 minutes.

3. Should I have any problems or queries about the way in which the study was conducted, and I do not feel comfortable contacting the research staff, I am aware that I may contact the Australian National University Human Ethics Committee.

4. I understand that I can refuse to take part in this project or withdraw from it at any time but my contribution before withdrawal cannot be deleted.

5. I understand that my involvement in this project and any information I provide will be kept confidential as far as the law allows.

6. I understand that I will be recontacted approximately two weeks after completing this survey for the second survey.

After considering all these points, I accept the invitation to participate in this project.

I AGREE
Demographic

1. Do you have any relatives or friends who suffer/suffered from dementia?
   Yes □  No □

2. If Yes, Have you cared for a family member or friend with dementia?
   Yes □  No □

3. Have you heard of an organisation called Alzheimer’s Australia?
   Yes □  No □

4. Have you heard of an organisation called the Dementia Foundation?
   Yes □  No □

5. How old are you? _______

6. Are you  
   Male □  Female □  Other □

7. What is your current marital status?
   Never married □
   Married, defector □
   Separated, divorced or widowed □

8. What is your postcode?  

9. What country were your born in?
   Australia □
   Outside Australia □  Please specify __________________

10. What is the highest level of education you have completed?
    Still attending school □
    Secondary school certificate □
11. Are you currently working?

- Yes
- No

*If yes, Are you working full-time or part-time?*

- Full-time
- Part-time

*If no, Which best describes your employment status*

- Looking for work
- Retired
- Housewife/househusband

12. Have you ever worked as a health professional (such as a doctor, nurse, psychologist, physiotherapist, or osteopath?)

- Yes
- No

13. Which of these broad income categories does your household fall into:

- <$15,600
- $15,600-52,000
- $52000-$104,000
- > $104,000
Dementia Health Belief Questionnaire

Please read the statements below and indicate how much you agree or disagree with them on the 5 point scale. There are no right or wrong answers to any question as you will be required to rate your own thoughts and beliefs. So please answer them as honestly and openly as possible.

Behavioural intention

1. To reduce my risk of dementia, I intend to change my lifestyle and behaviour

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2. I do not have plans to change my lifestyle and behaviour

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3. To reduce my risk of dementia, I am willing to use interventions to help me change my lifestyle and behaviour, if they are available to me

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Susceptibility

4. My chances of developing dementia are great

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5. My good physical health makes it less likely that I will develop dementia

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6. I feel that my chances of developing dementia in the future are high

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7. There is a strong possibility that I will develop dementia

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8. Within the next ten years I will develop dementia

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9. I am sure I will not develop dementia

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10. I have always had an unhealthy lifestyle and nothing has happened to me so I believe I will not develop dementia

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11. I am too young to think about dementia

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12. I will never develop dementia

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13. Dementia only happens to other people, not to me

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Severity

14. The thought of dementia scares me

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15. When I think about dementia I feel nauseous

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16. If I had dementia my career would be endangered

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17. When I think about dementia my heart beats faster

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18. Dementia would endanger my marriage (or a significant relationship)  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

19. My feelings about myself would change if I develop dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

20. I am afraid to even think about dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

21. My financial security would be endangered if I develop dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

22. The problems I would experience from dementia would last a long time  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

23. It would be more serious for me to develop dementia than if I developed other diseases  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

24. If I had dementia, my whole life would change  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

25. Dementia is a part of life so I do not worry whether or not I will develop dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

26. My life would be worthless if I have dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  

27. I would rather be dead than living with dementia  
   1 2 3 4 5  
   Strongly Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
   Agree Neither Agree or Disagree Disagree  
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268
28. Being forgetful is a normal part of ageing

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29. Dementia is a natural process of ageing for a lot of people

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Benefits

30. Adapting to a healthier lifestyle and behaviour would prevent dementia for me

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31. I have a lot to gain by changing my lifestyle and health behaviour

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32. Changing my lifestyle and health habits can help me reduce my chance of developing dementia

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33. I would not be so anxious about dementia if I could change my lifestyle and health habits

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34. Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia

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Barriers

35. I am too busy to change my lifestyle and health habits

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36. In order to reduce my risk of dementia I have to give up quite a lot

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### 37. Changing my lifestyle and behaviour is difficult

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### 38. Family responsibilities make it hard for me to change my lifestyle and behaviour

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### 39. Changing lifestyle and behaviour interferes with my schedule

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### 40. My physical condition makes it hard for me to change my lifestyle and behaviour

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### 41. I do not know what I can do to reduce my risk of dementia

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### 42. My financial situation does not allow me to change my lifestyle and behaviour

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### 43. I do not want to change my lifestyle because that would make my life boring

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### 44. I do not trust experts enough to follow their recommendations on how to reduce my risk of dementia

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### 45. I do not get enough support to change my lifestyle and behaviour

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Cues to action

46. Being forgetful makes me think I have to change my lifestyle and behaviour
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

47. Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

48. Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

49. Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

Health motivation

50. I think I have to pay attention to my own health
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

51. Nothing is as important to me as good health
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

52. I cannot get sick because I do not want to be a burden on my family
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

53. I often think about my health
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree

54. I am concerned about my health
- 1: Strongly Agree
- 2: Agree
- 3: Neither
- 4: Disagree
- 5: Strongly Disagree
Locus of control

55. It depends on me if I develop dementia
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

56. My own lifestyle and behaviour does not influence my likelihood of developing dementia
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

57. If I get dementia I will be to blame
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

58. No matter what I do, I will develop dementia
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

59. Chance will determine whether I develop dementia, it has nothing to do with what I do or don’t do
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

60. My lifestyle does not have any influence on whether I will develop dementia or not
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

61. If I have bad genes to start with, it does not matter what I do, I will develop dementia
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

62. Having dementia or not, is out of my control
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)

Self-efficacy

63. I am certain that I can change my lifestyle and behaviour so I can reduce risk of dementia
   1 (Strongly) Agree  2 (Agree)  3 (Neither)  4 (Disagree)  5 (Strongly Disagree)
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<td>64. I am able to make differences that will change my risk of developing dementia</td>
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<td>1 Strongly Agree</td>
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Fear

65. I really do not want to end up with dementia

|       | 1 Strongly Agree | 2 Agree  | 3 Neither Agree or Disagree | 4 Disagree | 5 Strongly Disagree |

66. I worry a lot about developing dementia

|       | 1 Strongly Agree | 2 Agree  | 3 Neither Agree or Disagree | 4 Disagree | 5 Strongly Disagree |

67. I really fear developing dementia

|       | 1 Strongly Agree | 2 Agree  | 3 Neither Agree or Disagree | 4 Disagree | 5 Strongly Disagree |
Appendix C

Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR) scale
Perceived Susceptibility

Q26.0 - My chances of developing dementia are great
Q28.0 - I feel that my chances of developing dementia in the future are high
Q29 - There is a strong possibility that I will develop dementia
Q30 - Within the next ten years I will develop dementia

Perceived Severity

Q37 - The thought of dementia scares me
Q38 - When I think about dementia my heart beats faster
Q40 - My feelings about myself would change if I develop dementia
Q42 - When I think about dementia I feel nauseous
Q46 - It would be more serious for me to develop dementia than if I developed other diseases

Perceived benefits

Q53 - Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia
Q54 - Changing my lifestyle and health habits can help me reduce my chance of developing dementia
Q55 - I have a lot to gain by changing my lifestyle and health behaviour
Q57 - Adapting to a healthier lifestyle and behaviour would prevent dementia for me

Perceived barriers

Q58 - I am too busy to change my lifestyle and health habits
Q61 - My financial situation does not allow me to change my lifestyle and behaviour

Q62 - Family responsibilities make it hard for me to change my lifestyle and behaviour

Q65 - Changing lifestyle and behaviour interferes with my schedule

**Cues to action**

Q126 - Being forgetful makes me think I have to change my lifestyle and behaviour

Q70 - Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour

Q71 - Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour

Q72 - Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour

**General health motivation**

Q73 - Nothing is as important to me as good health

Q74 - I often think about my health

Q76 - I think I have to pay attention to my own health

Q77 - I am concerned about my health

**Self-efficacy**

Q86 - I am certain that I can change my lifestyle and behaviour so I can reduce risk of dementia
Q87 - I am able to make differences that will change my risk of developing dementia
Appendix D

Information sheet, consent form and questionnaire used for Chapter 6
Dementia Risk Reduction study

Thank you for your interest in participating in the above study. We are pleased to invite you to join the study website and fill out the questionnaire that is available there. This will take approximately 20-30 minutes.

What is the purpose of this research?
We are interested in examining individuals' knowledge on dementia as well as the influence of people's perception of dementia on their motivation to change their lifestyle and behaviours.

Are there any risks to participating?
We do not anticipate that there will be any negative effects of participating.

Possible benefits of participating:
Participants will receive general information about how they can reduce their risk of dementia. We hope this study will benefit others who are concerned about their own risk of dementia, or the risk of a friend or family members.

What about confidentiality?
The results of the study may be published or disclosed to other people in a way that will not identify you (such as in scientific publications or presentation in scientific meetings). Results from your participation will be collated with all other participants and the findings may be published in research reports, journal articles and conference papers. Results will only be used in summary form, so that no
individual responses can be identified. Questionnaires will be stored securely in a locked filing cabinet at the Centre for Mental Health Research and computer files will be password protected.

**If I agree to participate, can I withdraw at a later time?**
Yes. If you decide to take part in the study, you can withdraw at any time, with no detrimental effect to yourself.

**Any further questions?**
If you have any further questions about the study, feel free to contact the Research Investigator or Research Supervisor:

Sarang Kim  
Centre for Mental Health Research  
Ph. 02) 6125 0713

Prof. Kaarin Anstey  
Centre for Mental Health Research  
Ph. 02) 6125 8410

If you have any concerns or questions regarding the ethical conduct of this study contact please contact:

**Human Research Ethics Committee**  
(02) 6125 3427

Thank you for your support for our ongoing research.

Yours sincerely,

Sarang Kim

Ageing Research Unit
Centre for Mental Health Research
Australian National University
PARTICIPANT CONSENT FORM

I have been invited to consent to participation in a research project, Dementia Risk Reduction:

In relation to this project I have been informed of the following points:

1. The aim of the project is to examine individuals’ knowledge on dementia and the influence of the individuals’ perception of dementia on their motivation to change health behaviour and lifestyle.

2. I understand that participation in this study involves filling out questionnaire, which will take approximately 20-30 minutes.

3. Should I have any problems or queries about the way in which the study was conducted, and I do not feel comfortable contacting the research staff, I am aware that I may contact the Australian National University Human Ethics Committee.

4. I understand that I can refuse to take part in this project or withdraw from it at any time but my contribution before withdrawal cannot be deleted.

5. I understand that the results of the research will be made accessible in summary form to the research team and participants who are interested to obtain them.

6. I understand that my involvement in this project and any information I provide will be kept confidential as far as the law allows.

After considering all these points, I accept the invitation to participate in this project

I AGREE
Dementia Literacy Questionnaire

The following paragraph presents the life circumstances of a man named John. Please read the description and answer the questions below of what you think of his situation. The person described is fictitious, but there are people who are like him. If you happen to know someone who is exactly like him, it is a coincidence.

John is a 75-year old retired man. He has been so forgetful lately that his wife needs to remind him each morning of his daily appointments. Even with reminders, he often gets mixed up about what he has planned for the day. Over the last few years, he has stopped doing home maintenance and is much more likely to lose things. He has been less interested in social activities except for golf, which he still plays twice a week. He also attends church on Sundays. When he plays golf his friends help him with his score sheet. He has trouble remembering the names of familiar people at church, whereas when he was working he was very good with names.

1. What would you say is wrong with John, if anything at all?

Old age □ Senile □ Psychological/mental problems □ Stress □ Depression □ Emotional breakdown □ Dementia □ Nothing □ Alzheimer’s disease □ Other ____________________ Don’t know □

2. There are a number of different people, who could possibly help John. For each of the following, are they likely to be helpful, harmful or neither to John?

a. A typical GP or family doctor

Helpful □ Neither □ Harmful □ Don’t know □
b. A typical chemist (pharmacist)
Helpful  □  Neither  □  Harmful  □  Don’t know  □

c. A counsellor
Helpful  □  Neither  □  Harmful  □  Don’t know  □

d. A social worker
Helpful  □  Neither  □  Harmful  □  Don’t know  □

e. A geriatrician
Helpful  □  Neither  □  Harmful  □  Don’t know  □

f. A psychiatrist
Helpful  □  Neither  □  Harmful  □  Don’t know  □

g. A neurologist
Helpful  □  Neither  □  Harmful  □  Don’t know  □

h. A priest/nun clergyman/clergywoman
Helpful  □  Neither  □  Harmful  □  Don’t know  □

i. Family
Helpful  □  Neither  □  Harmful  □  Don’t know  □

j. Close friends
Helpful  □  Neither  □  Harmful  □  Don’t know  □

3. If John receives the best professional help and treatments available, what do you think the most likely result will be
Full recovery  □  Partial recovery  □  No change  □
Deterioration  □  Don’t know  □
4. The next few questions contain statements about John’s condition. Please tell us whether you agree or disagree with each of these statements.

a. John’s condition is an inevitable part of normal ageing

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b. Nothing can be done to help someone with a condition like John’s

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c. John’s condition is not a real medical illness

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d. People with a condition like John should be put into a nursing home

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e. People with a condition like John are a burden on their family and friends

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f. People with a condition like John can no longer enjoy life

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5. When told John's story, specialists in ageing would generally agree that John might have dementia. There are many people in the community who have different forms of dementia including Alzheimer's disease, Vascular dementia and Lewy Body dementia. Do you think it is possible to reduce the risk of getting some forms of dementia?

Yes □ No □

If Yes, do you think the risk of dementia can be reduced by doing any of the following?:

- Eat healthily □
- Take heart medication □
- Physical exercise □
- Mental exercise (crosswords, puzzles, books etc.) □
- Socialise more □
- Reduce Stress □
- Avoid smoking □
- Drink red wine □
- Other ________________________________
- Nothing □
- Don't know □
6. How likely do you think the factors below contribute to the development of dementia? Would you say they are very likely, somewhat likely, somewhat unlikely or very unlikely to contribute to a person developing dementia?

a. **Old age**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

b. **Genetics**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

c. **Social isolation or loneliness**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

d. **Stress**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

e. **Weakness of character**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

f. **Aluminium**
   Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □
g. A virus or infection
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

h. Heart disease
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

i. Stroke or mini-stroke
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

j. Brain disease
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

k. Laziness
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

7. Some people believe that it is possible to reduce the risk of developing dementia. Do you think the behaviours listed below increase, decrease or do not change the risk of developing dementia
   a. Getting out and about more
      Increases □ Does not change □ Decreases □ Don’t know □

   b. Becoming more active physically, such as playing more sport, or doing a lot more walking or gardening
      Increases □ Does not change □ Decreases □ Don’t know □
c. Becoming more active mentally, such as reading books and newspapers, doing crosswords, taking courses
   Increases □  Does not change □  Decreases □  Don’t know □

d. Becoming more active socially, such as doing volunteer work, going to discussion groups
   Increases □  Does not change □  Decreases □  Don’t know □

e. Stopping smoking
   Increases □  Does not change □  Decreases □  Don’t know □

f. Reducing stress
   Increases □  Does not change □  Decreases □  Don’t know □

g. Drinking more water
   Increases □  Does not change □  Decreases □  Don’t know □

h. Using non-aluminium cookware
   Increases □  Does not change □  Decreases □  Don’t know □

i. Reducing coffee and tea intake
   Increases □  Does not change □  Decreases □  Don’t know □

j. Eating foods high in antioxidants
   Increases □  Does not change □  Decreases □  Don’t know □

k. Eating foods high in omega-3 fatty acids
   Increases □  Does not change □  Decreases □  Don’t know □
l. Eating foods high in estrogen such as soy
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐

m. Maintaining a healthy weight
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐

n. Maintaining healthy blood pressure levels
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐

o. Maintaining healthy cholesterol levels
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐

p. Cutting down on alcohol if you drink excessively
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐

q. Taking vitamin and nutritional supplements
   Increases ☐  Does not change ☐  Decreases ☐  Don’t know ☐
Group 1 (Control group):

Research has shown that risk of dementia can be reduced by changing your lifestyle and health behaviours by doing the following:

- Maintaining a healthy diet
- Quitting smoking
- Reducing alcohol consumption
- Increasing mental, physical and social activity
- Avoiding depression
- Avoiding mid-life obesity
- Avoiding mid-life high cholesterol
- Increasing education level
- Avoiding head injury
Group 2 (Education group):

Dementia is one of the principal causes of disability and decreased quality of life among older adults. However, dementia and cognitive decline are often believed to be a part of normal ageing and an unavoidable condition.

Even though dementia cannot yet be cured, the risk of dementia may be reduced and onset or progress of cognitive decline and dementia may be delayed. Recent research has identified some risk factors for dementia and cognitive decline. These risk factors increase the chance of dementia occurring although they are not necessarily causes. Some of these risk factors are modifiable whereas others are non-modifiable, such as age and genetics.

Research has shown that participation in cognitively stimulating activities is associated with lower incidence of dementia in middle-aged and older individuals. Several long-term studies have also demonstrated that obesity in mid-life is associated with a 70-100% increase in the risk of later developing dementia and Alzheimer’s disease. Moreover, research has demonstrated that the risk of dementia is lower in those who engage in high levels of physical activity compared to those exercising little.

Studies have revealed that smokers have a 79% increased risk of Alzheimer’s disease and a 78% increased risk of vascular dementia, compared to those who never smoked. Moreover, former smokers had a 41% reduced risk of Alzheimer’s disease compared to those still smoking.

Excessive alcohol consumption is also a modifiable risk factor for dementia. Small amounts of alcohol may in fact reduce the risk of developing dementia. Studies have shown that light drinkers have a 37% reduced risk of dementia and a 43% reduced risk of Alzheimer’s disease compared to non-drinkers. However, chronic heavy drinking can lead to irreversible brain damage, cognitive
impairment and alcohol-related dementia (Korsafoff’s syndrome). Regular binge drinking in mid-life has also been associated with a three-fold increased risk of late-life dementia.

In summary, it is suggested that **risk of dementia can be reduced by changing your lifestyle and health behaviours** by doing the following:

- Maintaining a healthy diet
- Quitting smoking
- Reducing alcohol consumption
- Increasing mental, physical and social activity
- Avoiding depression
- Avoiding mid-life obesity
- Avoiding mid-life high cholesterol
- Increasing education level
- Avoiding head injury
Group 3 (Vulnerability/fear group):

Dementia is an illness that affects many older people in Australia. In 2010, there were an estimated **257,275 Australians with dementia. One in four people over 85 years will develop dementia**, making it one of the highest incidences of any disease.

As the graph below shows, prevalence of dementia increases with age which means your chance of developing dementia keeps increasing as you get older. In addition, with increased life expectancy due to better nutrition, advances in medical fields and easier access to hospitals and doctors, the likelihood of you developing dementia in your life time has increased.

![Estimated dementia prevalence rates in Australia 2009](image)
Moreover, although dementia is more common after the age of 65 years, people in their 40s and 50s can have dementia; **dementia can happen to anybody, and potentially, everyone.**

There is limited community awareness that some lifestyle behaviours directly affect their risk of dementia. Research has shown that risk of dementia may be increased if you have lifestyle and health behaviours as below:

- Poor diet
- Smoking
- Excessive alcohol consumption
- Lack of mental, physical and social activity
- Depression
- Mid-life obesity
- Mid-life high cholesterol
- Low education level
- Head injury
Dementia Health Belief Questionnaire

Please read the statements below and indicate how much you agree or disagree with them on the 5 point scale. There are no right or wrong answers to any question as you will be required to rate your own thoughts and beliefs. So please answer them as honestly and openly as possible.

**Behavioural intention**

1. To reduce my risk of dementia, I intend to change my lifestyle and behaviour

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2. Do not have plans to change my lifestyle and behaviour

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3. To reduce my risk of dementia, I am willing to use interventions to help me change my lifestyle and behaviour, if they are available to me

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**Perceived Susceptibility**

4. My chances of developing dementia are great

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5. I feel that my chances of developing dementia in the future are high

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6. There is a strong possibility that I will develop dementia

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7. Within the next ten years I will develop dementia

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**Perceived Severity**

8. The thought of dementia scares me

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9. When I think about dementia my heart beats faster

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10. My feelings about myself would change if I develop dementia

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11. When I think about dementia I feel nauseous

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12. It would be more serious for me to develop dementia than if I developed other diseases

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**Perceived Benefits**

13. Adapting to a healthier lifestyle and behaviour would prevent dementia for me

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14. I have a lot to gain by changing my lifestyle and health behaviour

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15. Changing my lifestyle and health habits can help me reduce my chance of developing dementia

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16. Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia

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**Perceived Barriers**

17. I am too busy to change my lifestyle and health habits

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18. Family responsibilities make it hard for me to change my lifestyle and behaviour

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19. Changing lifestyle and behaviour interferes with my schedule

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<td></td>
<td>Strongly Agree</td>
<td>Neither Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Agree</td>
<td>Neither Agree or Disagree</td>
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20. My financial situation does not allow me to change my lifestyle and behaviour

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<td>Strongly Agree</td>
<td>Neither Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Agree</td>
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**Cues to action**

21. Being forgetful makes me think I have to change my lifestyle and behaviour

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<td>Strongly Agree</td>
<td>Neither Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Agree</td>
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22. Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour

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<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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</table>

23. Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour

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<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
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24. Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour

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<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
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</table>

**General Health Motivation**

25. I think I have to pay attention to my own health

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<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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26. Nothing is as important to me as good health

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<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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</table>

27. I often think about my health

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<tr>
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<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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</table>
28. I am concerned about my health

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<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
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</table>

Self-efficacy

29. I am certain that I can change my lifestyle and behaviour so I can reduce risk of dementia

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<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
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</tbody>
</table>

30. I am able to make differences that will change my risk of developing dementia

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<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither</td>
<td>Agree or Disagree</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
</tr>
</tbody>
</table>
1. Have you known a family member or friend with dementia?
   Yes □  No □

2. If Yes, have you cared for a family member or friend with dementia?
   Yes □  No □

3. Have you heard of an organisation called Alzheimer’s Australia?
   Yes □  No □

4. Have you heard of an organisation called the Dementia Foundation?
   Yes □  No □

5. How old are you? _______

6. Are you
   Male □  Female □

7. What is your current marital status?
   Never married □
   Married, de-facto □
   Separated, divorced or widowed □

8. What is your postcode?
   □□□□□
9. **What country were your born in?**
   - Australia □
   - Outside Australia □ Please specify ________________________

10. **What is the highest level of education you have completed?**
   - Still attending school □
   - Secondary school certificate □
   - Trade certificate/ apprenticeship □
   - Other certificate □
   - Associate or undergraduate diploma □
   - Bachelor’s degree or higher □
   - Other □

11. **Are you currently working?**
   - Yes □
   - No □

   *If yes, Are you working full-time or part-time?*
   - Full-time □
   - Part-time □

   *If no, Which best describes your employment status*
   - Looking for work □
   - Retired □
   - Housewife/househusband □
12. Have you ever worked as a health professional (such as a doctor, nurse, psychologist, physiotherapist, or osteopath?)

Yes ☐
No ☐

13. Which of these broad income categories does your household fall into:

<$15,600 ☐
$15,600-52,000 ☐
$52,000-$104,000 ☐
>$104,000 ☐

Thank you for your time, if you want to learn more about dementia, please contact your local Alzheimer’s Australia branch. Or you can go to their website at www.alzheimers.org.au
Appendix E – Information letter, consent form, and questionnaire used for the cross-national study in Chapter 7
Attitude and beliefs about chronic diseases

Thank you for your interest in participating in the above study. We are pleased to invite you to join the study and fill out the questionnaire. This will take approximately 20-30 minutes.

**What is the purpose of this research?**
We are interested in examining individuals' knowledge and beliefs of chronic diseases as well as the influence of people's beliefs of chronic diseases on their intention to change their lifestyle and health behaviours.

**Are there any risks to participating?**
We do not anticipate that there will be any negative effects of participating. However, some participants may experience distress due to unforeseen personal reasons.

**Possible benefits of participating:**
Even though this project will not have direct benefits to participants, by gaining an understanding of people's knowledge and perceptions towards chronic diseases, we can learn how enhancing awareness and knowledge can increase intentions to prevent chronic diseases.

**What about confidentiality?**
The results of the study may be published or disclosed to other people in a way that will not identify you (such as in scientific publications or presentation in scientific meetings). Results from your participation will be collated with all other participants and the findings may be published in research reports, journal articles and conference papers. Results will only be used in summary form, so that no individual responses can be identified. Questionnaires will be stored securely in a locked filing cabinet at the Centre for Research on Ageing, Health and Wellbeing at least 5 years after completion of the study. The electronic data will be stored in password protected files that are only accessible by investigators.

**If I agree to participate, can I withdraw at a later time?**
Yes. If you decide to take part in the study, you can withdraw at any time, with no detrimental effect to yourself.
Any further questions?
If you have any further questions about the study, feel free to contact the Research Investigator or Research Supervisor:

Sarang Kim
Centre for Research on Ageing, Health and Wellbeing
The Australian National University
Ph. 02) 6125 0713
Sarang.Kim@anu.edu.au

Prof. Kaarin Anstey
Centre for Research on Ageing, Health and Wellbeing
The Australian National University
Ph. 02) 6125 8410
Kaarin.Anstey@anu.edu.au

If you have any concerns or questions regarding the ethical conduct of this study contact please contact:

Ethics Manager
The ANU Human Research Ethics Committee
Research Office, Chancelry 10B,
The Australian National University, ACT 0200
Telephone: (02) 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

Thank you for your support for our ongoing research.

Yours sincerely,

Sarang Kim
Centre for Research on Ageing, Health and Wellbeing
The Australian National University
PARTICIPANT CONSENT FORM

I have been invited to consent to participation in a research project, ‘Attitude and Beliefs About Chronic Diseases’.

In relation to this project I have been informed of the following points:

1. The aim of the project is to examine individuals' knowledge and beliefs of chronic diseases and the influence of the individuals' beliefs on their intention to change health behaviour and lifestyle.

2. I understand that participation in this study involves filling out a questionnaire online, and will take approximately 20-30 minutes.

3. I understand that I may experience distress due to unanticipated personal reasons.

4. Should I have any problems or queries about the way in which the study was conducted, and I do not feel comfortable contacting the research staff, I am aware that I may contact the Australian National University Human Ethics Committee:

   The Ethics Secretariat, Human Research Ethics Committee,
   Research Office, Chancelry 10B,
   The Australian National University, ACT 0200
   Phone: 02) 6125 3427, Email: Human.Ethics.Officer@anu.edu.au.

5. I understand that I can refuse to take part in this project or withdraw from it at any time without giving a reason or suffering any negative
consequence.

6. I understand that the results of the research will be made accessible in summary form to the research team and may be published in research reports, journal articles and conference papers.

7. I understand that my involvement in this project and any information I provide will be kept confidential as far as the law allows for at least 5 years.

After considering all these points, I accept the invitation to participate in this project.

I AGREE
### Attitudes and beliefs about chronic diseases

1. Can you list the five main causes of death in Australia/Korea (List them in order)?

   |   |   |   |   |   |
---|---|---|---|---|---|
1 |   |   |   |   |   |
2 |   |   |   |   |   |
3 |   |   |   |   |   |
4 |   |   |   |   |   |
5 |   |   |   |   |   |

2. Which chronic diseases are you most concerned about developing (rank them in order, 1=Most concerned, 5=Least concerned)?

   a. Cancer
   b. Dementia
   c. Type 2 Diabetes
   d. Cardiovascular disease
   e. Depression
   f. Respiratory disease

3. Which chronic disease do you think you are most likely to develop (rank them in order, 1=Most likely, 5=Least likely)?

   a. Cancer
   b. Dementia
   c. Type 2 Diabetes
   d. Cardiovascular disease
   e. Depression
   f. Respiratory disease

4. Are you currently doing anything to prevent following chronic diseases? If so, please state what types of action you are taking to prevent these chronic diseases.

   a. Cancer
   b. Dementia
   c. Type 2 Diabetes
   d. Cardiovascular disease
   e. Depression
   f. Respiratory disease

   |   |   |
---|---|---|
Yes | No |   |
   |   |   |
Yes | No |   |
   |   |   |
Yes | No |   |
   |   |   |
Yes | No |   |
   |   |   |
Yes | No |   |
   |   |   |
5. Risk factors are factors that may increase a person’s chances of developing illness even though they are not cause of the illness. Some risk factors are closely related to your lifestyle and health behaviours. Please indicate which lifestyle and health behaviours you think are risk factors for the conditions below (choose as many as you think are relevant).

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Cancer</th>
<th>Dementia</th>
<th>Type 2 Diabetes</th>
<th>Cardiovascular disease</th>
<th>Depression</th>
<th>Respiratory disease</th>
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<tbody>
<tr>
<td>Tobacco smoking</td>
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<tr>
<td>Physical inactivity</td>
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<tr>
<td>Excessive alcohol consumption</td>
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<tr>
<td>Poor diet</td>
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<tr>
<td>Obesity</td>
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<tr>
<td>High blood fats</td>
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</table>

6. Are you currently willing to make lifestyle and health behavioural changes for the following chronic diseases (1. Strongly disagree, 2. Disagree, 3. Neither disagree nor agree, 4. Agree, 5. Strongly agree)? If so, what changes are you willing to make?

   a. Dementia ________ ________
   b. Cancer ________ ________
   c. Cardiovascular disease ________ ________
   d. Depression ________ ________
   e. Respiratory disease ________ ________
   f. Type 2 Diabetes ________ ________
Dementia literacy scale

The following paragraph presents the life circumstances of a man named Mary/Young hee. Please read the description and answer the questions below of what you think of her situation.

Mary/Young hee is a 75-year old retired woman. She has been so forgetful lately that her husband needs to remind her each morning of her daily appointments. Even with reminders, she often gets mixed up about what she has planned for the day. Over the last few years, she has stopped doing home maintenance and is much more likely to lose things. She has been less interested in social activities except for golf, which she still plays twice a week. She also attends church on Sundays. When she plays golf her friends help her with her score sheet. She has trouble remembering the names of familiar people at church, whereas when she was working she was very good with names.

1. What would you say is wrong with Mary/Young hee, if anything at all?

Old age □  Senile □  Psychological/mental problems □
Stress □  Depression □  Emotional breakdown □
Dementia □  Nothing □  Alzheimer’s disease □
Other ___________  Don’t know □

2. There are a number of different people, who could possibly help Mary/Young hee. For each of the following, are they likely to be helpful, harmful or neither to Mary/Young hee?

   a. A typical GP or family doctor
       Helpful □  Neither □  Harmful □  Don’t know □

   b. A typical chemist (pharmacist)
       Helpful □  Neither □  Harmful □  Don’t know □

   c. A counsellor
       Helpful □  Neither □  Harmful □  Don’t know □

   d. A social worker
       Helpful □  Neither □  Harmful □  Don’t know □
c. A geriatrician

Helpful □  Neither □  Harmful □  Don’t know □

f. A psychiatrist

Helpful □  Neither □  Harmful □  Don’t know □

g. A neurologist

Helpful □  Neither □  Harmful □  Don’t know □

h. A priest/nun/clergyman/clergywoman

Helpful □  Neither □  Harmful □  Don’t know □

i. Family

Helpful □  Neither □  Harmful □  Don’t know □

j. Close friends

Helpful □  Neither □  Harmful □  Don’t know □

3. If Mary receives the best professional help and treatments available, what do you think the most likely result will be

Full recovery  □

Partial recovery  □

No change  □

Deterioration  □

Don’t know  □
4. The next few questions contain statements about Mary/Young hee's condition. Please tell us whether you agree or disagree with each of these statements.

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<tbody>
<tr>
<td>a. Mary/Young hee’s condition is an inevitable part of normal ageing</td>
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<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>2</td>
<td>Agree</td>
<td>3</td>
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<tr>
<td>b. Nothing can be done to help someone with a condition like Mary/Young hee’s</td>
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<tr>
<td>1</td>
<td>Strongly Agree</td>
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<td>Agree</td>
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<tr>
<td>c. Mary/Young hee’s condition is not a real medical illness</td>
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<tr>
<td>1</td>
<td>Strongly Agree</td>
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<td>Agree</td>
<td>3</td>
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<tr>
<td>d. People with a condition like Mary/Young hee should be put into a nursing home</td>
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<tr>
<td>1</td>
<td>Strongly Agree</td>
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<td>Agree</td>
<td>3</td>
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<tr>
<td>e. People with a condition like Mary/Young hee are a burden on their family and friends</td>
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<tr>
<td>1</td>
<td>Strongly Agree</td>
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<td>Agree</td>
<td>3</td>
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<tr>
<td>f. People with a condition like Mary/Young hee can no longer enjoy life</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>2</td>
<td>Agree</td>
<td>3</td>
</tr>
</tbody>
</table>
5. When told Mary/Young hee's story, specialists in ageing would generally agree that Mary/Young hee might have dementia. There are many people in the community who have different forms of dementia including Alzheimer's disease, Vascular dementia and Lewy Body dementia. Do you think it is possible to reduce the risk of getting some forms of dementia?

Yes □ No □

If Yes, do you think the risk of dementia can be reduced by doing any of the following?:

Eat healthily □ Take heart medication □ Physical exercise □
Mental exercise (crosswords, puzzles, books etc.) □ Socialise more □
Reduce Stress □ Avoid smoking □ Drink red wine □
Other

Nothing □ Don’t know □

6. How likely do you think the factors below contribute to the development of dementia?

a. Old age

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

b. Genetics

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

c. Social isolation or loneliness

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

d. Stress

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

e. Weakness of character

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □
f. Aluminium

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

g. A virus or infection

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

h. Heart disease

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

i. Stroke or mini-stroke

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

j. Brain disease

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

k. Laziness

Very likely □ Likely □ Undecided □ Unlikely □ Very likely □

7. Some people believe that it is possible to reduce the risk of developing dementia. Do you think the behaviours listed below increase, decrease or do not change the risk of developing dementia

a. Getting out and about more

Increases □ Does not change □ Decreases □

b. Becoming more active physically, such as playing more sport, or doing a lot more walking or gardening

Increases □ Does not change □ Decreases □

c. Becoming more active mentally, such as reading books and newspapers, doing crosswords, taking courses

Increases □ Does not change □ Decreases □
d. Becoming more active socially, such as doing volunteer work, going to discussion groups

Increases □  Does not change □  Decreases □

e. Stopping smoking

Increases □  Does not change □  Decreases □

f. Reducing stress

Increases □  Does not change □  Decreases □

g. Drinking more water

Increases □  Does not change □  Decreases □

h. Using non-aluminium cookware

Increases □  Does not change □  Decreases □

i. Reducing coffee and tea intake

Increases □  Does not change □  Decreases □

j. Eating foods high in antioxidants

Increases □  Does not change □  Decreases □

k. Eating foods high in omega-3 fatty acids

Increases □  Does not change □  Decreases □

l. Eating foods high in estrogen such as soy

Increases □  Does not change □  Decreases □

m. Maintaining a healthy weight

Increases □  Does not change □  Decreases □

n. Maintaining healthy blood pressure levels

Increases □  Does not change □  Decreases □
o. Maintaining healthy cholesterol levels

Increases □   Does not change □   Decreases □

p. Cutting down on alcohol if you drink excessively

Increases □   Does not change □   Decreases □

q. Taking vitamin and nutritional supplements

Increases □   Does not change □   Decreases □
Dementia stigma items

1. To what extent do you think a person with dementia (1. Unlikely, 5 likely):

   a. Does not understand simple instructions
   b. Does not remember recent events
   c. Does not recognise his/her family members
   d. Disturbs the persons around him/her
   e. Perturbs the persons around him/her
   f. Suffers from urinary incontinence
   g. Suffers from faecal incontinence
   h. Has a disgusting odour
   i. Looks neglected
   j. Looks disgusting

2. To what extent do you think that other people feel (_____ ) toward the person with dementia (1. Unlikely, 5 likely):

   a. Shame
   b. Embarrassment
   c. Disgust
   d. Fear
   e. Disgrace
   f. Uneasiness
   g. Dread
   h. Repulsion
   i. Sadness
   j. Sorrow
   k. Pity
   l. Compassion
   m. Willingness to give support
   n. Willingness to be of assistance
   o. Willingness to help

3. To what extent do you think that other people (1. Unlikely, 5 likely):

   a. Avoid the person with dementia
   b. Keep away from the person with dementia
   c. Ignore the person with dementia
Have you known a family member or friend with dementia?
Yes ☐  No ☐

If Yes, Have you cared for a family member or friend with dementia?
Yes ☐  No ☐

How old are you?  ________

Are you
Male ☐  Female ☐  Other ☐

What is your current marital status?

- Never married ☐
- Married, defacto ☐
- Separated, divorced or widowed ☐

What is your state you are living now?

What is the highest level of education you have completed?

- Still attending school ☐
- Secondary school certificate ☐
- Trade certificate/ apprenticeship ☐
- Associate or undergraduate diploma ☐
- Bachelor’s degree or higher ☐
- Other  Please specify __________ ☐

Are you currently working?

Yes ☐  No ☐

If yes, Are you working full-time or part-time?

Full-time ☐  Part-time ☐
If no, Which best describes your employment status

- Looking for work □
- Retired □
- Housewife/househusband □

Have you ever worked as a health professional (such as a doctor, nurse, psychologist, physiotherapist, or osteopath?)

- Yes □
- No □

Which of these broad income categories does your household fall into:

- <$15,600 □
- $15,600-52,000 □
- $52,000-$104,000 □
- >$104,000 □
Appendix F – Phone screening questionnaires, inclusion and exclusion criteria, and questionnaire used for the Body Brain Lifestyle study in Chapter 8
Phone screening questionnaire 1

Greeting and explanation of the purpose of the call

Hello XX, this is XX calling from the ANU, how are you today? Do you have time to do the first phone screening interview now? Okay great, well first of all thank you for your interest in the project and for consenting to undergo further screening. We will be conducting two separate phone interviews, and the purpose of this first one is to check some details regarding your medical history, just to see whether you meet any of the inclusion or exclusion criteria for the study. So everything that you tell me will be kept completely confidential, I won't be disclosing the information to anybody else and your name will in no way be connected with your answer sheet. Are you ready to begin?

Part 1 – Inclusion criteria

A. CHOLESTEROL
   a. Are you aware of your total cholesterol levels over the past 12 months? 
   b. Have you been told by a doctor or other health professional that you have had high cholesterol levels within the last 2 years? Yes/ No/ Not sure
   c. Are you currently taking any medications to control your cholesterol? No/Yes, Please specify

B. HYPERTENSION
   a. Have you ever been told by a doctor or other health professional that you have hypertension or high blood pressure? Yes/ No/ Not sure
   b. Do you know what your current (last 12 months) blood pressure reading is? No/Yes, Please specify 
   c. Are you currently taking any medications to control blood pressure? No/Yes, Please specify

C. DIABETES
   a. Have you ever been told by a doctor or other health professional that you have diabetes? Yes/ No/ Not sure
   b. What type of diabetes were you told you have?
      i. Type 1 (insulin-dependent)
      ii. Type 2 (non-insulin dependent)
      iii. Gestational diabetes
      iv. Unknown
   c. Have you been told by a doctor or other health professional that you have high sugar levels in your blood or urine? Yes/ No/ Not sure

D. HEAD INJURY
   a. Have you ever had a head injury? No/Yes/Don’t know
   b. What year was the injury? 
   c. Did you lose consciousness? No/Yes
d. If yes, please specify roughly how long
   i. Under 30 min
   ii. Under an hour
   iii. Under 24 hours
   iv. More than 24 hours

E. DEPRESSION
   a. Have you been told by a doctor or health profession that you suffered from depression? Yes/No/Don’t know
   b. Have you ever taken medication to manage depression? No/Yes/Don’t know
   c. Do you think you are currently depressed? Yes/No/Don’t know
   d. Over the past week, have you experienced low mood or sadness most of the day on most days? Yes/No

Part II – Exclusion criteria
Has a medical professional ever told that you that you have:

A. Dementia, for example Alzheimer’s disease.
   a. Has your doctor told you that you suffer from progressive memory loss?

B. Major mental health illness such as Schizophrenia, Bipolar disorder, or other psychotic illness
   a. Are you currently being treated for any of these conditions?

C. Major neurological problems
   a. Parkinsonism
   b. Epilepsy
   c. Bain infection or swelling
   d. Brain tumour
   e. Stroke resulting in significant motor or cognitive disabilities
   f. Multiple sclerosis
   g. Neurosurgery

D. Any heart problems which could limit your functions like cardiac failure, (revascularization within last year)

E. Any functional limitations like severe hearing loss, reduced vision

Are you currently being treated for any major condition or illness?
   1. Are you currently undergoing treatment for cancer, HIV, or undergoing dialysis?

Other Criteria
Finally, please ask the following additional questions:
   1. If English is not your first language, what is? ______________________
   2. What was the highest educational level they have attained
      a. Primary
      b. Secondary
      c. Professional/Trade
      d. Tertiary
   3. Are you currently participating in any other clinical study? __________
4. Are you currently taking medication as part of participation in any other clinical study? 
5. Could you tell us your height in cm 
6. Could you tell us your current weight 

BMI =

Additional instructions for the interviewer:

Conduct all phone interviews in full, even if the person seems to meet one or more of the exclusion criteria. In some instances, a team discussion may be necessary to determine whether a person should be excluded from the study or not. At the end of the interview, thank the volunteer and explain that a second call will be required to assess other suitability criteria. In the event that the research team decides that they don’t meet the study criteria, they will receive a letter to thank them and offer them participation in other relevant studies being conducted at the Centre for Research on Ageing, Health, and Wellbeing.
PART I – LIFESTYLE

1. Physical Activity

I am going to ask you about the time you spent being physically active in the last 7 days. Think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. I am going to ask you about both moderate physical activity, and vigorous physical activity, so let me explain what I mean by these:

Moderate physical activities make you breathe somewhat harder than normal and may include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did for at least 10 minutes at a time.

Vigorous activities make you breathe much harder than normal and may include heavy lifting, digging, aerobics, or fast bicycling. Think only about those physical activities that you did for at least 10 minutes at a time.

GPs physical activity life scripts (downloaded from the Department of Health and Ageing)

How many times a week do you usually do 30 minutes or more of moderate physical activity? (e.g. brisk walking). **Please circle one**

0 1 2 3 4 5 6 7+

How many times a week do you usually do 20 minutes or more of vigorous physical activity? **Please circle one**

0 1 2 3 4 5 6 7+

Do you usually do muscle-strengthening activities on two or more days a week? 

Yes No

Score \((Q1 + 2 \times Q2)\) = 
Score < 5 = does not meet Australian physical activity guidelines (i.e., eligible for inclusion).
2. Social engagement
Alternative 1 (newly developed)

“The following few questions deal with your living situation and with the nature and frequency of your social engagement. Please respond as openly as you can”

a. Do you currently live

1. On your own 2. With spouse/partner 3. Other

b. Think about the amount of time you spend interacting with your family, friends or acquaintances (face-to-face, over the phone, over the internet) in a typical week. Would you say that the frequency would be?

1. Less the once p/w 2. At least once p/w 3. 4-5 times p/w 4. At least once a day

c. On the whole, how satisfied are you with the quality of your relationship with friends and relatives?


Low risk= Qa (2 or 3)+ Qb (3 or 4)+ Qc (4)

3. Cognitive engagement

“The following questions deal with the extent to which you engage in activities that challenge and stimulate your thinking. Please be as open as you can.

In a typical week, how often do you engage in leisure and work activities in a way which challenges you and makes you think hard (e.g., when doing cross-word puzzles, reading magazines or books, planning activities, doing memory training or other ‘brain games’ etc.?)

1. Once p/w or less 2. 2-3 times p/w 3. 4-5 times p/w 4. Once a day or more

I will now mention a few activities, and I want you to say ‘yes’ to activities you generally engage in at least once a week” (circle all that applies)

a. Read the newspaper (including online)
b. Read a magazine (including online)
c. Read a book
d. Play board games, cards, mind teasers, trivia, word games, crosswords, puzzles, etc.
e. Formal memory training or other forms of mental training
f. Read and write emails or letters
g. Watch documentaries
h. Plan or organise an activity

I will mention a few more activities, and I want you to say ‘yes’ if you participated in the activity at some point in the past 6 months:
a. Attended a concert, play or musical
c. Attended a debate
d. Visited a museum or a gallery
e. Visited a library

**Low Risk:** Engages in challenging activities 4 times a week or more AND engaged in at least 6 of the 12 activities above.

### 4. Smoking

*Do you smoke cigarettes, cigars, pipes or any other tobacco products?*

1. *Yes-currently* 2. *Yes-not currently* 3. *Never*

Smoke (level of risk): past or current smoking will be high risk

### 6. Fish intake

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of times per week</th>
<th>Number of times per month</th>
<th>Number of times per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How often did you eat smoked fish or seafood (such as smoked salmon, oysters, trout or others)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How often did you eat sushi or sashimi (containing raw fish or seafood including shellfish)?</td>
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<td></td>
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</tbody>
</table>

Total Score
PART II - MENTAL STATUS

"I now need to quickly evaluate your general orientation and simple thinking processes. You are most likely going to find this very simple and straightforward, but we need to go through these questions to make sure that you do not have any major difficulties with your thinking. If you are ready, I will go ahead and ask you some questions now:"

**TELE (Telephone Cognitive Screen- Gatz et al. 1995)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Points</th>
</tr>
</thead>
</table>
| 1. **What is your name?**
  Responses: First and second names required | 1 |
| 2. **How old are you?** | MSQ1 1 |
| 3. **What is your date of birth?** | MSQ2 1 |
| 4. **In what year were you born?** | MSQ3 1 |
| 5. **What is your current address?** | MSQ4 1 |
| 6. **What kind of place is that?**
  Responses: Home/work, etc. | MSQ5 1 |
| 7. **What is the date today?**
  Responses: Score correct if exact date only | MSQ6 1 |
| 8. **What month is it?**
  Responses: Exact response required | MSQ7 1 |
| 9. **What year is it?** | MSQ8 1 |
| 10. **Please repeat these words and try and remember them as I will ask you to repeat them again shortly:**
  "toothbrush", "key", "lamp"
  Responses: all 3 words need to be repeated correctly. Maximum 3 |
11. Count back from 20 by 3's until I tell you to stop
Responses: 1 point for each correct response, stop after 3 steps

<table>
<thead>
<tr>
<th>Responses</th>
<th>Score</th>
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<tbody>
<tr>
<td></td>
<td>3</td>
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</table>

12. Who is the current prime minister?
Responses: Julia Gillard is required

<table>
<thead>
<tr>
<th>Responses</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>MSQ9 1</td>
</tr>
</tbody>
</table>

13. Who was the previous prime minister
Responses: Kevin Rudd is required

<table>
<thead>
<tr>
<th>Responses</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>MSQ10 1</td>
</tr>
</tbody>
</table>

14. What were the 3 words I told you to remember before?
Responses (circle): toothbrush, key, lamp

<table>
<thead>
<tr>
<th>Recognition task for missed words (if missed recall)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 points each</td>
<td>3</td>
</tr>
</tbody>
</table>

Did I say “page”, “[missing word 1]”, or “phone’?

Did I say “[missing word 2]”, “pen” or “watch”?

Did I say “cup”, “apple” or “[missing word 3]”

15. How are “dog” and “lion” similar?
Responses: animals, four-legged animals

<table>
<thead>
<tr>
<th>Responses</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>1</td>
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</table>

16. How are “sugar” and “vinegar” different?
Responses: different tastes

<table>
<thead>
<tr>
<th>Responses</th>
<th>Score</th>
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Total

<table>
<thead>
<tr>
<th>Score</th>
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<td>20</td>
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As per the original publication of the TELE, a cut-off score of 17 will be used to identify people with a suspected cognitive impairment. A cut-off of 14 is used for the identification of people with suspected dementia.
Concluding the interview:

"Thank you for responding to these questions. This brings us to the conclusion of the interview. What will happen now is that I will go away and look at your responses to all the questions I’ve asked you, and then we will be able to decide whether we can invite you to take part in the study. In some cases this may require a discussion with other researchers in our team, so bear in mind that it might take a few days before I get back to you. If you are found eligible, I will send you an email and also mail out to you an information sheet about the study, and a consent form that you will have to bring back with you at the time of your baseline assessment at the ANU.

Do you have any questions?"
## Risk/Protective Factors Checklist

<table>
<thead>
<tr>
<th>Risk/Protective Factor</th>
<th>High risk/protective? (tick all that apply)</th>
<th>For discussion? (tick all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protective Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Social engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Cognitive engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Fish intake</td>
<td></td>
<td></td>
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<tr>
<td><strong>Risk Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Smoking</td>
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<tr>
<td>6 Cholesterol</td>
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<td>7 Hypertension</td>
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<td>8 Diabetes</td>
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<tr>
<td>9 Traumatic Brain injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Depression</td>
<td></td>
<td></td>
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<tr>
<td>11 BMI &gt; 25</td>
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<tr>
<td>12 Low Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total risk factors: Total protective factors:

### Inclusion criteria met?

<table>
<thead>
<tr>
<th>Risk factors &gt;2</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective factors &lt;2</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

## Exclusion Criteria Checklist

<table>
<thead>
<tr>
<th>Exclusion Criterion</th>
<th>Was criterion met? (tick all that apply)</th>
<th>For discussion? (tick all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dementia</td>
<td></td>
<td></td>
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<tr>
<td>2 Cognitive impairment</td>
<td></td>
<td></td>
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<tr>
<td>3 Significant mental illness (please specify)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Major neurological event:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Parkinsonism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Epilepsy</td>
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<tr>
<td>3. Brain infection/swelling</td>
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<td>4. Brain tumour</td>
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<td>5. Significant stroke</td>
<td></td>
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<tr>
<td>6. MS</td>
<td></td>
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<tr>
<td>7. Neurosurgery</td>
<td></td>
<td></td>
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<tr>
<td>5 Significant cardiac event/risk</td>
<td></td>
<td></td>
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<tr>
<td>6 Sensory loss (hearing, sight)</td>
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<td></td>
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<tr>
<td>7 Undergoing treatments with adverse side effects</td>
<td></td>
<td></td>
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<tr>
<td>8 Participates in other clinical trial</td>
<td></td>
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</tr>
</tbody>
</table>

Signed

331
John is a 75-year old retired man. He has been so forgetful lately that his wife needs to remind him each morning of his daily appointments. Even with reminders, he often gets mixed up about what he has planned for the day. Over the last few years, he has stopped doing home maintenance and is much more likely to lose things. He has been less interested in social activities except for golf, which he still plays twice a week. He also attends church on Sundays. When he plays golf his friends help him with his score sheet. He has trouble remembering the names of familiar people at church, whereas when he was working he was very good with names.

1. **What would you say is wrong with John, if anything at all?**

   | Old age ☐ | Senile ☐ | Psychological/mental problems ☐ |
   | Stress ☐  | Depression ☐ | Emotional breakdown ☐ |
   | Dementia ☐ | Nothing ☐ | Alzheimer’s disease ☐ |
   | Other □    | Don’t know □ |

2. **There are a number of different people, who could possibly help John. For each of the following, are they likely to be helpful, harmful or neither to John?**

   a. **A typical GP or family doctor**

      | Helpful ☐ | Neither ☐ | Harmful ☐ | Don’t know □ |
b. A typical chemist (pharmacist)
Helpful □ Neither □ Harmful □ Don’t know □

c. A counsellor
Helpful □ Neither □ Harmful □ Don’t know □

d. A social worker
Helpful □ Neither □ Harmful □ Don’t know □

e. A geriatrician
Helpful □ Neither □ Harmful □ Don’t know □

f. A psychiatrist
Helpful □ Neither □ Harmful □ Don’t know □

g. A neurologist
Helpful □ Neither □ Harmful □ Don’t know □

h. A priest/nun clergyman/clergywoman
Helpful □ Neither □ Harmful □ Don’t know □

i. Family
Helpful □ Neither □ Harmful □ Don’t know □

j. Close friends
Helpful □ Neither □ Harmful □ Don’t know □

3. If John receives the best professional help and treatments available, what do you think the most likely result will be
Full recovery □ Partial recovery □ No change □
Deterioration □ Don’t know □
4. The next few questions contain statements about John’s condition. Please tell us whether you agree or disagree with each of these statements.

a. John’s condition is an inevitable part of normal ageing

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<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither Agree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Agree or</td>
<td>Disagree</td>
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b. Nothing can be done to help someone with a condition like John’s

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<th>4</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither Agree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Agree or</td>
<td>Disagree</td>
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c. John’s condition is not a real medical illness

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<td>Disagree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
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<tr>
<td></td>
<td>Agree</td>
<td>Agree or</td>
<td>Disagree</td>
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</table>

d. People with a condition like John should be put into a nursing home

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<th>4</th>
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<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither Agree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Agree or</td>
<td>Disagree</td>
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e. People with a condition like John are a burden on their family and friends

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<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Neither Agree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Agree or</td>
<td>Disagree</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. When told John’s story, specialists in ageing would generally agree that John might have dementia. There are many people in the community who have different forms of dementia including Alzheimer's disease, Vascular dementia and Lewy Body dementia. Do you think it is possible to reduce the risk of getting some forms of dementia?

If Yes, do you think the risk of dementia can be reduced by doing any of the following?:

- Eat healthily ☐
- Take heart medication ☐
- Physical exercise ☐
- Mental exercise (crosswords, puzzles, books etc.) ☐
- Socialise more ☐
- Reduce Stress ☐
- Avoid smoking ☐
- Drink red wine ☐
- Other
  
  Nothing ☐
  Don’t know ☐

6. How likely do you think the factors below contribute to the development of dementia? Would you say they are very likely, somewhat likely, somewhat unlikely or very unlikely to contribute to a person developing dementia?

a. Old age
b. Genetics
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

c. Social isolation or loneliness
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

d. Stress
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

e. Weakness of character
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

f. Aluminium
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

g. A virus or infection
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

h. Heart disease
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

i. Stroke or mini-stroke
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

j. Brain disease
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

k. Laziness
Very likely □ Somewhat likely □ Somewhat unlikely □ Very unlikely □ Don’t know □

7. Some people believe that it is possible to reduce the risk of developing dementia. Do you think the behaviours listed below increase, decrease or do not change the risk of developing dementia?

a. Getting out and about more
Increases □  Does not change □  Decreases □  Don’t know □

b. Becoming more active physically, such as playing more sport, or doing a lot more walking or gardening
Increases □  Does not change □  Decreases □  Don’t know □

c. Becoming more active mentally, such as reading books and newspapers, doing crosswords, taking courses
Increases □  Does not change □  Decreases □  Don’t know □

d. Becoming more active socially, such as doing volunteer work, going to discussion groups
 Increases □ Does not change □ Decreases □ Don’t know □

e. Stopping smoking
 Increases □ Does not change □ Decreases □ Don’t know □

f. Reducing stress
 Increases □ Does not change □ Decreases □ Don’t know □

g. Drinking more water
 Increases □ Does not change □ Decreases □ Don’t know □

h. Using non-aluminium cookware
 Increases □ Does not change □ Decreases □ Don’t know □

i. Reducing coffee and tea intake
 Increases □ Does not change □ Decreases □ Don’t know □

j. Eating foods high in antioxidants
 Increases □ Does not change □ Decreases □ Don’t know □

k. Eating foods high in omega-3 fatty acids
 Increases □ Does not change □ Decreases □ Don’t know □

l. Eating foods high in estrogen such as soy
 Increases □ Does not change □ Decreases □ Don’t know □

m. Maintaining a healthy weight
 Increases □ Does not change □ Decreases □ Don’t know □
n. Maintaining healthy blood pressure levels
Increase □  Does not change □  Decreases □  Don’t know □

o. Maintaining healthy cholesterol levels
Increase □  Does not change □  Decreases □  Don’t know □

p. Cutting down on alcohol if you drink excessively
Increase □  Does not change □  Decreases □  Don’t know □

q. Taking vitamin and nutritional supplements
Increase □  Does not change □  Decreases □  Don’t know □
Dementia Health Belief Questionnaire

Please read the statements below and indicate how much you agree or disagree with them on the 5 point scale. There are no right or wrong answers to any question as you will be required to rate your own thoughts and beliefs. So please answer them as honestly and openly as possible.

**Behavioural intention**

1. I do not have plans to change my lifestyle and behaviour

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2. To reduce my risk of dementia, I intend to change my lifestyle and behaviour

   1. Within 1 week
   2. Within 1 month
   3. Within 6 months
   4. Within 12 months
   5. Within more than 12 months
   6. Never
   7. I have already made changes

3. If you intend to make lifestyle changes, in what areas are you planning to make changes? ______________

**Perceived Susceptibility**

4. My chances of developing dementia are great

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5. I feel that my chances of developing dementia in the future are high

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6. There is a strong possibility that I will develop dementia

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7. Within the next ten years I will develop dementia

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**Perceived Severity**

8. The thought of dementia scares me

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9. When I think about dementia my heart beats faster

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10. My feelings about myself would change if I develop dementia

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11. When I think about dementia I feel nauseous

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12. It would be more serious for me to develop dementia than if I developed other diseases

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Perceived Benefits

13. Adapting to a healthier lifestyle and behaviour would prevent dementia for me

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14. I have a lot to gain by changing my lifestyle and health behaviour

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15. Changing my lifestyle and health habits can help me reduce my chance of developing dementia

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16. Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia

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### Perceived Barriers

17. I am too busy to change my lifestyle and health habits

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18. Family responsibilities make it hard for me to change my lifestyle and behaviour

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19. Changing lifestyle and behaviour interferes with my schedule

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20. My financial situation does not allow me to change my lifestyle and behaviour

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### Cues to action

21. Being forgetful makes me think I have to change my lifestyle and behaviour

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22. Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour

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23. Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour

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24. Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour

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**General Health Motivation**

25. I think I have to pay attention to my own health

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26. Nothing is as important to me as good health

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27. I often think about my health

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28. I am concerned about my health

1 2 3 4 5
Strongly Agree Neither Disagree Strongly Agree Agree or Disagree
Agree
Disagree

**Self-efficacy**

29. I am certain that I can change my lifestyle and behaviour so I can reduce risk of dementia

1 2 3 4 5
Strongly Agree Neither Disagree Strongly Agree Agree or Disagree
Agree
Disagree

30. I am able to make differences that will change my risk of developing dementia

1 2 3 4 5
Strongly Agree Neither Disagree Strongly Agree Agree or Disagree
Agree
Disagree
ANU-ADRI questionnaire

PART 1- ABOUT YOU

First, we would like to ask you for some background information and personal history.

[age_yrs: numerical] What was your age at your last birthday?

-----years

1. [date_birth: numerical] What is your date of birth?

-----Year/Month

----- Refused

[Subjects need to answer at least one of above questions to proceed to the next questions]

2. [sex: radio] What is your sex?

[1] Male

[2] Female

3. How many years of education do you have? (Please select the number at each level)

A. [education_p: radio] Primary school 0, 1, 2, 3, 4, 5, 6, 7, 8

B. [education_h: radio] Secondary school 0, 1, 2, 3, 4, 5, 6, 7, 8

C. [education_t: radio] Technical college 0, 1, 2, 3, 4, 5, 6, 7, 8

D. [education_u: radio] University 0, 1, 2, 3, 4, 5, 6, 7, 8

E. [education_o: radio] Other 0, 1, 2, 3, 4, 5, 6, 7, 8

5. [marital: radio] What is your current marital status?

[1] Married

[2] De facto

[3] Separated

[4] Divorced


[6] Never married
6. [height_meters: numerical] (values must be saved in cm, only accept values between 100 and 220) Could you tell us how tall you are?

-------- cm

OR

-------- feet. -------- inches

7. [weight_Kg: numerical] (values must be saved in kg) How much do you weigh without your clothes and shoes?

-------- kg

OR

-------- stones -------- pounds

8. [occupation: radio] Which of the following best describes your current occupation? (If you retired, please provide your previous principal occupation)

1. Managers

Chief executives, general managers and legislators
Farmers and Farm managers
Specialist managers
Hospitality, retail and service managers

2. Professionals

Art and media professionals
Business, Human resource and marketing professionals
Design, engineering, science and transport professionals
Educational professionals
Health professionals
ICT professionals
Legal, social, and welfare professionals

3. Technical and Trade Workers

Engineering, ICT and science technicians
Automotive and engineering trades workers
Construction trades workers
Electro technology and Telecommunications trades workers
Food trades workers
Skilled animal and horticultural workers
Other technicians and trades workers

4. Community and Personal Service Workers

Health and welfare support workers
Carers and Aids
Hospitality workers
Protective service workers
Sports and personal service workers

5. Clerical and Administrative Workers

Office managers and program administrators
Personal assistants and secretaries
General clerical workers
Inquiry clerks and receptionists
Numerical clerks
Clerical and office support workers

6. Sales Workers

Sales representatives and agents
Sales assistants and salespersons
Sales support workers

7. Machinery Operators and Drivers

Machine and stationary plant operators
Mobile plant operators
Road and rail drivers
Store persons

8. Labourers

Cleaners and laundry workers
Construction and mining labourers
Factory process workers
Farm, Forestry and garden workers
Food preparation assistants
Other labourers
ABOUT YOUR MEDICAL HEALTH
The following section will ask about your health.

9. [health_monitor: radio] In the past 24 months, have you attended a GP or had a medical specialist visit in which your blood pressure, your cholesterol and/or blood sugar levels were checked?
   [1] Never
   [2] Once
   [3] Twice

10. [hypert: radio] Have you ever been told by a doctor or other health professional that you suffer from hypertension or high blood pressure?
   [1] Yes
   [2] No
   [3] Don’t know
   [4] I have never tested

11. [bp: numerical] Do you know what your blood pressure measures are?
    (please only provide blood pressure measures collected within the last year or since the last time you responded to this questionnaire)
    Blood pressure -------/--------
    I do not know my blood pressure [radio: insert 999/999 in bp field if pressed]

12. [hypert_med: radio] Do you take medication for hypertension/ high blood pressure?
    [1] Yes – currently
    [2] Yes – not currently
    [3] Never
    [4] Don’t know
13. \([\text{stroke: radio}]\) Have you ever been told by a doctor or other health professional that you have had a stroke?

[1] Yes
[2] No (go to Q 15)
[3] Don’t know (go to Q15)

14. \([\text{stroke_recurrent: radio}]\) Have you had more than one stroke?

[1] Yes
[2] No
[3] Don’t know

15. \([\text{myocardialinfarction: radio}]\) Have you ever been told by a doctor or other health professional that you have had a myocardial infarction or heart attack?

[1] Yes
[2] No
[3] Don’t know

16. \([\text{angina: radio}]\) Have you ever been told by a doctor or other health professional that you suffer from Angina pectoris or chest pain due to heart disease?

[1] Yes
[2] No
[3] Don’t know

17. \([\text{cholesterol_level: numerical}]\) (only accept values between 1-20) Are you aware of your total cholesterol levels?

(Please only record your cholesterol level if it was measured within last two years, otherwise press “next”)

Total cholesterol \(\ldots\ldots\ldots\ldots\ldots\) mmol/l (usually between 3.0 and less than 10)

Don’t know (code: 999)

I have never been tested (code: 99)

18. \([\text{cholesterol: radio}]\) Have you been told by a doctor or other health professional within the last year that you have a high cholesterol level?

[1] Yes
[2] No
[3] Don’t know
[4] I have never tested
19. [chole_med: radio] Do you take medication for hypercholesterolemia (high cholesterol)?

[1] Yes – currently
[2] Yes – not currently
[3] Never (go to Q 21)
[4] Don’t know (go to Q 21)

20. [cholest_med2: checkbox] If yes, what are the names of the medications you took for lowering your cholesterol in the last month?

[1] Ausgem
[2] Caduet
[3] Cholesterol Control
[5] Colestid Granules
[6] Crestor
[7] Ezetrol
[8] Gemfibrozil, any brand
[9] Gemhexal
[10] Jezil
[11] Lescol
[12] Lipazil
[13] Lipex
[14] Lipidil
[15] Lipitor
[16] Lipostat
[17] Liprachol
[18] Logicol
[19] Lopid
[20] Metamucil
[21] Nicotinic acid
[22] Policosanol-5
[23] Pravachol
[24] Pravastatin, any brand
[25] Pro-activ
[26] Psyllium Husk
[27] Questran Lite
[28] Simvabell, Simvaor,
Simvahexal
[29] Simvastatin, any brand
[30] Soy Lecithin
[31] Vastin
[32] Vytorin
[33] Zimstat
[34] Zocor
[35] Other

21. [diabetes: radio] Have you ever been told by a doctor or other health professionals that you have diabetes?

[1] Yes
[2] No (go to Q 23)
[3] Don’t know (go to Q 23)
[4] I have never tested (go to Q 23)
22. **[diabetes_type: radio]** What type of diabetes were you told you had?

[1] Type 1 (Insulin-dependent diabetes mellitus)
[2] Type 2 (Non insulin-dependent diabetes mellitus)
[4] Diabetes (type unknown)
[5] Other

23. **[highbldsugar: radio]** Have you been told by a doctor or other health professional that you have high sugar levels in your blood or urine?

[1] Yes
[2] No (go to Q 25)
[3] Don’t know (go to Q 25)
[4] I have never tested (go to Q 25)

24. **[diabetes_treat: radio]** What diabetes treatment are you currently taking?

[1] Insulin
[2] Insulin and tablets
[3] Tablets
[4] Diet only
[5] None
[6] Other

25. **[headinjury: radio]** Have you ever had a **head injury**?

[1] Yes
[2] No (go to Q28)
[3] Don’t know (go to Q29)

26. **[tbi: radio]** Thinking of the most severe head injury you have had, did you lose consciousness?

[1] Yes
[2] No
[3] Don’t know

26. **[tbi_time: radio]** If yes, for how long were you unconscious?

[1] 0 to 15 minutes
[2] 15 to 30 minutes
[3] 30 minutes to one hour
27. [tbi_age: numerical ](only accept values between 1 and 110 or valid dates) How old were you at the time?-------years
Or when did it happen -----/------ month/year

28. [depression: radio] Have you been told by a doctor or health profession that you suffered from **depression**?

[1] Yes
[2] No
[3] Don’t know

29. [depression_treat: radio] Have you ever been taking medication for depression?

[1] Yes – currently
[2] Yes – not currently
[3] Never
[4] Don’t know

**ABOUT YOUR FEELINGS**

The next questions ask about your feelings. For each of the following statements, please say if you felt that way **during the past week**.
<table>
<thead>
<tr>
<th>Questions to be answered</th>
<th>Rarely or none of the time (less than 1 day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or moderate amount of time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the best answer for each question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. [cesd1: radio] I was bothered by things that usually don’t bother me.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>31. [cesd2: radio] I did not feel like eating, my appetite was poor.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>32. [cesd3: radio] I felt that I could not shake off the blues, even with help from my family and friends.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>33. [cesd4: radio] I felt that I was just as good as other people.</td>
<td>[3]</td>
<td>[2]</td>
<td>[1]</td>
<td>[0]</td>
</tr>
<tr>
<td>34. [cesd5: radio] I had trouble keeping my mind on what I was doing.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>35. [cesd6: radio] I felt depressed.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>36. [cesd7: radio] I felt that everything I did was an effort.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>37. [cesd8: radio] I felt hopeful about the future.</td>
<td>[3]</td>
<td>[2]</td>
<td>[1]</td>
<td>[0]</td>
</tr>
<tr>
<td>38. [cesd9: radio] I thought my life had been a</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
</tbody>
</table>
failure.

<table>
<thead>
<tr>
<th>39. [cesd10: radio]</th>
<th>I felt fearful.</th>
<th>[0]</th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
</tr>
</thead>
<tbody>
<tr>
<td>40. [cesd11: radio]</td>
<td>My sleep was restless.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>41. [cesd12: radio]</td>
<td>I was happy.</td>
<td>[3]</td>
<td>[2]</td>
<td>[1]</td>
<td>[0]</td>
</tr>
<tr>
<td>42. [cesd13: radio]</td>
<td>I talked less than usual.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>43. [cesd14: radio]</td>
<td>I felt lonely.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>44. [cesd15: radio]</td>
<td>People were unfriendly.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>45. [cesd16: radio]</td>
<td>I enjoyed life.</td>
<td>[3]</td>
<td>[2]</td>
<td>[1]</td>
<td>[0]</td>
</tr>
<tr>
<td>46. [cesd17: radio]</td>
<td>I had crying spells.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>47. [cesd18: radio]</td>
<td>I felt sad.</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>48. [cesd19: radio]</td>
<td>I felt that people disliked me</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>49. [cesd20: radio]</td>
<td>I could not “get going”</td>
<td>[0]</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
</tbody>
</table>

**ABOUT YOUR ACTIVITY**

The following questions will ask you about the time you spent being physically active in the last 7 days.

Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

**PHYSICAL ACTIVITY PART 1: JOB-RELATED**

The first section is about your work. This section includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family.
50. [workstatus: radio] Do you currently have a job or do any unpaid work outside your home?

[ ] [1] Yes

[ ] [2] No

Skip to PART 2: TRANSPORTATION

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include travelling to and from work.

51. [workvigorousdays: numerical] During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ days per week

[ ] No vigorous job-related physical activity

Skip to question 53

52. How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

[workvhours: numerical] _____ hours per day

[workvmin: numerical] _____ minutes per day

53. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

[workmoddays: numerical] _____ days per week

[ ] No moderate job-related physical activity

Skip to question 55

54. How much time did you usually spend on one of those days doing moderate physical activities as part of your work?

[workmodhours: numerical] _____ hours per day

[workmodmin: numerical] _____ minutes per day

55. During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.

[workwalkdays: numerical] _____ days per week
No job-related walking  ➡️  Skip to PART 2: TRANSPORTATION

56. How much time did you usually spend on one of those days walking as part of your work?

[workwalkhours: numerical] _____ hours per day
[workwalkmin: numerical] _____ minutes per day

PHYSICAL ACTIVITY PART 2: TRANSPORTATION

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

57. [daysvehicle: numerical] During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?

_____ days per week

[ ] No travelling in a motor vehicle  ➡️  Skip to question 59

58. How much time did you usually spend on one of those days travelling in a train, bus, car, tram, or other kind of motor vehicle?

[hoursvehicle: numerical] _____ hours per day
[minvehicle: numerical] _____ minutes per day

59. During the last 7 days, on how many days did you cycle for at least 10 minutes at a time to go from place to place?

[dayscyling: numerical] _____ days per week

[ ] No bicycling from place to place  ➡️  Skip to question 61

60. How much time did you usually spend on one of those days to cycle from place to place?

[hoursycling: numerical] _____ hours per day
[mincyling: numerical] _____ minutes per day

61. During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place?

[dayswalktrans: numerical] _____ days per week
62. How much time did you usually spend on one of those days walking from place to place?

[hourswalktrans: numerical] ______ hours per day
[minwalktrans: numerical] ______ minutes per day

PHYSICAL ACTIVITY PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the last 7 days in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

63. [daysviggarden: numerical] Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

______ days per week

☐ No vigorous activity in garden or yard

 Skip to question 65

64. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?

[hoursviggarden: numerical] ______ hours per day
[minviggarden: numerical] ______ minutes per day

65. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

[daysmodgarden: numerical] ______ days per week

☐ No moderate activity in garden or yard

 Skip to question 67
66. How much time did you usually spend on one of those days doing \textit{moderate} physical activities in the \textit{garden} or \textit{yard}?

\begin{itemize}
  \item \texttt{[hoursmodgarden: numerical]} \hspace{1cm} \text{hours per day}
  \item \texttt{[minmodgarden: numerical]} \hspace{1cm} \text{minutes per day}
\end{itemize}

67. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the \textbf{last 7 days}, on how many days did you do \textit{moderate} activities like carrying light loads, washing windows, scrubbing floors and sweeping \textit{inside your home}?

\begin{itemize}
  \item \texttt{[daysmodhome: numerical]} \hspace{1cm} \text{days per week}
\end{itemize}

\[\square \quad \text{No moderate activity inside home} \quad \rightarrow \quad \text{Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY}\]

68. How much time did you usually spend on one of those days doing \textit{moderate} physical activities inside your home?

\begin{itemize}
  \item \texttt{[hoursmodhome: numerical]} \hspace{1cm} \text{hours per day}
  \item \texttt{[minmodhome: numerical]} \hspace{1cm} \text{minutes per day}
\end{itemize}

\textbf{PHYSICAL ACTIVITY PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY}

This section is about all the physical activities that you did in the \textbf{last 7 days} solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

69. Not counting any walking you have already mentioned, during the \textbf{last 7 days}, on how many days did you \textit{walk} for at least 10 minutes at a time \textit{in your leisure time}?

\begin{itemize}
  \item \texttt{[dayswalkleisure: numerical]} \hspace{1cm} \text{days per week}
\end{itemize}

\[\square \quad \text{No walking in leisure time} \quad \rightarrow \quad \text{Skip to question 71}\]
70. How much time did you usually spend on one of those days walking in your leisure time?

(hourswalkleisure: numerical) ______ hours per day
(minuteswalkleisure: numerical) ______ minutes per day

71. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?

(daysvigleisure: numerical) ______ days per week

☐ No vigorous activity in leisure time → Skip to question 73

72. How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time?

(hoursvigleisure: numerical) ______ hours per day
(minutesvigleisure: numerical) ______ minutes per day

73. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time?

(daysmodleisure: numerical) ______ days per week

☐ No moderate activity in leisure time → Skip to PART 5: TIME SPENT SITTING

74. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?

(hoursmodleisure: numerical) ______ hours per day
(minuteswalkleisure: numerical) ______ minutes per day

PHYSICAL ACTIVITY PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.
75. During the last 7 days, how much time did you usually spend sitting on a weekday?

[hours_sitting_week: numerical] _____ hours per day
[minutes_sitting_week: numerical] _____ minutes per day

76. During the last 7 days, how much time did you usually spend sitting on a weekend day?

[hours_sitting_weekend: numerical] _____ hours per day
[minutes_sitting_weekend: numerical] _____ minutes per day

ABOUT YOUR LEISURE TIME

These following questions will ask you about your leisure activities

77. [reading: radio] About how much time do you spend reading each day, including online reading?

[1]. None
[2]. Less than one hour
[3]. One to less than two hours
[4]. Two to less than three hours
[5]. Three or more hours
[6]. DON'T KNOW

78. [museum: radio] In the past year, how many times did you visit a museum?

[5] = Every day or almost every day
[4] = Several times a week
[3] = Several times a month
[2] = Several times a year
[1] = Once a year or less
[9] = DON'T KNOW

79. [concert: radio] In the past year, how many times did you attend a concert, play, or musical?

[5] = Every day or almost every day
[4] = Several times a week
[3] = Several times a month
[2] = Several times a year
[1] = Once a year or less
[9] = DON'T KNOW
80. [library: radio] In the past year, how often did you visit a library?

[5]. Every day or almost every day
[4]. Several times a week
[3]. Several times a month
[2]. Several times a year
[1]. Once a year or less
[6]. DON'T KNOW

81. [newspaper: radio] Thinking of the last year, how often do you read newspapers, including online?

[5]. Every day or almost every day
[4]. Several times a week
[3]. Several times a month
[2]. Several times a year
[1]. Once a year or less
[6]. DON'T KNOW

82. [magazines: radio] During the past year, how often did you read magazines?

[5]. Every day or almost every day
[4]. Several times a week
[3]. Several times a month
[2]. Several times a year
[1]. Once a year or less
[6]. DON'T KNOW

83. [books: radio] During the past year, how often did you read books?

[5]. Every day or almost every day
[4]. Several times a week
[3]. Several times a month
[2]. Several times a year
[1]. Once a year or less
[6]. = DON'T KNOW
84. [letters: radio] During the **past year**, how often did you write letters or emails?

- [5]. Every day or almost every day
- [4]. Several times a week
- [3]. Several times a month
- [2]. Several times a year
- [1]. Once a year or less
- [6]. = DON'T KNOW

85. During the **past year**, how often did you get involved in online social network activities like facebook/twitter?

- [5]. Every day or almost every day
- [4]. Several times a week
- [3]. Several times a month
- [2]. Several times a year
- [1]. Once a year or less
- [6]. = DON'T KNOW

86. [games: radio] During the **past year**, how often did you play games like checkers or other board games, cards, puzzles, word games, mind teasers, or any other similar games? (This includes online games)

- [5]. Every day or almost every day
- [4]. Several times a week
- [3]. Several times a month
- [2]. Several times a year
- [1]. Once a year or less
- [6]. DON'T KNOW

87. During the **past year**, how often did you participate in ‘brain training’ activities? This includes activities such as online and computer and activities to improve memory and thinking, Sudoku, and crosswords.

- [5]. Every day or almost every day
- [4]. Several times a week
- [3]. Several times a month
- [2]. Several times a year
- [1]. Once a year or less
- [6]. DON'T KNOW
ABOUT YOUR FRIENDS AND FAMILY

We would like to know about your friends and relatives

88. [relative_see: radio] How many relatives do you see or hear from at least once a month?

[1]. None
[2]. One
[3]. Two
[4]. Three or four
[5]. Five thru eight
[6]. Nine or more

89. [relative_often: radio] How often do you see or hear from the relative with whom you have the most contact?

[1]. Less than monthly
[2]. Monthly
[3]. Few times a month
[4]. Weekly
[5]. Few times a week
[6]. Daily

90. [relative_talk: radio] How many relatives do you feel at ease with that you can talk about private matters?

[1]. None
[2]. One
[3]. Two
[4]. Three or four
[5]. Five thru eight
[6]. Nine or more

91. [relative_help: radio] How many relatives do you feel close to such that you could call on them for help?

[1]. None
[2]. One
[3]. Two
[4]. Three or four
[5]. Five through eight
[6]. Nine or more
92. [relative_decision: radio] When one of your relatives has an important
decision to make, how often do they talk to you about it?

[1]. Never
[2]. Seldom
[3]. Sometimes
[4]. Often
[5]. Very often
[6]. Always

93. [relative_decision2: radio] How often is one of your relatives available for
you to talk to when you have an important decision to make?

[1]. Never
[2]. Seldom
[3]. Sometimes
[4]. Often
[5]. Very often
[6]. Always

Considering all of your friends including those who live in your neighbourhood

94. [numberoffriends: radio] How many of your friends do you see or hear from
at least once a month?

[1]. None
[2]. One
[3]. Two
[4]. Three or four
[5]. Five through eight
[6]. Nine or more

95. [friends_often: radio] How often do you see or hear from the friend with
whom you have the most contact?

[1]. Less than monthly
[2]. Monthly
[3]. Few times a month
[4]. Weekly
[5]. Few times a week
[6]. Daily
96. [friends_talk: radio] How many friends do you feel at ease with that you can talk about private matters?

[1]. None  
[2]. One  
[3]. Two  
[4]. Three or four  
[5]. Five through eight  
[6]. Nine or more  

97. [friends_help: radio] How many friends do you feel close to such that you could call on them for help?

[1]. None  
[2]. One  
[3]. Two  
[4]. Three or four  
[5]. Five through eight  
[6]. Nine or more  

98. [friends_decision: radio] When one of your friends has an important decision to make, how often do they talk to you about it?

[1]. Never  
[2]. Seldom  
[3]. Sometimes  
[4]. Often  
[5]. Very often  
[6]. Always  

99. [friends_talk: radio] How often is one of your friends available for you to talk to when you have an important decision to make?

[1]. Never  
[2]. Seldom  
[3]. Sometimes  
[4]. Often  
[5]. Very often  
[6]. Always  

100. [satisfaction: radio] Are you satisfied with your relationships with friends and relatives?

[0]. Yes  
[1]. No
101. [socialgroups: radio] How often do you participate in religious services or social, political or community groups?

[0]. Less than weekly
[1]. Weekly or more frequently

102. [livingstatus: radio] Do you live alone or with other people?

[0]. Living alone or with spouse only
[1]. Living with extended family (with children and grand children)

ABOUT YOUR DIETARY HABITS

103. [smokedfish: radio] How often do you eat smoked fish or seafood (such as smoked salmon, oysters, trout or others? 

[1] Never
[2] 1-6 times per year
[3] 7-11 times per year
[4] 1 time per month
[5] 2-3 times per month
[6] 1 time per week
[7] 2 times per week
[8] 3-4 times per week
[9] 5-6 times per week
[10] 1 time per day
[11] 2 or more times per day

104. [sushi: radio] How often do you eat sushi or sashimi (containing raw fish or seafood including shellfish)?

[1] Never
[2] 1-6 times per year
[3] 7-11 times per year
[4] 1 time per month
[5] 2-3 times per month
[6] 1 time per week
[7] 2 times per week
[8] 3-4 times per week
[9] 5-6 times per week
[10] 1 time per day
[11] 2 or more times per day
105. [rawfish: radio] How often do you eat raw oysters, raw clams or other raw fish (not including raw fish in sushi)?

<table>
<thead>
<tr>
<th>1</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1-6 times per year</td>
</tr>
<tr>
<td>3</td>
<td>7-11 times per year</td>
</tr>
<tr>
<td>4</td>
<td>1 time per month</td>
</tr>
<tr>
<td>5</td>
<td>2-3 times per month</td>
</tr>
<tr>
<td>6</td>
<td>1 time per week</td>
</tr>
<tr>
<td>7</td>
<td>2 times per week</td>
</tr>
<tr>
<td>8</td>
<td>3-4 times per week</td>
</tr>
<tr>
<td>9</td>
<td>5-6 times per week</td>
</tr>
<tr>
<td>10</td>
<td>1 time per day</td>
</tr>
<tr>
<td>11</td>
<td>2 or more times per day</td>
</tr>
</tbody>
</table>

106. [friedfish: radio] How often do you eat fish sticks or fried fish (including fried seafood or shellfish)?

<table>
<thead>
<tr>
<th>1</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1-6 times per year</td>
</tr>
<tr>
<td>3</td>
<td>7-11 times per year</td>
</tr>
<tr>
<td>4</td>
<td>1 time per month</td>
</tr>
<tr>
<td>5</td>
<td>2-3 times per month</td>
</tr>
<tr>
<td>6</td>
<td>1 time per week</td>
</tr>
<tr>
<td>7</td>
<td>2 times per week</td>
</tr>
<tr>
<td>8</td>
<td>3-4 times per week</td>
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<tr>
<td>9</td>
<td>5-6 times per week</td>
</tr>
<tr>
<td>10</td>
<td>1 time per day</td>
</tr>
<tr>
<td>11</td>
<td>2 or more times per day</td>
</tr>
</tbody>
</table>

107. [otherfish: radio] How often do you eat all other fish or seafood (including shellfish) that was not fried, smoked, or raw?

<table>
<thead>
<tr>
<th>1</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1-6 times per year</td>
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<tr>
<td>3</td>
<td>7-11 times per year</td>
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<tr>
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<td>5</td>
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<td>7</td>
<td>2 times per week</td>
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<td>8</td>
<td>3-4 times per week</td>
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<td>9</td>
<td>5-6 times per week</td>
</tr>
<tr>
<td>10</td>
<td>1 time per day</td>
</tr>
<tr>
<td>11</td>
<td>2 or more times per day</td>
</tr>
</tbody>
</table>
108. [vegi: radio] How many serves of vegetables do you usually eat each day? Please choose only one of the following:

[1] 1 serve or less
[2] 2-3 serves
[3] 4-5 serves
[4] 6 serves or more
[5] Don’t eat vegetables

109. [fruit: radio] How many serves of fruit do you usually eat each day? Please choose only one of the following:

[1] 1 serve or less
[2] 2-3 serves
[3] 4-5 serves
[4] 6 serves or more
[5] Don’t eat fruits

110. [fruit_juice: radio/numerical] How often do you drink fruit juices such as orange, grapefruit or tomato? (Enter answer in one box only)

[1] ------ per day
[2] ------ per week (if less than daily)
[3] ------ per month (if less than weekly)
[4] Rarely or never
[5] I don’t know

111. [fruit_freq: radio/numerical] Not including juice, how often do you eat fruit? (Enter answer in one box only)

[1] ------ per day
[2] ------ per week (if less than daily)
[3] ------ per month (if less than weekly)
[4] Rarely or never
[5] I don’t know

112. [chips: radio/numerical] How often do you eat chips, French fries, wedges, fried potatoes or crisps? (Enter answer in one box only)

[1] ------ per day
[2] ------ per week (if less than daily)
[3] ------ per month (if less than weekly)
[4] Rarely or never
[5] I don’t know
113. [potatoes: radio/frequency] How often do you eat potatoes? (Enter answer in one box only)

    [1] ------ per day
    [2] ------ per week (if less than daily)
    [3] ------ per month (if less than weekly)
    [4] Rarely or never
    [5] I don’t know

114. [salad: radio/frequency] How often do you eat salad? (salad includes mixed green salad and other mixtures of raw vegetables) (Enter answer in one box only)

    [1] ------ per day
    [2] ------ per week (if less than daily)
    [3] ------ per month (if less than weekly)
    [4] Rarely or never
    [5] I don’t know

115. [veg_freq: radio/numerical] Not counting potatoes and salad, how often do you eat cooked vegetables? (Enter answer in one box only)

These next questions are concerned with your alcohol consumption.

These are example of standard drinks with similar amounts of alcohol. In the following questions base your responses on the drink sizes shown below

| Sparkling wine 100 ml | Wine 100 ml | Light Beer 425 ml | Regular Beer 285 ml | Fortified wine 60 ml | Spirits 30 ml |
116. [audit1: radio] How often do you have a drink containing alcohol
[0] never (go to Q 118)
[1] Monthly or less
[2] 2-4 times a month
[3] 2-3 times a week
[4] 4 or more times a week

117. [audit2: radio] (unless on the same page pls repeat drinks table with this question) How many standard drinks (as per table) do you have on a typical day when you are drinking?
[0] 0-4
[1] 3-4
[2] 5-6
[3] 7-9
[4] 10 or more

The following questions ask about the use of tobacco or nicotine products.

118. [smokingstatus] Do you smoke cigarettes, cigars, pipes or any other tobacco products?
[1] Yes- Currently
[2] Yes – Not currently (go to Q141)
[3] Never (go to Q155)

119. [cigarettes: radio] Do you smoke cigarettes?
[1] Yes,
[2] No, (go to Q123)

If yes

120. [cigarettes_no: numerical] How many cigarettes do you smoke each day? ---
121. [cigarettes_years: numerical] (only accept values between 10 and 100) for how many years have you smoked this number of cigarettes each day? --- Years

122. [cigarettes_past: radio] Before that time,
   [1] I did not smoke [ ]
   [2] I smoked . . . . . . . . . . . [cigarettes_past_no: numerical] cigarettes a day

123. [ownrolledcig: radio] Do you smoke own-rolled cigarettes?
   [1] Yes,
   [2] No, (go to Q127)
If yes

124. [ownrolled_grams: numerical] How many packs of tobacco (40 grams) do you use each week?

125. [ownrolled_years: numerical] For how many years have you used this number of packs each week?

126. [ownrolled_past: radio] Before that time,
   [1] I did not smoke [ ]
   [2] I smoked . . . . . . . . . . . [ownrolledpast_no: numerical] packages of own rolled tobacco a week

127. [cigars: radio] Do you smoke cigars or cigarillos?
   [1] Yes,
   [2] No, (go to Q131)
If yes

128. [cigars_no: numerical] How many cigars/cigarillos do you smoke each week?

129. [cigars_years: numerical] (only accept values between 10 and 100) For how many years have you smoked this number of cigars/cigarillos each week?
130. [cigars_past: radio] Before that time,
   [1] I did not smoke [ ]
   [2] I smoked ...........[cigarspast_no: numerical] cigars/cigarillos a week

131. [pipe: radio] Do you smoke pipe tobacco?
   [1] Yes,
   [2] No, (go to Q135)
   If yes
132. [pipe_numb: categorical] How many packages of pipe tobacco (50 grams) do you use each week?
133. [pipe_years: numerical] For how many years have you smoked this number of packages each week?
134. [pipe_past: radio] Before that time,
   [1] I did not smoke [ ]
   [2] I smoked ........... [pipepast_number: numerical] packages of pipe tobacco a week

135. [smokstart_agecurrent: numerical] (only accept values between 1 and 110) How old were you when you first started smoking?
136. [smokquit: radio] Have you ever tried to quit smoking from the moment you started to smoke regularly?
   [1] Yes
   [2] No (go to Q151)
   If yes,
137. [quit_times: numerical] How many times did you quit smoking?
       ............................................................ times
138. [quittime_dura: numerical] How long did these attempts last on average?
       ............................................................
139. [quitage: numerical] How old were you when you tried to quit smoking for the first time?

............................................. years

140. [quitage_last: numerical] How old were you when you tried to quit smoking for the last time? (go to question 151)

............................................. years

Past-smokers [This section is only for ever smokers]

141. [cigarettes_ever: numerical] How many cigarettes did you smoke each day on average? ------

142. [cigarettes_everyears: numerical] How many years did you smoke this number of cigarettes? --------- years

143. [ownrolled_ever: numerical] How many packages of ownrolled tobacco did you smoke each week on average? .................

144. [ownrolled_everyears: numerical] How many years did you smoke this number of packages? ...................... years

145. [cigars_ever: numerical] How many cigars/cigarillos did you smoke each week on average? ..........

146. [cigars_everyears: numerical] How many years did you smoke this number of cigars/cigarillos on average? .......... years

147. [pipe_ever: numerical] How many packages of pipe tobacco did you smoke each week on average? ..................

148. [pipe_everyears: numerical] How many years did you smoke this number of packages? ...................... years

149. [smoke_past] Before that time,

[1] I did not smoke [finish the questionnaire]

[2] I smoked. ..............
150. I smoked
[cigarettes_past] .................cigarettes a day
[ownrolled_past] ................. packages of ownrolled tobacco each week
[cigars_past] ................... cigars/cigarillos each week
[pipe_past] ..................... packages of pipe tobacco each week
151. [smorkstartage_past: numerical] How old were you when you first started smoking. .................... years
152. [smorkquitage_past: numerical] How old were you when you quit smoking for the last time? .................
153. [quittimes: numerical] How many times did you quit before? .................
154. [quitduration: numerical] How long did these attempts last on average? . . . .
155. [fhmother: radio] Does your natural or biologic mother have or have had a problem with memory loss, confusion, dementia?

[1] = Yes
[2] = No
[9] = DON'T KNOW
156. [fhfather: radio] Does your natural or biologic father have or have had a problem with memory loss, confusion, dementia?

[1] = Yes
[2] = No
[9] = DON'T KNOW
157. [fhsibling: radio] Does any of your natural or biological siblings have a problem with memory loss, confusion, dementia?

[1] = Yes
[2] = No
[9] = DON'T KNOW
158. [pesticide: radio] Have you ever been involved with mixing, applying or loading any pesticides, herbicides, weed killers, fumigants or fungicides?

[1] = Yes  
[2] = No  
[9] = DON'T KNOW

159. [solvent: radio] Have you ever been involved with mixing, applying or loading any solvents as part of your occupation?

[1] = Yes  
[2] = No  
[9] = DON'T KNOW

160. [omega 3: radio] Do you take omega 3 supplements?

[1] = Yes I take fish oils  
[2] = Yes I take omega 3 supplements that are not fish oils (eg. vegetarian omega 3 supplements such as flaxseed oil, walnut oil, etc.)  
[9] = No I don’t take omega three supplements.
Appendix G Characteristics and points assigned to each risk and protective factors in the ANU-ADRI
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Beta weight</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;11 years</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>8 to 11 years</td>
<td>0.42</td>
<td>3</td>
</tr>
<tr>
<td>&lt;8 years</td>
<td>0.80</td>
<td>6</td>
</tr>
<tr>
<td>BMI (age&lt;60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.30</td>
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</tr>
<tr>
<td>Obese</td>
<td>0.71</td>
<td>5</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No diabetes</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.33</td>
<td>3</td>
</tr>
<tr>
<td>Symptoms of depression</td>
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<td></td>
</tr>
<tr>
<td>CES-D&lt;16</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>CES-D&gt;=16</td>
<td>0.29</td>
<td>2</td>
</tr>
<tr>
<td>High cholesterol (aged&lt;60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not high</td>
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<tr>
<td>High</td>
<td>0.41</td>
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<td>Traumatic brain injury (TBI)</td>
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</tr>
<tr>
<td>No TBI</td>
<td>Reference</td>
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<tr>
<td>TBI</td>
<td>0.46</td>
<td>4</td>
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<tr>
<td>Smoking</td>
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</tr>
<tr>
<td>Never</td>
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<td>Current</td>
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<tr>
<td>Alcohol intake</td>
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<td></td>
</tr>
<tr>
<td>No alcohol</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>Light to moderate</td>
<td>-0.33</td>
<td>-3</td>
</tr>
<tr>
<td>Social engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>Lowest</td>
<td>0.84</td>
<td>6</td>
</tr>
<tr>
<td>Low to med</td>
<td>0.51</td>
<td>4</td>
</tr>
<tr>
<td>Med to high</td>
<td>0.17</td>
<td>1</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Reference</td>
<td>0</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>----</td>
</tr>
<tr>
<td>Lowest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>-0.29</td>
<td>-2</td>
</tr>
<tr>
<td>Higher level</td>
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<td>-3</td>
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</table>

<table>
<thead>
<tr>
<th>Cognitive activity</th>
<th>Reference</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lowest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>-0.97</td>
<td>-7</td>
</tr>
<tr>
<td>Highest</td>
<td>-0.84</td>
<td>-6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fish intake</th>
<th>Reference</th>
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</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.25 p p/week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25-2 p p/week</td>
<td>-0.33</td>
<td>-3</td>
</tr>
<tr>
<td>2-4 p p/week</td>
<td>-0.53</td>
<td>-4</td>
</tr>
<tr>
<td>&gt;4 p p/week</td>
<td>-0.62</td>
<td>-5</td>
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<table>
<thead>
<tr>
<th>Pesticide exposure</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Never</td>
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<td></td>
</tr>
<tr>
<td>Ever</td>
<td>0.31</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The points were derived by multiply the beta weights by 7.6923 and rounding up to an integer; p p/week=portions per week

Source: (Anstey, Cherbuin, et al., 2013)
Development of the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction Scale

Sarang Kim  Kerry Sargent-Cox  Nicolas Cherbuin  Kaarin J. Anstey

Centre for Research on Ageing, Health and Well-Being, Australian National University, Canberra, A.C.T., Australia

Abstract

Background and Aims: It is not yet understood how attitudes concerning dementia risk may affect motivation to change health behaviours and lifestyle. This study was designed to develop a reliable and valid theory-based measure to understand beliefs underpinning the lifestyle and health behavioural changes needed for dementia risk reduction. Methods: 617 participants aged ≥50 years completed a theory-based questionnaire, namely, the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction (MCLHB-DRR) scale. The MCLHB-DRR consists of 53 items, reflecting seven subscales of the Health Belief Model. Results: Confirmatory factor analysis was performed and revealed that a seven-factor solution with 27 items fitted the data (comparative fit index = 0.920, root-mean-square error of approximation = 0.047) better than the original 53 items. Internal reliability (α = 0.608–0.864) and test-retest reliability (α = 0.552–0.776) were moderate to high. Measurement of invariance across gender and age was also demonstrated. Conclusions: These results propose that the MCLHB-DRR is a useful tool in assessing the beliefs and attitudes of males and females aged ≥50 years towards dementia risk reduction. This measure can be used in the development and evaluation of interventions aimed at dementia prevention.

Introduction

It is well understood that individuals can make major contributions to their own health and wellbeing through the adaptation of health-enhancing behaviours (e.g., exercising) and the avoidance of health-compromising behaviours (e.g., smoking and excessive alcohol consumption) [1]. In the past few decades, research has focused on the identification of health behaviours that contribute to disease and on interventions designed to improve health behaviours [2, 3].
Of specific interest here, research has identified numerous lifestyle factors that play a major role in reducing the risk of dementia. It is now well recognized that participating in cognitively stimulating leisure activities [4], regular physical activity [5–8], a Mediterranean-type diet [9, 10], and a moderate alcohol intake [11] are all associated with a lower incidence of dementia, whereas smoking [12], diabetes [13], mid-life high cholesterol [14], excessive alcohol consumption [15], depression [16], and mid-life obesity [17, 18] are associated with a higher risk of dementia. Moreover, combination of behaviours targeting multiple risk factors may reduce the risk of dementia better than targeting a single risk factor. Barnes and Yaffe [19] argued that 1.1–3.0 million Alzheimer’s disease cases can be prevented worldwide by a 10–25% reduction in seven risk factors (diabetes, midlife hypertension, midlife obesity, smoking, depression, cognitive inactivity, and physical inactivity).

Nevertheless, reduction of dementia prevalence cannot be achieved by the identification of risk factors alone. What is needed are theoretically and empirically driven interventions targeting optimisation of the known health behaviours and lifestyle. There are three large ongoing dementia prevention studies in Europe: the Prevention of Dementia by Intensive Vascular Care (PreDIVA, ISRCTN 29711771) study; the Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER, NCT01041989), and the Multi-domain Alzheimer Preventive Trial (MAPT, NCT00672685) [20]. In addition, there are limited numbers of randomised controlled trials, which have shown positive but weak to moderate effects of physical exercise and cognitive training on cognition [21–24]. Although these results may not be conclusive and require extensive further research, there is mounting evidence from observational studies that point to the importance of reducing these risk factors for dementia prevention.

Behavioural change theories provide a helpful basis for the design of interventions to change lifestyle and health behaviours through the understanding of structural and psychological determinants of behaviours [25, 26]. Within a health behaviour change model, successful interventions designed to address dementia risk behaviours include addressing attitudes and beliefs surrounding health and lifestyle behaviours and dementia risk in the population. We are, however, unaware of any studies using a behavioural change model as a theoretical framework that examines attitudes regarding motivation for behaviour and lifestyle changes for the prevention of dementia. Therefore, the development of a scale examining the motivations and beliefs surrounding behavioural and lifestyle change specifically for dementia risk reduction is needed.

In the current study, the Health Belief Model (HBM) is used as a conceptual model to develop a measurement of motivation for behavioural and lifestyle change for dementia risk reduction for middle-aged and older Australians. The HBM is one of the most commonly used theories explaining health-related behaviours and health promotion [27, 28]. The premise of the HBM is that the identification of beliefs and motivations related to health behaviours can inform the development of interventions designed to increase desirable health behaviours [29]. This model was initially introduced with four main concepts: perceived susceptibility, perceived seriousness/severity, perceived benefits, and perceived barriers [30, 31]. Three additional concepts, cues to action, general health motivation, and confidence (self-efficacy), were later added to the original HBM to enrich the model and to address some criticism of the earlier model of the HBM [32]. Such criticism was that (1) health behaviours are not always rational; (2) HBM only focuses on the individual and ignores social and environment factors; (3) the role of emotional factors is not duly considered, and (4) alternative factors may predict health behaviour, such as outcome expectancy and self-efficacy [33, 34]. Although introducing these three additional components to the HBM does not address all its weaknesses, the HBM with seven concepts was chosen as the best-suited model for dementia risk reduction after careful consideration of six different behaviour change models (HBM, Health Locus of
Control, Theory of Reasoned Action/Theory of Planned Behaviour, Self-efficacy Theory, stage of change/Transtheoretical Model of Change, and common sense model of self-regulation) against the outcome of a qualitative study [35].

According to the HBM, a health-promoting behaviour is more likely to occur if the individual feels threatened by her/his current behavioural patterns through perceived susceptibility and severity, and believes that a specific behavioural change will result in a valued outcome at acceptable cost where perceived benefits outweigh perceived barriers. Moreover, an internal or external stimulus to change behaviours (cues to action), desire to achieve an outcome (general health motivation), and confidence in being able to perform the desired behaviours (self-efficacy) are needed [46].

The HBM has not been applied to the examination of behavioural changes for dementia risk reduction specifically. However, a small number of studies have used the HBM to understand the intention to undergo a cognitive status examination for dementia and memory loss and have shown that factors from the HBM (especially perceived barriers and cues to action) were significant predictors of intention [36, 37].

The purpose of this study is to develop and evaluate a new instrument, namely the Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR) scale, designed to assess beliefs and attitudes about lifestyle and health behavioural changes for dementia risk reduction among middle-aged and older Australians.

Methods

Development of the MCLHB-DRR Scale

The items included in the MCLHB-DRR were constructed based on focus group interviews conducted with 34 middle-aged and older Australians [38] and by modifying items from the existing literature on the HBM applied to breast cancer screening [30] and cognitive status examination [36]. The scale included seven subscales that reflected the seven concepts of the HBM: perceived susceptibility (participants' perceived risk for developing dementia during their lifetime); perceived severity (how anxious and stressed they would feel if they developed dementia); perceived benefits (participants' perceptions regarding possible benefits associated with changing lifestyle and health behaviour to reduce dementia risk); perceived barriers (participants' perceptions regarding possible barriers associated with changing lifestyle and health behaviour to reduce dementia risk); cues to action (participants' perceptions regarding the social influence to change lifestyle and health behaviour for dementia risk reduction); general health motivation (how much they value their general health and wellbeing), and self-efficacy (confidence in changing lifestyle and health behaviour for dementia risk reduction), comprising 53 items. All items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

The HBM typically predicts one specific type of health behaviour. However, multi-domain interventions may be more effective than single-domain interventions in dementia prevention [19]. Therefore, any health behaviour and lifestyle that individuals are engaged in to reduce their risk of developing dementia should be considered as a dementia-preventing behaviour. These behaviours include participating in cognitively stimulating leisure activities; participating in regular physical activity; drinking at light to moderate levels; quitting smoking; maintaining body mass index within the normal range; increasing fish consumption, and engaging in high level of social engagement.

Before the questionnaire was distributed to the participants, the 53 items, prepared by the first author, were assessed for their clarity of expression and content validity by all investigators. Minor revisions (rephrasing of items) were made based on this process.
Table 1. Characteristics of the sample (given in percentages)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Male age groups, years</th>
<th>Female age groups, years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50–59 (n = 85)</td>
<td>60–69 (n = 118)</td>
</tr>
<tr>
<td></td>
<td>50–59 (n = 197)</td>
<td>60–69 (n = 136)</td>
</tr>
<tr>
<td>Marital status: married/de facto</td>
<td>62.4</td>
<td>72.9</td>
</tr>
<tr>
<td>High school education</td>
<td>41.2</td>
<td>28.0</td>
</tr>
<tr>
<td>Currently working</td>
<td>51.8</td>
<td>28.8</td>
</tr>
<tr>
<td>Income &lt;AUD 52,000</td>
<td>50.6</td>
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</tr>
<tr>
<td>Born in Australia</td>
<td>82.4</td>
<td>75.4</td>
</tr>
<tr>
<td>Area of residency</td>
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<td></td>
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<tr>
<td>Australian Capital Territory</td>
<td>1.2</td>
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<tr>
<td>New South Wales</td>
<td>22.6</td>
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<td>Northern Territory</td>
<td>2.4</td>
<td>0</td>
</tr>
<tr>
<td>Tasmania</td>
<td>1.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Relatives/friends with dementia</td>
<td>38.8</td>
<td>52.5</td>
</tr>
<tr>
<td>Cared for relatives/friends with dementia</td>
<td>11.8</td>
<td>17.8</td>
</tr>
</tbody>
</table>

Participants and Data Collection

A total of 659 Australians, recruited through the survey company Qualtrics (www.qualtrics.com), took part in an online survey on motivations to change health and lifestyle behaviours for dementia risk reduction. The criteria for inclusion were a minimum age of 50 years and not having previously been diagnosed with dementia. Forty-two individuals who did not agree with the terms and hence did not give their consent to participate in the study and those who were under 50 years of age were not included, leaving 617 subjects for data analysis. The study was approved by the Australian National University Ethics Committee, and all participants provided written informed consent to participate.

On the website, participants were required to read an information sheet and approve a consent form before proceeding to the questionnaire. The sociodemographics questionnaire (age, gender, education level, marital status, employment status, and income level) was given prior to the completion of the MCLHB-DRR.

The participants ranged in age from 50 to 96 years (males = 61.08, SD = 7.61), and 59.6% of the total participants were female. The majority of participants were married or in de facto relationships (67.3%), lived in New South Wales (33.7%), had a secondary school education (43.1%), and were retired (45.4%). A total of 305 individuals (49.4%) also reported that they had relatives or friends who suffer/suffered from dementia, and 110 (17.8%) cared for a relative or friend with dementia. See table 1 for more detailed demographics.

To examine the test-retest reliability of the questionnaire, a random subsample from the original 617 participants (n = 108) was asked to return to the survey website within approximately 3 weeks to complete the questionnaire again. Participants had provided consent to being recontacted at the start of the study.

Data Analysis

As the scale was theory driven and developed based on pre-existing conceptual findings from our qualitative study and literature, pre-determined categories or grouping of the items were used. To validate and refine this structure, a series of confirmatory factor analyses (CFA) were conducted. We allowed for improvements and modifications in the form of error covari-

KARGER
Table 2. GFI for MCLHB-DRR models

<table>
<thead>
<tr>
<th>GFI indices</th>
<th>( \chi^2 )</th>
<th>d.f.</th>
<th>GFI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>5,810.62</td>
<td>1,682</td>
<td>0.713</td>
<td>0.668</td>
<td>0.063</td>
</tr>
<tr>
<td>Model 2</td>
<td>718.65</td>
<td>302</td>
<td>0.916</td>
<td>0.920</td>
<td>0.047</td>
</tr>
</tbody>
</table>

ances and removal of poor performing items (i.e., low factor loading of a value below 0.45 or significant cross-loading) [39] to maximize future use of the scale and minimize participant burden. Items were permitted to load only on the construct they theoretically represented. Error covariances identified by modification indices were only examined further if (a) they would reduce large residuals and significantly improve the fit of a poor fitting model and (b) made theoretical or conceptual sense.

We used the following multiple fit indices to evaluate the model fit: the \( \chi^2 \) (and the respective degrees of freedom, d.f.), goodness of fit index (GFI), comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). The CFI and GFI values between 0.90 and 0.95 or above suggest a good to excellent fit [40-42], and RMSEA values of \( p < 0.05 \) suggest a good model fit [43].

Reliability and internal consistency for each subscale were assessed using correlation analyses (Cronbach’s alpha and item-total correlation), and the stability of the measures was examined through test-retest reliability assessment via intra-class correlation coefficients. Construct validity was not evaluated due to unavailability of a similar measurement to the MCLHB-DRR.

To examine whether the scores obtained from the MCLHB-DRR are generalizable between age and gender, tests of measurement invariance were conducted. Data were analysed with SPSS and AMOS version 20.

Results

Confirmatory Factor Analyses

Two models (table 2) were tested, and the first model was a seven-factor model in which all 53 items were used. The analysis showed that this model was not a good fit of the data. All fitted indices were less than the accepted value of 0.9 (CFI = 0.668, GFI = 0.713). The RMSEA (0.063) was also outside the accepted value of 0.05 or less.

The second model (fig. 1) was a seven-factor model using the 27 remaining items (see Appendix A) after deleting items demonstrating low correlations with their respective scales (value below 0.45) and items loading on more than one factor. This model resulted in a better fit than the first model, with all fit indices being larger than 0.90 (GFI = 0.916, CFI = 0.920) and smaller than 0.05 (RMSEA = 0.047), \( \chi^2 \) was 718.6 (d.f. = 302, \( p = 0.000 \)). The standardized coefficients of the perceived susceptibility items (4 items), perceived severity (5), perceived benefits (5), perceived barriers (4), cues to action (4), general health motivation (4), and self-efficacy (2) ranged from 0.366 to 0.852 and were all statistically significant (\( p < 0.001 \)). The correlations between factors were statistically significant for most factors (table 3).

Reliability and Internal Consistencies

Correlation analyses were conducted using the 27 items from the second CFA. Correlation analysis indicated that all item scores were positively correlated with the total scale score. The correlation coefficients ranged from 0.743 to 0.875 (\( p < 0.01 \) for all) for perceived
Fig. 1. CFA model with 27 items. Sus (perceived susceptibility), Sev (perceived severity), Benefit (perceived benefit), Barrier (perceived barrier), Cues (cues to action), Health M (general health motivation), SE (self-efficacy).

Table 3. Covariance coefficients for subscale factors

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Perceived susceptibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Perceived severity</td>
<td>0.453**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Perceived benefits</td>
<td>0.021</td>
<td>0.205**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Perceived barriers</td>
<td>0.114</td>
<td>0.152*</td>
<td>-0.463**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Cues to action</td>
<td>0.368**</td>
<td>0.489**</td>
<td>0.863**</td>
<td>-0.202**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 General health motivation</td>
<td>0.248**</td>
<td>0.362**</td>
<td>0.559**</td>
<td>-0.183*</td>
<td>0.541**</td>
<td></td>
</tr>
<tr>
<td>7 Self-efficacy</td>
<td>0.064</td>
<td>-0.105</td>
<td>-1.008**</td>
<td>0.529**</td>
<td>-0.751**</td>
<td>-0.433**</td>
</tr>
</tbody>
</table>

*p < 0.01; **p < 0.001.
Table 4. Reliabilities for subscales

<table>
<thead>
<tr>
<th>Subscales</th>
<th>No. of items</th>
<th>Cronbach’s alpha</th>
<th>Test-retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived susceptibility</td>
<td>4</td>
<td>0.864</td>
<td>0.776</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>5</td>
<td>0.725</td>
<td>0.726</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>4</td>
<td>0.694</td>
<td>0.645</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>4</td>
<td>0.740</td>
<td>0.651</td>
</tr>
<tr>
<td>Cues to action</td>
<td>4</td>
<td>0.684</td>
<td>0.552</td>
</tr>
<tr>
<td>General health motivation</td>
<td>4</td>
<td>0.608</td>
<td>0.596</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2</td>
<td>0.658</td>
<td>0.602</td>
</tr>
</tbody>
</table>

Table 5. Results of the measurement invariance tests

<table>
<thead>
<tr>
<th>Model description</th>
<th>$\chi^2$</th>
<th>d.f.</th>
<th>$\Delta \chi^2$</th>
<th>ACFI</th>
<th>$\Delta$ACFI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configural model (no equality constraints imposed)</td>
<td>1,077.8</td>
<td>604</td>
<td>-</td>
<td>0.910</td>
<td>-</td>
</tr>
<tr>
<td>Measurement model (all factor loadings constrained equal)</td>
<td>1,112.1</td>
<td>631</td>
<td>34.3</td>
<td>n.s.</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configural model (no equality constraints imposed)</td>
<td>1,095.2</td>
<td>604</td>
<td>-</td>
<td>0.908</td>
<td>-</td>
</tr>
<tr>
<td>Measurement model (all factor loadings constrained equal)</td>
<td>1,114.2</td>
<td>625</td>
<td>19</td>
<td>n.s.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

susceptibility, from 0.606 to 0.752 for perceived severity, from 0.648 to 0.787 for perceived benefits, from 0.728 to 0.796 for perceived barriers, from 0.642 to 0.765 for cues to action, from 0.589 to 0.779 for general health motivation, and from 0.861 to 0.866 for self-efficacy. The Cronbach alpha values ranged from 0.608 to 0.864 (table 4) for general health motivation and perceived susceptibility, respectively, showing good internal consistency.

Test-retest reliability was evaluated with a representative subset of the original sample (108 subjects) approximately 3 weeks later. The retest participants did not significantly differ from the remaining members of the sample on demographic factors or any other variables examined in this study. The factor scores demonstrated moderate test-retest reliabilities for all subscales, and the Cronbach alpha values ranged from 0.552 to 0.776 (table 4).

**Gender and Age Differences**

Tests of measurement invariance were performed to examine the generalizability of the MCLHB-DRR across gender and age groups. Traditionally, the $\Delta \chi^2$ has been used as the index of difference in fit. However, because $\Delta \chi^2$ has been found to be overly sensitive to sample size, Cheung and Rensvold [47] recommended using $\Delta$ACFI with values higher than 0.01 as an indication of measurement invariance not being found.

The results from measurement invariance tests indicated that the fit of this model to be consistent with that of the configural model for both gender and age groups (50–64 years old: pre-retirement, and 65 years and over: post-retirement; table 5). Both $\Delta \chi^2$ and $\Delta$ACFI argued for invariance where the differences were not statistically significant.

In addition, a table describing the means for each subscale for the MCLHB-DRR across different gender and age groups is recorded in table 6. Males who were 50–59 years old had significantly higher levels of perceived susceptibility (p = 0.036) and perceived barriers (p = 0.022) than 70-year-old and older males. Males who were 50–59 years old also had significantly higher levels of health motivation than 60–69 years old males (p = 0.014). On the other hand, no significant age difference was shown in females.
Table 6. Results of the MCLHB-DDR subscales for the different age and gender groups

<table>
<thead>
<tr>
<th></th>
<th>Male age group, years</th>
<th>Female age group, years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-59</td>
<td>60-69</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>11.2±2.3 (4-17)</td>
<td>10.9±2.6 (4-19)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>14.9±2.9 (9-24)</td>
<td>14.9±3.3 (5-25)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>13.8±2.5 (4-20)</td>
<td>14.0±2.1 (9-20)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>10.5±2.9 (4-20)</td>
<td>9.8±2.3 (4-15)</td>
</tr>
<tr>
<td>Cues to action</td>
<td>12.4±2.5 (4-20)</td>
<td>12.2±2.2 (8-18)</td>
</tr>
<tr>
<td>Health motivation</td>
<td>15.0±2.6 (4-20)</td>
<td>15.9±2.1 (10-20)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>5.3±1.2 (2-6)</td>
<td>5.1±1.3 (2-8)</td>
</tr>
</tbody>
</table>

Values are presented as means ± SD (ranges).

Discussion and Conclusions

This study describes the development and evaluation of the psychometric properties of a new scale (MCLHB-DDR) designed to understand beliefs and motivations of behaviours to reduce dementia risk for middle-aged and older Australians. The seven-factor model reflected dimensions of the HBM (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, general health motivation, and self-efficacy) on lifestyle and health behavioural changes for dementia risk reduction.

The CFA showed a model with 27 (of the original 53) items as the best fit for the data, demonstrating the soundness of the psychometric properties of the MCLHB-DDR, and the suitability of the HBM in characterizing beliefs and motivations regarding behavioural and lifestyle changes critical for dementia risk reduction. The internal consistencies for the seven subscales were moderate to high, and the test-retest reliability for the scale was moderate after an approximate 3-week interval. Lower test-retest reliability can be due to fluidity of the beliefs as MCLHB-DDR measures a construct of values that can change with experiences or knowledge. The findings also indicated that all items designed to measure motivation to change lifestyle and health behaviours for dementia risk reduction are operating equivalently across the two groups of age and gender.

One interesting finding from this study was that three of the five final perceived severity items were emotionally driven items that address fear (the thought of dementia scares me; when I think about dementia my heart beats faster, and when I think about dementia I feel nauseous). This is in contrast to the construct of the initial items (from the original 53-item scale) that addressed perceived severity of developing dementia in terms of its relation to finance, relationship, and other effects on the individual. However, having these emotionally driven items was not a surprise, as in 2010, Pfizer reported that almost two of three Australians (63%) over the age of 18 years feared developing dementia. This suggests that the fear of developing dementia may be a motivating factor for health and lifestyle behavioural changes, and this can be examined closely in future research. However, the items for other subscales were all in line with the typical HBM construct in that individuals are likely to change lifestyle and health behaviour if they believe that (1) they have a high chance of developing dementia; (2) they will benefit from changing lifestyle and health behaviours; (3) they have few barriers; (4) they have internal and/or external cues to change; (5) they value general health, and (6) they believe that they are capable of making changes.

This study had a number of limitations. The main aim of this study was to develop a scale to measure beliefs about dementia-preventing behaviours, which was very broad in terms of the possible changes participants could have thought about when answering questions. More than one lifestyle and behavioural change was implied for dementia risk reduction. Consequently, it is not clear, which behavioural change individuals were reflecting on when they...
were considering the implication of behavioural change for dementia risk. In addition, if participants did not know what changes were required to reduce their risk of developing dementia (e.g., they did not know that smoking is correlated to a higher risk of developing dementia), they might not have understood what changes the questions were referring to. Moreover, the benefit of behavioural change might not have been clearly established due to participants’ unawareness. Therefore, future studies providing information on dementia-preventing behaviours and lifestyle before the completion of the scale should be sought. In addition, future studies examining how these subscales could predict the intention to change lifestyle and health behaviours and whether this intention would be followed by behaviour change itself should also be conducted.

The current study used a convenience sample, which may not be completely representative of the population. Therefore, the psychometric properties of this scale should be further examined in community samples. Furthermore, having no objective assessment of cognition could not guarantee that all participants were free from dementia or cognitive impairment. Therefore, future research should address this limitation and carry out a cognitive testing such as the Mini-Mental State Examination (MMSE) to ensure that we are testing the scale on 50-year-old and older individuals without dementia/cognitive impairment.

Despite these limitations, the current study has contributed to the literature by providing the MCLHB-DRR, which is a first step towards developing more specific instruments to assess particular domains/types of changes. Moreover, as intervention studies based on the HBM have shown increased rates in positive behaviours such as breast cancer screening [30, 44], the MCLHB-DRR scale can also be used to increase health-promoting behaviours and lifestyle changes for dementia risk reduction.

The scale can also provide useful information for developing effective interventions. The current study can assist researchers in not only identifying individuals who would benefit most from the intervention but also tailoring intervention programs based on an individual’s particular motivations and beliefs. It is likely that different individuals would score differently on each subscale; thus, by identifying specific HBM domains relevant to each individual, tailored interventions are possible and even desirable [45]. For instance, for someone who is low on perceived susceptibility and high on perceived benefits, education focused on the prevalence of dementia may be more effective for changing behaviours and lifestyle than education targeted at the benefits of performing preventive behaviours.

This is the first study known to the authors that develops and assesses the psychometric properties of a scale attempting to understand the beliefs of health and lifestyle behaviours specifically aimed at preventing dementia. The analysis of the psychometric properties of the MCLHB-DRR scale are encouraging and suggest that it is a useful tool to assess beliefs about lifestyle and behavioural changes for dementia risk reduction among middle-aged and older Australians. This tool could be used in intervention studies and surveys aimed at dementia prevention.

Acknowledgements

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Disclosure Statement

The authors have no conflicts of interest to declare.

Appendix A

*Motivation to Change Lifestyle and Health Behaviour for Dementia Risk Reduction (MCLHB-DRR) Scale*

<table>
<thead>
<tr>
<th>Perceived susceptibility</th>
<th>Q26.0 My chances of developing dementia are great</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q28.0 I feel that my chances of developing dementia in the future are high</td>
</tr>
<tr>
<td></td>
<td>Q29 There is a strong possibility that I will develop dementia</td>
</tr>
<tr>
<td></td>
<td>Q30 Within the next 10 years I will develop dementia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived severity</th>
<th>Q37 The thought of dementia scares me</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q38 When I think about dementia my heart beats faster</td>
</tr>
<tr>
<td></td>
<td>Q40 My feelings about myself would change if I develop dementia</td>
</tr>
<tr>
<td></td>
<td>Q42 When I think about dementia I feel nauseous</td>
</tr>
<tr>
<td></td>
<td>Q46 It would be more serious for me to develop dementia than if I developed other diseases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived benefits</th>
<th>Q53 Information and advice from experts may give me something that I never thought of, and may reduce my chance of developing dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q54 Changing my lifestyle and health habits can help me reduce my chance of developing dementia</td>
</tr>
<tr>
<td></td>
<td>Q55 I have a lot to gain by changing my lifestyle and health behaviour</td>
</tr>
<tr>
<td></td>
<td>Q57 Adapting to a healthier lifestyle and behaviour would prevent dementia for me</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived barriers</th>
<th>Q58 I am too busy to change my lifestyle and health habits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q61 My financial situation does not allow me to change my lifestyle and behaviour</td>
</tr>
<tr>
<td></td>
<td>Q62 Family responsibilities make it hard for me to change my lifestyle and behaviour</td>
</tr>
<tr>
<td></td>
<td>Q65 Changing lifestyle and behaviour interferes with my schedule</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cues to action</th>
<th>Q126 Being forgetful makes me think I have to change my lifestyle and behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q70 Having risk factor(s) for dementia makes me think I have to change my lifestyle and behaviour</td>
</tr>
<tr>
<td></td>
<td>Q71 Learning more about dementia from the media makes me think I have to change my lifestyle and behaviour</td>
</tr>
<tr>
<td></td>
<td>Q72 Knowing family member(s) with dementia makes me think I have to change my lifestyle and behaviour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General health motivation</th>
<th>Q73 Nothing is as important to me as good health</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q74 I often think about my health</td>
</tr>
<tr>
<td></td>
<td>Q76 I think I have to pay attention to my own health</td>
</tr>
<tr>
<td></td>
<td>Q77 I am concerned about my health</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-efficacy</th>
<th>Q86 I am certain that I can change my lifestyle and behaviour so I can reduce the risk of developing dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q87 I am able to make differences that will change the risk of developing dementia</td>
</tr>
</tbody>
</table>
References


Kinn et al.: Development of the Motivation to Change Lifestyle and Health Behaviours for Dementia Risk Reduction Scale