Does Improving Women’s Attitudes to Ageing Facilitate Increase in Physical Activity?
Evaluation of an Intervention across Sociocultural Contexts

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Improving attitudes to ageing to increase physical activity

Abstract

The role of regular physical activity during midlife in reducing the risk of disease and improving well-being in midlife and late adulthood is well-established. Attitudes to ageing are related to a range of health outcomes and behaviours, such as physical activity, and are likely to be shaped by age stereotypes that differ from culture to culture. Interventions that aim to improve older adults’ attitudes to ageing have been found to be effective in increasing their physical activity levels. However, previous studies have not investigated the efficacy of interventions to improve attitudes to ageing among midlife women, and among those of different cultural identification. This thesis investigated the efficacy of an intervention in improving attitudes to ageing and increasing physical activity over an eight-week follow-up period among midlife women who broadly identified with either Australian or Chinese culture. It was hypothesized that intervention condition participants would experience a greater improvement in attitudes to ageing and a greater increase in physical activity levels post-intervention, and that among the intervention participants, those with Australian, compared to Chinese cultural identification, would experience greater improvement in attitudes to ageing and greater increase in physical activity levels. On the other hand, subjective norms were hypothesized to exert a greater influence on physical activity levels for participants with Chinese, compared to Australian, cultural identification. Intention and self-efficacy were hypothesized to mediate the positive relationship between attitudes to ageing and physical activity levels. Moreover, self-efficacy and perceived control over external factors were hypothesized to form a feedback loop with physical activity levels.

One hundred women aged 45 to 60 were recruited, 77 of whom completed the study. Participants attended a one-to-one physiotherapist session, during which they set physical activity goals. Approximately one week later, participants attended a group session either on the intervention condition topic of healthy ageing or the control condition topic of healthy
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diet. Participants recorded baseline physical activity levels between the physiotherapist session and group session, as well as physical activity levels for eight weeks following the group session. Linear mixed model analyses indicated that the intervention improved attitudes to ageing in the psychological growth domain post-group session. However, this improvement was not maintained at eight-week follow-up, and the intervention was not effective at increasing physical activity, thus providing only partial support for the hypotheses relating to intervention efficacy on attitudes to ageing. As predicted, perceived control over external factors was found to be a significant proximal predictor of days per week with physical activity. However, after including baseline physical activity in path analyses, baseline physical activity became the strongest predictor of physical activity at eight-week follow-up and perceived control became a non-significant predictor of days per week with physical activity. Intention, self-efficacy and subjective norms were not found to be predictors of physical activity levels in the current study’s sample of midlife women, who were non-sedentary at baseline. These findings did not provide support for the hypotheses relating to the proposed feedback loop and the role of subjective norms in influencing physical activity levels. However, the findings highlight the importance of cultivating the habit of physical activity in women as early as possible, as well as increasing their sense of control over their schedule, to facilitate regular physical activity among midlife women. Moreover, the positive association found between attitudes to ageing and self-efficacy provides support for replacing attitudes to physical activity with attitudes to ageing within the TPB framework in the investigation of factors influencing midlife individuals’ physical activity levels. The efficacy of the intervention on improving attitudes in the psychological growth domain contributes to the literature by highlighting the potential of culturally relevant interventions in improving attitudes to ageing in an inclusive manner in an increasingly globalised world.
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Declaration

This is to certify that
(i) the thesis comprises only my original work towards the PhD
(ii) due acknowledgement has been made in the text to all other material used
(iii) the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

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Chapter 1: Introduction

This thesis aims to contribute towards a more comprehensive and culturally sensitive understanding of factors that influence the physical activity levels of women at midlife. Midlife is a developmental period that is usually associated with considerable work and family responsibilities (Lachman, Lewkowicz, Marcus, & Peng, 1994), and also with the start of decline in physical functioning (Robertson & Watts, 2016). With the increase of average life expectancy over the past fifty years (Australian Institute of Health and Welfare, 2016), midlife is now widely regarded as starting from around 40 to 45 years old and ending around 60 to 65 years old (Hassing et al., 2009; Lachman et al., 1994). Research has shown that engaging in regular physical activity from as early as midlife contributes significantly to the reduction of risk factors for diseases in later life (El Khoudary et al., 2015; Eriksson, 2001). Most studies that investigate factors influencing physical activity levels, however, have either focused on older adults or investigated participants over a wide range of different developmental periods. Thus, the findings of these studies might be insufficient to highlight specific factors that are especially important in influencing physical activity levels of individuals at midlife who might be experiencing challenges in work and family that are often associated with middle adulthood. In addition, most of these studies have not investigated the
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role of culture in influencing physical activity levels. Therefore, the primary goal of the current study was to increase physical activity levels among midlife women through an intervention that aimed to improve their attitudes to ageing. This thesis also aims to investigate, using an Extended Theory of Planned Behaviour framework, the respective roles of attitudes to ageing, intention to increase physical activity, self-efficacy, perceived control over external factors, subjective norms and cultural identification, in influencing the physical activity levels of midlife women.

**Successful ageing**

The importance of preventative health behaviours, such as regular physical activity, for successful ageing, has been highlighted in Rowe and Kahn’s model of successful ageing (Rowe & Kahn, 1997), one of the most widely used frameworks in studies on ageing. Rowe and Kahn’s model (Rowe & Kahn, 1997) suggests that older adults can continue to be healthy, independent and productive members of society via the fulfillment of three criteria: low probability of disease and disease-related disability, high physical and cognitive functioning, and active engagement with life. In addition, through emphasising the role of individual effort in attaining these criteria, one of the strengths of this model lies in its encouragement of health-promoting behaviours at the individual level, such as engaging in
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regular physical activities (Rowe & Kahn, 1997). More recently, the World Health Organisation has also highlighted the role of physical activity in facilitating healthy ageing (World Health Organisation, 2002).

Late adulthood is a developmental stage in life that comes after midlife and for many, it is associated with increased incidence of diseases such as cardiovascular diseases, as well as some declines in both physical and cognitive functioning (Baltes & Smith, 2003; Benjamin et al., 2017; Bosman & Charness, 1996; Scheibe, Freund, & Baltes, 2007). On the other hand, many older adults continue to enjoy good health and high levels of physical and cognitive functioning in their sixties and seventies that make active engagement with family and society still possible (Baltes & Smith, 2003; Scheibe et al., 2007). These older adults could be considered as “ageing successfully”, as they have successfully delayed the impact of disease and decline that have been regarded by some as synonymous with old age (Rowe & Kahn, 1997).

Although Rowe and Kahn’s model has faced criticism by researchers adopting the life course perspective for proposing a model on late adulthood that disregards contextual influences across the lifespan (Stowe & Cooney, 2015), the importance of preventative health behaviours is nevertheless a common emphasis in research on ageing. A life course perspective posits that ageing outcomes are shaped by interactions between developmental contexts (such as disease and disability across the lifespan) and individual actions within
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these contexts (Dannefer, 2012; Elder, Johnson, & Crosnoe, 2003; Stowe & Cooney, 2015).

Ageing is understood as part of a continuous process of development across the lifespan
during which there is continued possibility for adaptation and growth (Elder et al., 2003;
Stowe & Cooney, 2015). For example, the proactivity model (Kahana & Kahana, 1996),
which adopts a life course perspective, recognises challenges faced during the ageing process
and advocates adaptive behaviour, both in response to and in anticipation of these challenges.
In encouraging preventative health behaviours, it thus shares a common strength with Rowe
and Kahn’s model (Martin et al., 2015). Despite its strengths, Kahana and Kahana’s
proactivity model (Kahana & Kahana, 1996) demonstrates limitations in its lack of a
framework that might explain factors driving uptake of preventative health behaviours.

**Physical activity in midlife and successful ageing**

Many factors, including environmental influences, and preventative health
behaviours, contribute to the delay of age-related disease and disability, as well as the
maintenance of physical and cognitive functioning in late adulthood. Research has
demonstrated that increasing physical activity levels in middle adulthood increases physical
fitness levels, which could in turn reduce the risk of a range of illnesses, including coronary
heart disease in late adulthood (El Khoudary et al., 2015; Erikssen, 2001). Higher levels of
physical activity demonstrated by women at midlife have also been associated with lower
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levels of allostatic load, an index indicative of the effects of socioeconomic and environmental stressors accumulated over the lifespan that contribute to physiological dysregulation and increased risks of diseases (Upchurch, Rainisch, & Chyu, 2015).

Despite the many benefits of increasing physical activity levels from midlife, middle-aged adults are less likely to reach recommended levels of physical activity, compared to younger adults aged 18 to 44. Moreover, among middle-aged adults aged 55 to 64, women, compared to men, are less likely to be sufficiently active (Australian Bureau of Statistics, 2017). Regardless of gender and cultural background, it is recommended that adults aged 18 to 64 engage in at least 150 minutes (2.5 hours) of moderate intensity physical activity, or at least 75 minutes (1.25 hours) of vigorous intensity physical activity, per week, to enjoy health benefits such as improvement in blood pressure and cholesterol levels, as well as muscle and bone strength. Moreover, engaging in up to 300 minutes (five hours) of moderate intensity physical activity, or up to 150 minutes of vigorous intensity physical activity, per week, reduces unhealthy weight gain, as well as the risk of some cancers (Australian Government Department of Health, 2017). Moderate intensity physical activity refers to physical activity that increases the heart rate but is performed at an intensity at which the individual is still able to hold a conversation, and examples of such activities include brisk walking, dancing, social tennis and household chores such as cleaning windows. Vigorous intensity physical activity refers to physical activity that requires more effort and makes the individual breath harder and faster, compared to moderate intensity physical activity, and includes activities such as jogging, aerobics and activities that involve lifting and carrying objects (Australian Government Department of Health, 2017). According to the Australian Health Survey that was conducted between 2011 and 2012, among adults aged 45 to 54, only 43.9% of males and 44.1% of females met recommended physical activity guidelines, and among adults aged
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55 to 64, only 40.5% of males and 37.5% of females met recommended physical activity guidelines.

Although the proportion of females aged 55 to 64 who did not meet recommended physical activity guidelines was only slightly lower, compared to same-aged males (Australian Bureau of Statistics, 2017), being physically active might be relatively more important to health for midlife females compared to males with regards to the prevention of specific conditions, such as osteoporosis, with implications for all-cause mortality. Osteoporosis has been found to be associated with an increased risk of sustaining fractures (Marshall, Johnell, & Wedel, 1996), which is in turn associated with mortality (Beck, Daly, Singh, & Taaffe, 2017). During the menopausal transition, midlife women experience changes in levels of oestrogen, a risk factor for the development of osteoporosis (Shangold, Sherman, & DiNubile, 1998). Regular physical activity, on the other hand, has been demonstrated to be a protective factor against osteoporosis (Lim et al., 2005). Thus, compared to same-aged men, it might be especially important for midlife women to increase physical activity uptake to recommended levels in order to facilitate successful ageing. It was therefore decided to target women only, so that the intervention could be designed to be highly relevant to them. It has been argued that the more similar role models are to the study participants, the more likely they are to emulate the role models’ behaviour (Bandura, 1994).

Factors that influence physical activity levels

Many factors might influence physical activity levels in midlife, and these factors include attitudes to ageing and perceived self-efficacy for engaging in physical activities. While Bird and colleagues (Bird et al., 2009) found that lack of perceived self-efficacy in
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Older adults could act as one of the barriers to increasing physical activity levels, Levy and Myers (2004) posited that positive attitudes to ageing facilitate physical activity uptake.

Attitudes to ageing can be defined as how individuals evaluate their own ageing experiences (Laidlaw, Power, Schmidt, & the WHOQOL-OLD Group, 2007). Moreover, attitudes to ageing are a potentially modifiable factor (Wolff, Warner, Ziegelmann, & Wurm, 2014; Sarkisian, Prohaska, Davis, & Weiner, 2007) that could be harnessed to encourage physical activity.

Studies have found that improving attitudes to ageing can lead to increase in physical activity levels among older adults, demonstrating a relationship between attitudes to ageing and physical activity levels (Wolff et al., 2014; Sarkisian et al., 2007). Older adults with more positive attitudes to ageing tend to be more future-orientated and willing to invest time and effort in health behaviours such as regular physical activities (Wolff et al., 2014), suggesting that more positive attitudes to ageing could strengthen intention for increasing physical activity levels (Wolff et al., 2014). Sarkisian et al. (2007) further suggested that perceived self-efficacy could be a possible mediator of the relationship between positive attitudes to ageing and increase in physical activity levels.

A number of studies have found that attitudes to ageing are shaped by interactions among factors such as sociocultural attitudes towards older adults, physical and mental well-being of individuals, as well as psychological factors (Bryant et al., 2016; Laidlaw et al.,
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2007; Levy, 2009). Studies have found that there are differences among how older adults are perceived within different cultures, highlighting the possibility that different cultures may encourage different attitudes to ageing (Lockenhoff et al., 2009; Luo, Zhou, Newman, & Liang, 2013). In addition, having the psychological capacity to view life changes, including ageing, as opportunities for growth and development, could orientate individuals towards the future (Ward, 2010), and thereby facilitate more positive attitudes to ageing.

Although studies of older adults’ physical activity uptake and attitudes to ageing might provide an indication of possible factors influencing physical activity levels among women at midlife, there is a lack of research investigating these factors within a comprehensive framework for behavioural change. This thesis thus aims to contribute to the literature by investigating factors influencing physical activity levels of women at midlife within the framework of the Extended TPB (Ajzen, 1985, 1988, 1991; Armitage, 2005; Armitage & Conner, 1999), a theoretical framework that has been used in many studies on changes in health behaviours, including the maintenance of physical activity uptake (Armitage, 2005). The Extended TPB investigates factors, such as attitudes, intention and perceived self-efficacy, that influence behavioural change, and would be an appropriate framework to investigate, in a culturally sensitive manner, how attitudes to ageing, cultural identification and perceived self-efficacy interact with one another, as well as other factors featured in the Extended TPB, to influence physical activity levels of women at midlife who
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**The Extended Theory of Planned Behaviour**

The Extended TPB is a theoretical framework that has been developed by researchers based on Ajzen’s Theory of Planned Behaviour (TPB) (Ajzen, 1985, 1988, 1991). The TPB posits that intention and perceived behavioural control directly predict behaviour, while attitudes, perceived behavioural control and subjective norms predict intention to perform the behaviour (Ajzen, 1985, 1988, 1991). Armitage and Conner (1999) further developed the TPB by validating the respective roles of perceived self-efficacy, which best explains the concept of perceived behavioural control (Sparks, Guthrie, & Shepherd, 1997), and perceived control over external factors (that hinder or facilitate the performance of the behaviour under investigation). It has also been found that successful performance of the behaviour predicts subsequent increase in levels of perceived behavioural control (Armitage, 2005). Within an Extended TPB framework, behaviour is thus predicted by intention to perform the behaviour, as well as perceived self-efficacy and perceived control over external factors. Attitudes towards the behaviour, perceived self-efficacy, perceived control over external factors and subjective norms in turn predict intention. Moreover, successful performance of the behaviour predicts subsequent increase in levels of perceived self-efficacy and perceived control over external factors.
Customising the Extended TPB for investigating physical activity levels among women at midlife

Although attitudes towards a behaviour are usually investigated within an Extended TPB framework, it might be equally appropriate to investigate attitudes to ageing as a predictor of physical activity levels among women at midlife. Engaging in physical activities is a health behaviour for which perceived self-efficacy tends to be contingent upon physical functioning, which could start declining from midlife. More positive attitudes to ageing could improve perceived self-efficacy for physical activity during midlife, which could in turn contribute towards strengthening intention. In addition, more positive attitudes to ageing might predict stronger intention to increase health behaviours that invest in future health and well-being, such as engaging in regular physical activity. Attitudes to ageing will therefore be investigated in this thesis within the Extended TPB framework as a factor that is potentially modifiable through an intervention to improve attitudes to ageing.

Cultural identification, a sociocultural factor that could potentially influence the efficacy of this intervention on women who broadly identify with two different cultural backgrounds, is also important to investigate. This is because culture could influence the level of importance of subjective norms in influencing physical activity levels. For instance, a study by Armitage (2005) did not find that subjective norms exerted a significant influence
Improving attitudes to ageing to increase physical activity on physical activity uptake among participants who were British. However, the validity of this finding could be limited to individuals within a relatively individualistic culture (cultures emphasising individual goals over group goals (Triandis, 1989), such as British and Australian cultures). Subjective norms might exert a greater influence on behaviour for individuals who identify with collectivistic cultures, which emphasise group goals over individual goals (Triandis, 1989), an example of which would be Chinese culture.

**Aims of thesis**

This thesis thus aims to investigate if an intervention to improve attitudes to ageing will increase physical activity levels of women at midlife, and if the intervention is efficacious, to further investigate if cultural identification moderates the intervention effects. The role of attitudes to ageing in increasing physical activity levels of women at midlife will also be examined within a modified Extended TPB framework by investigating if perceived self-efficacy mediates the relationship between more positive attitudes to ageing and higher physical activity levels. In addition, an investigation of whether subjective norms influence physical activity levels to different extents for individuals who broadly identify with two different cultures would also further our understanding of the Extended TPB through a culturally sensitive perspective. This thesis also aims to extend previous findings of perceived control over external factors influencing physical activity levels, and the reciprocal
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relationship between perceived behavioural control and physical activity levels.

Outline of thesis

Chapter 2 reviews literature examining the benefits of engaging in physical activities in midlife and late adulthood. Chapter 3 elaborates on factors influencing the physical activity levels of midlife women and the utility of the Extended TPB in predicting midlife women’s physical activity levels. It also reviews literature that suggests the possibility that subjective norms might have differing levels of influence on physical activity within different cultural contexts. Chapter 4 reviews the literature on different conceptualisations and measures for attitudes to ageing, and factors, including sociocultural factors, that shape these attitudes.

Chapter 5 introduces the rationale and hypotheses for this thesis and Chapter 6 describes the participants, and the measures and procedure for this study. Chapter 7 presents the descriptive results of the study. Chapters 8 to 11 presents the results of the inferential statistics that address the specific aims of the thesis, while Chapter 12 presents an integrative discussion of what the respective findings from Chapters 8 to 11 collectively inform within the modified Extended TPB framework of factors influencing physical activity levels of socio-culturally diverse women at midlife. Chapter 12 also elucidates how findings from this thesis might enable researchers and health workers to increase the efficacy of their interventions in order
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to promote increase in physical activity levels at midlife.
Chapter 2: Benefits of physical activity in midlife and late adulthood

Overview

Engaging in regular physical activity provides benefits to physical and mental health across the lifespan, including midlife and late adulthood. These benefits include reducing the risk of cardiovascular diseases (El Khoudary et al., 2015), cancer (White et al., 2014), dementia (Tolppanen et al., 2015), and improving quality of sleep (Chen, Liu, Huang, & Chiou, 2012). In this chapter, the benefits of physical activity will be reviewed, with a focus on benefits to physical and mental health in midlife and late adulthood, and how increasing physical activity levels from midlife accumulates health benefits in preparation for late adulthood. Given the breadth of the literature, this review highlights key findings of relevance to the proposed study.

Age-related diseases in late adulthood

Late adulthood is a developmental phase known to be associated with an increase in the incidence of numerous age-related diseases. These diseases include cardiovascular diseases (Benjamin et al., 2017), diabetes mellitus (US Department of Health and Human Services, Centers for Disease Control and Prevention (CDC, 2012), cancer (White et al., 2014), dementia (Tolppanen et al., 2015), and osteoporosis (Pietschmann, Rauner, Sipos, &
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Kerschan-Schindl, 2009). An inspection of the updated report on Heart Disease and Stroke Statistics prepared by the American Heart Association (Benjamin et al., 2017) revealed that more than one in three American adults, or an estimated 92.1 million individuals, experience at least one type of cardiovascular disease, and among these individuals, approximately half of them, or 46.7 million individuals, are concentrated among the age group of 60 and above.

Cardiovascular diseases include high blood pressure, a major risk factor of strokes, and coronary heart disease, which includes symptoms such as heart attacks, chest pains and strokes (Mozaffarian et al., 2015).

Besides cardiovascular diseases, another age-related disease is diabetes. Diabetes mellitus, commonly known as diabetes, had a prevalence rate of 18.9% among adults aged 65 and above in the United States during 2007 to 2009 (CDC, 2012), and has been projected to expect the largest increase in prevalence rates among adults aged 65 to 74, and 75 and above, by 2050 (Mozaffarian et al., 2015). Diabetes is known to be a major risk factor for cardiovascular diseases such as coronary heart disease, stroke and heart failure (Mozaffarian et al., 2015), and Type 2 diabetes is particularly known to increase the risk of cancers of the colon, breast (post-menopausal) and pancreas (Cannata, Fierz, Vijayakumar, & LeRoith, 2010; Huxley, Ansary-Moghaddam, Berrington De González, Barzi, & Woodward, 2005; La, Giordano, Hortobagy, & Chabner, 2011). In the United States, data from 2009 indicated that slightly more than half of all cancers occurred in older adults aged 65 and above (U.S. Cancer Statistics Working Group, 2013).

Age is also a risk factor for diseases that are negatively associated with cognitive and physical functioning in late adulthood. The incidence of Alzheimer’s disease, the most
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common form of dementia, is known to increase with age, and the incidence of Alzheimer’s
disease doubles with an increase of five years of age from age 65 onwards (Knopman, Boeve,
& Petersen, 2003). Osteoporosis, which is marked by reduced bone strength that leads to
increased risk of fractures, is another disease for which age is a major risk factor. Post
menopausal women, compared to men of the same age, have a higher risk of developing
osteoporosis, as the former experience an abrupt reduction in estrogen levels following
menopause, leading to higher risks of excessive bone loss (Pietschmann et al., 2009).

Besides an increase in risk of diseases that adversely affect physical and cognitive
functioning, the diseases of late adulthood can also affect the mental health of older adults.
For example, declines in physical functioning, age-related chronic diseases and death of a
partner, have all been found to be positively associated with depressive symptoms in older
adults. For instance, in a longitudinal study conducted to investigate risk factors for
depression in late adulthood, Gertner, Domino, and Dow (2017) found that increase in
physical disability was a risk factor for new onset of severe depression, defined as a score of
11 and above as measured by the 15-item Geriatric Depression Scale Short Form (Yesavage
et al., 1983; Sheikh & Yesavage, 1986), as well as new onset of less severe depression,
defined as a score of 6 and above on the same scale. In addition, new diagnoses of chronic
diseases and bereavement for a partner were also risk factors for a new diagnosis of severe
depression. Physical disability was assessed with 14 questions asking participants about
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activities related to daily living, and higher scores on this measure indicated greater disability (Rosero-Bixby & Dow, 2009). Participants also self-reported on whether they had ever been diagnosed by a healthcare provider with chronic diseases including heart disease, stroke, cancer, diabetes and osteoporosis. Gertner et al. (2017) conducted their longitudinal study using data collected from the Costa Rican Longevity and Healthy Aging Study, which was a longitudinal study conducted among a nationally representative sample of 2827 community dwelling Costa Rican older adults, aged 60 and above. Participants from the Costa Rican Longevity and Healthy Aging Study who responded without a proxy respondent for at least one wave of data (n = 2223) were included in Gertner et al.’s study. Baseline data for the Costa Rican Longevity and Healthy Aging Study was collected in 2005, and two waves of follow-up data were collected in 2007 and 2009 respectively. Although one limitation of Gertner et al.’s findings (2017), as the authors have pointed out, is the exclusion of institutionalized older adults among the sample population, this study provided some insights into risk factors for the mental health of community-dwelling older adults.

Health benefits of engaging in physical activity in late adulthood

Given that the increase in incidence of age-related diseases leads to lower levels of independent functioning, maintenance of physical and mental health during the ageing process is a major area of concern. Although factors such as genetic predisposition to
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diseases and increase in age cannot be changed, research has demonstrated that modifiable
factors such as lifestyle changes that support health behaviours contribute to the prevention or
delay of age-related diseases and decline in functioning. Engaging in regular physical activity
is an example of one such health behaviour.

Physical activity has been found to improve physical and cognitive functioning, and
to improve mental health among older adults. For instance, in a cross-sectional study
conducted among 436 Spanish older adults aged 65 to 98, Salguero, Martínez-García,
Molinero and Márquez (2011) found that higher levels of self-reported physical activity were
positively correlated with better health-related quality of life for both physical and mental
health, and with lower levels of depression measured by the Geriatric Depression Scale
(Yesavage et al., 1983). Fifty-eight percent of the participants were community-dwelling and
42% were institutionalised, thus the findings suggested that physical activity could be
beneficial to both older adults living within the community, as well as institutionalised older
adults. In this study, self-reported physical activity levels were measured with the Yale
Physical Activity Survey (YPAS) questionnaire, an interviewer-administered questionnaire
that provides measures of time spent on leisure activities, including physical activities, and
the intensity of each activity, which allowed for the calculation of estimated weekly energy
expenditure (Dipietro, Haven, Caspersen, Ostfeld, & Nadel, 1993). The YPAS questionnaire
also measures participation in five activity dimensions that include vigorous activities and
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leisurely walking (Dipietro et al., 1993). Health-related quality of life was measured by the Medical Outcomes Study’s short-form functioning and well-being profile (SF-36), a 36-item questionnaire that measures eight domains pertaining to physical and mental health (Ware & Sherbourne, 1992). It was found that the estimated weekly energy expenditure and vigorous activity index were positively correlated with quality of life in the physical health domains of physical function and role physical, and the mental health domains of vitality and mental health. Moreover, even less intense physical activities such as walking, as measured by the leisure walking index, was positively correlated to the domains of general health, vitality and social function (Salguero et al., 2011), suggesting that older adults might be able to reap health benefits even with physical activities such as leisure walking, which are less intense.

The paradox of well-being suggests that subjective well-being increases with age among older adults even as they experience age-related physical decline, as older adults adapt to physical decline and readjust their expectations on level of physical functioning (Blanchflower & Oswald, 2008). However, Hansen and Slagsvold’s study (2012) provided some caveats to the interpretation of the paradox of well-being. For example, Hansen and Slagsvold found that the positive relationship between age and subjective well-being was demonstrated only among participants aged 40 to 70, with decline in well-being found among participants aged 70 and above. The finding that age-related health partially mediated the relationship between age and well-being (Hansen & Slagsvold, 2012) provides further support for the importance of health maintenance through physical activity to facilitate subjective, self-reported, health and well-being in late adulthood.
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In addition to the maintenance of mental health and well-being in late adulthood, intervention studies that provide objective outcome measures have also demonstrated the benefits of physical activity for physical and cognitive functioning. For instance, using data from the Lifestyle Interventions and Independence for Elders (LIFE) study, Pahor et al. (2014) found positive effects of engaging in physical activity on reducing decline in physical functioning. The LIFE study was a randomised controlled trial conducted among 1635 American adults aged 70 to 89 (Marsh et al., 2013). Participants were eligible to take part in the LIFE study if they were sedentary and assessed to be at risk of mobility disability by the Short Physical Performance Battery (Gulranik, Ferrucci, Simonsick, Salive, & Wallace, 1995), but were still able to walk 400m independently, or with a cane, within 15 minutes at baseline. The intervention consisted of progressive training towards the goal of engaging in moderate intensity physical activities of 30 minutes of daily walking at moderate intensity, lower extremities strength training, balance training and flexibility training of large muscle groups. Participants in the intervention condition attended centre-based activities twice a week and engaged in home-based activities three to four times a week for the duration of the intervention. The control condition consisted of participation in a health education programme for successful ageing, and included short durations of upper extremities light stretching or flexibility exercises. Participants were assessed every six months, and major mobility disability was defined as the inability to walk 400m independently, or with a cane,
Improving attitudes to ageing to increase physical activity within 15 minutes, while persistent mobility disability was defined as two consecutive assessments of major mobility disability or an assessment of major mobility disability followed by death (Marsh et al., 2013). Over a 2.6 year follow-up period, it was found that among the 1597 participants who provided follow-up data, intervention condition participants who participated in the 24-month physical activity programme demonstrated significantly lower incidence rates of major mobility disability, persistent mobility disability, and the combined outcome of major mobility disability or death, compared to their control condition counterparts (Pahor et al., 2014). The findings of Pahor et al. (2014) thus provide empirical support for the benefits of engaging in regular physical activity of a suitable intensity during late adulthood for the reduction of decline in physical functioning.

In addition to the maintenance of physical functioning, engaging in regular physical activity might also contribute to the maintenance of cognitive functioning in late adulthood. A study conducted by Rosano et al. (2017) found that regular physical activity was associated with larger hippocampal volume, suggesting that engaging in physical activity could have benefits on cognitive functioning. In Rosano et al.’s study (2017), a sub-sample of 26 participants were recruited from the Pittsburgh site for the LIFE study and consented to participate in an ancillary study on the effects of the physical activity intervention on hippocampal volume. Rosano et al. (2017) found that the volume of the left hippocampus was significantly larger at 24 month follow-up for participants who had attended the physical activity intervention, compared to their counterparts who attended the health education control programme. Left hippocampal volume has been found to be positively associated with delayed memory recall performance (Jiang et al., 2014). Therefore, the findings of
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Rosano et al. (2017) suggest that engaging in regular physical activity in late adulthood is associated with higher levels of cognitive functioning.

Appropriate physical activity, specifically balance training, has also been found to be beneficial for older adults with osteoporosis (Halvarsson, Franzén, & Stähle, 2015), a risk factor for fractures in late adulthood (Pietschmann et al., 2009). In a randomised controlled trial conducted among 96 Swedish older adults with osteoporosis, aged 66 to 87, Halvarsson et al. (2015) found that for participants in the training intervention condition, a 12-week progressive balance training programme reduced fear of falling and improved gait speed at three month-follow-up, and these benefits were maintained at 15-month follow-up. The 12-week balance training programme was conducted three times per week in groups of six to ten participants each, and there were two to three physiotherapists present to assist participants during each session through various exercises that included training in gait or walking speed and reactions to loss of balance (Halvarsson et al., 2015). Although participants in the control condition, who were not enrolled in any training programme, also experienced a reduction in fear of falling at three-month follow-up, this improvement was not maintained over the long term (Halvarsson et al., 2015).

Midlife as an important developmental phase for physical activity uptake

The health benefits of physical activity uptake for older adults suggest that it is not
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too late to start engaging in physical activity even in late adulthood. However, engaging in regular physical activity from as early as midlife provides even greater protection against age-related diseases and decline in physical and cognitive functioning (Heinonen, Oja, Sievänen, Pasanen, & Vuori, 1998; Cheng, Suominen, Rantanen, Parkatti, & Heikkinen, 1991; Shimegi et al., 1994; Upchurch et al., 2015). Indeed, many chronic conditions and diseases that might be preventable with lifestyle changes, such as diabetes and obesity, develop rapidly from midlife, and have also been found to be risk factors for various forms of cancer (White et al., 2014). For instance, data for 2007 to 2009 revealed that the prevalence of diabetes among American adults aged 20 to 44 was only 2.6%, but increased to 11.7% among American adults aged 45 to 64 (CDC, 2012). Similarly, data for 2009 to 2010 also revealed that approximately one in three American adults aged 40 to 59 was obese (Ogden, Carroll, Kit, & Flegal, 2012), and obesity has in turn been found to be a risk factor of various forms of cancer such as cancer of the esophagus, pancreas, thyroid, colon and rectum (Renehan, Roberts, & Dive, 2008; Wolin, Carson, & Colditz, 2010). Obesity has also been found to contribute to metabolic syndrome, a condition which includes symptoms such as abdominal obesity, high blood pressure, and a high level of fasting glucose. Metabolic syndrome has in turn been found to be a risk factor of cancers such as colon cancer (Giovannucci, 2007; Russo, Autelitano, & Bisanti, 2008). Data for 2003 to 2006 indicated that the prevalence of metabolic syndrome among American adults aged 40 to 59 was 41%
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for men and 37% for women, more than twice as high as the respective prevalence rates for men and women aged 20 to 39 (Ervin, 2009).

Besides genetic factors, the cumulative impact of socioeconomic and environmental stressors on the body plays a significant role in explaining the rapid increase in prevalence rates of chronic diseases and conditions from midlife. Socioeconomic and environmental stressors trigger stress responses in the body that result in higher levels of cortisol, a stress hormone, and secondary responses such as increase in blood pressure (McEwen & Stellar, 1993). Prolonged exposure to stressors, however, leads to dysregulation of the stress response, and wear and tear of the body, that is manifested in sub-optimal functioning of various regulatory systems of the body, such as the neuroendocrine, cardiovascular, metabolic and immune systems (McEwen & Stellar, 1993). The wear and tear of the body that is caused by prolonged effort to adapt to various stressors can be objectively measured by a comprehensive index known as allostatic load (McEwen & Stellar, 1993). Higher allostatic load is, in turn, associated with higher risks of diseases such as cancer (Parente, Hale, & Palermo, 2013) and cardiovascular diseases (Seeman, Singer, Rowe, Horwitz, & McEwen, 1997), lower levels of physical and cognitive functioning in late adulthood (Seeman et al., 1997), and all-cause mortality (Seeman et al., 2004).

This accumulation of wear and tear of the body becomes prominent around midlife and is manifested through significantly higher levels of allostatic load. In a study conducted
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to investigate demographic moderators of the relationship between lower socioeconomic status and higher level of allostatic load, Robertson and Watts (2016) found that both socioeconomic status and age were significant predictors of allostatic load. Robertson and Watts (2016) used data collected from adults aged 18 to 94 who participated in the Scottish Health Survey, an annual cross-sectional survey of Scottish adults and children. The combined data set from 2008 to 2011 was used to maximise the sample size to 1834 adults. In Robertson and Watts’s study, allostatic load was operationalised as a score derived from ten biomarkers including pulse rate, systolic blood pressure and diastolic blood pressure (which reflect cardiovascular functioning), body mass index, waist-to-hip ratio, high density lipoprotein cholesterol (which reflect metabolic functioning), and fibrinogen (which reflects immune system functioning). A score of one-unit was given for each biomarker that placed individuals in the high-risk quartile of the sample population. The minimum possible allostatic load score was zero and the maximum possible score was ten, with higher allostatic load scores indicative of greater levels of dysregulation. Lower socioeconomic status was operationalized as having an education level up to ‘Standard Grade’ qualifications, which were education qualifications attained during the third and fourth year of secondary school, while higher socioeconomic status was operationalised as having an education level of “Highers” or above. “Highers” are Scottish school-leaving exams that are a prerequisite for university education (Robertson & Watts, 2016).
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Robertson and Watts (2016) found that an increase of 19.4 years in age was predictive of a one-unit increase in allostatic load. Moreover, it was found that among individuals with lower socioeconomic positions, those who were aged 35 and above had significantly higher allostatic load scores compared to same-aged counterparts with higher socioeconomic positions, but differences in allostatic load scores were not significant between lower and higher socio-economic position groups in the age range of 18 to 34 (Robertson & Watts, 2016). These findings thus demonstrated the cumulative impact of socioeconomic stressors on physiological functioning that is manifested in significantly higher allostatic load scores from around midlife.

Despite age-related increase in allostatic load, especially among individuals of lower socioeconomic status, physical activity has been found to ameliorate the cumulative effects of prolonged exposure to stressors. For instance, in a study using National Health and Nutrition Examination Survey data for 1999 to 2004, Upchurch et al. (2015) found that among 1,680 American women aged 40 to 59, women who had moderate or high levels of moderate or vigorous leisure-time physical activity demonstrated significantly lower allostatic load compared to women with no activities. This finding of Upchurch et al. (2015) thus suggests that physical activity could be effective in reducing allostatic load, and in turn reduce risks of age-related diseases.

Among the various age-related diseases, regular physical activity at midlife appears to be especially useful to women for the delay and prevention of osteoporosis. Although women are at higher risk of osteoporosis following menopause (Shangold, Sherman, & DiNubile, 1998), studies have shown that regular physical activity is associated with higher levels of
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bone mineral density at midlife (Cheng et al., 1991; Heinonen et al., 1998; Shimegi et al., 1994), indicative of lower risks of developing osteoporosis. For instance, in a cross-sectional study of 26 post-menopausal Japanese women aged 49 to 61, Shimegi et al. (1994) demonstrated that those who were volleyball players or joggers had significantly higher levels of bone mineral density measured at the lumbar vertebrae, compared to age-matched controls who did not engage in any regular physical activities. It was also found that the volleyball players, but not the joggers, had significantly higher levels of bone mineral density measured at the proximal femur, compared to controls. However, there were no differences in levels of bone mineral density measured at the proximal and distal radius for all three groups of participants. The results of this study suggests that mechanical stress on specific locations of the body resulting from specific types of physical activities, rather than increase in estrogen levels, could explain the benefits of regular physical activities on post-menopausal bone health.

The uptake of physical activity after menopause can be beneficial to bone health even for women who were previously sedentary. In a study that was a 24-week randomised controlled trial conducted with 79 healthy and sedentary post-menopausal women aged 58 to 78, Tartibian, Maleki, Kanaley, and Sadeghi (2011) found that participants in the exercise and oral supplement condition had significantly greater increases in bone mineral density at 24-week follow-up, measured at both the anterior-posterior lumbar spine and non-dominant proximal femur, compared to participants in the exercise only, supplement only, and control conditions. In this study, the exercise intervention consisted of 24 weeks of walking and jogging at a progressive pace of 25 to 30 minutes per day for three to four days per week.
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during the first 12 weeks, before progressing to 40 to 45 minutes per day for four to six days per week during the second 12 weeks (Tartibian et al., 2011). The findings from this study suggest that the uptake of aerobic exercises even after menopause could still contribute towards maintaining bone health.

Contribution of midlife physical activity to physical and cognitive functioning in late adulthood

Studies that have investigated the relationship between physical activity levels at midlife and physical and cognitive functioning in late adulthood provide further evidence for the protective effects of midlife physical activity on the maintenance of functioning in late adulthood. For instance, in a prospective study investigating midlife predictors of functional decline in late adulthood, using data provided by 6316 British civil servants, Brunner, Welch, Shipley, Ahmadi-Abhari, Singh-Manoux and Kivimäki (2017) found that physical activity level at age 50 predicted physical and cognitive functioning at 18-year follow-up. In this study, physical functioning was measured with the activities of daily living scale which measured difficulty in completing six tasks for daily self-care such as bathing or showering (Katz, Downs, Cash, & Grotz, 1970), and impaired physical functioning was defined as difficulty in completing at least one of the six tasks listed on the scale (Brunner et al., 2017). Cognitive functioning was measured with the Mini-Mental State Examination with potential
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scores ranging from zero to 30 (Folstein, Folstein, & McHugh, 1975), and impaired cognitive functioning was defined as a score of less than 27 on the Mini-Mental State Examination (Brunner et al., 2017). Physical inactivity at midlife, defined as less than an hour each of moderate and vigorous physical activity per week, was found to be one of the significant predictors of both impaired physical functioning and impaired cognitive functioning at 18 year follow-up (Brunner et al., 2017). This finding thus suggests that engaging in regular physical activity at midlife has protective benefits for physical and cognitive functioning in late adulthood.

Engaging in regular physical activity from midlife could reduce the likelihood of impaired physical functioning in late adulthood, through reducing the likelihood of age-related diseases, such as osteoporosis and diabetes. Osteoporosis, which increases the risk of fractures (Marshall et al., 1996), increases the likelihood of impaired physical functioning among older adults, if they become unable to complete daily tasks for self-care after sustaining fractures. In addition, having type 2 diabetes, for which obesity is a risk factor (Tee & Yap, 2017), increases the likelihood of future mobility disability and in turn, impaired physical functioning, as individuals with type 2 diabetes experience progressive loss in muscle mass and deterioration of muscle strength and quality (Volpato et al., 2012). Given that post-menopausal women might be at higher risk of experiencing osteoporosis due to reduction in levels of oestrogen (Lindsay, Cosman, & Nieves, 1993), compared to same-aged men, engaging in regular physical activity from midlife might be especially important for women for the maintenance of physical functioning through the prevention of osteoporosis.
Moreover, besides physical functioning, engaging in regular physical activity contributes to the maintenance of cognitive functioning in late adulthood, specifically verbal memory performance. One area of cognitive functioning in late adulthood that physical activity at midlife enhances is verbal memory performance. In a study conducted by Szoeke et al. (2016) to investigate predictors of cognitive functioning in late adulthood, evidence was found for the cumulative effect of engagement in physical activity from midlife to late adulthood in facilitating verbal memory performance in late adulthood. This study with a 22 year follow-up period was conducted with data collected from 387 women, with a mean age of 49.62 years at baseline, who participated in the Women’s Healthy Ageing Project, a longitudinal prospective study of Australian women that aimed to identify modifiable midlife risk factors for diseases such as dementia (Szoeke et al., 2013). Szoeke et al. (2016) operationalised cognitive functioning as verbal episodic memory, measured by a battery of tests, including a modified version of the Consortium to Establish a Registry for Alzheimer’s disease 10-item supraspan word list score delayed-recall (CERAD-DR). Verbal recall of a supraspan word list tests participants’ memory of a list of words in the sequence that they were presented. The CERAD-DR measures delayed recall of 10 nouns of one to two syllables each (Morris et al., 1989), and has been found to be sensitive in detecting mild cognitive impairment, which is an early sign of Alzheimer’s disease (Petersen et al., 2001). Physical activity level was operationalised as the number of days per week participants engaged in recreational physical activities (Szoeke et al., 2016). It was found that among a variety of predictors including physical activity level, high density lipoprotein and blood pressure, mean physical activity level from midlife to late adulthood was the most significant predictor of verbal memory performance, with higher physical activity level predictive of better performance on the CERAD-DR (Szoeke et al., 2016). This finding thus provides evidence
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for the protective benefits of regular physical activity at midlife that continues into late adulthood.

Engaging in physical activity at midlife also reduces the risks of being diagnosed with dementia in late adulthood. In a study conducted to investigate the association of physical activity engagement during midlife and late adulthood with risk of dementia, Tolppanen et al. (2015) found evidence for the protective effect of midlife physical activity on reducing the risk of being diagnosed with dementia. Tolppanen et al. (2015) used data collected from 1411 Finnish men and women who participated in the Cardiovascular Risk Factors, Aging and Dementia (CAIDE) study (Vartiainen, Puska, Jousilahti, Korhonen, Tuomilehto, & Nissinen, 1994), a longitudinal study with an average follow-up period of 28.3 years. Participants had a mean age of 50.6 years at baseline. Level of physical activity was measured by response to the question “How often do you participate in leisure-time physical activity that lasts at least 20 to 30 minutes and causes breathlessness and sweating?” Low levels referred to no leisure time physical activity at all or leisure-time physical activity for at least a few times a year, moderate levels referred to leisure-time physical activity at least two to three times a month, and high levels referred to leisure-time physical activity at least two to three times per week (Tolppanen et al., 2015). It was found that, regardless of body mass index at midlife, those who had maintained low levels of leisure-time physical activity from midlife to late adulthood were about five times more likely to be diagnosed with dementia, while those who
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had only increased leisure-time physical activity in late adulthood were still three times more likely to be diagnosed with dementia, at 28-year follow-up, compared to those who had maintained high levels of leisure-time physical activity from midlife to late adulthood. Even those who had reduced leisure-time physical activity from midlife to late adulthood were still 30% less likely to be diagnosed with dementia, compared to those who had low levels of leisure-time physical activity at both midlife and late adulthood (Tolppanen et al., 2015), attesting to the cognitive benefits of engaging in at least moderate levels of physical activity during midlife.

The benefits of midlife physical activity in reducing the risk of dementia in late adulthood were found to be more pronounced for overweight or obese individuals. Tolppanen et al. (2015) found that while individuals who were of normal weight at midlife were twice as likely to be diagnosed with dementia in late adulthood if they had maintained low levels, rather than high levels, of leisure-time physical activity at midlife to late adulthood, the likelihood of being diagnosed with dementia increased from two-fold to five fold if these individuals were overweight (with a body mass index of between 25 and 29.9 kg/m2) or obese (with a body mass index of $\geq 30$ kg/m2) at midlife. The findings of Szoeke et al. (2016) and Tolppanen et al. (2015) thus collectively suggest that while engaging in regular physical activity during both midlife and late adulthood might be ideal in protecting cognitive functioning in late adulthood, engaging in moderate levels of physical
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activity only at midlife could still offer some protection against dementia if one is unable to continue engaging in regular physical activity in late adulthood due to various reasons such as ill health. Moreover, engaging in midlife physical activity was found to be especially beneficial for cognitive functioning in late adulthood among midlife individuals who were overweight or obese, compared to same-aged counterparts of healthy weight.

Rovio et al.’s study (2010) sheds light on the structural changes of the brain underlying the protective effects of midlife leisure-time physical activity for cognitive functioning at late adulthood. In a study also using data obtained from the CAIDE study, specifically magnetic resonance images obtained at 21 year follow-up from baseline among a subsample of 75 participants, Rovio et al. (2010) found that participants who were active at midlife, defined as participating in leisure-time physical activity at least twice a week, had significantly larger grey matter volume in the frontal lobe in late adulthood, compared to their sedentary counterparts. Rovio et al. (2010) further explained that this finding demonstrated the protective effects of midlife physical activity from risk of dementia in late adulthood, as the frontal lobe is associated with executive functions, such as working memory, planning and recognition of consequences, which are impaired for individuals with dementia. Taken together, these studies indicate that midlife is a critical period during which lifestyle changes, such as the uptake of regular physical activity, might be able to contribute towards the delay of chronic diseases and act as a buffer against decline in physical and cognitive functioning in
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late adulthood.

Midlife physical activity and mental health in late adulthood

In addition to the established benefits that midlife physical activity contributes to physical health and cognitive functioning in late adulthood, engagement in regular physical activity at midlife has been found to be associated with better mental health in late adulthood. Waller, Kaprio, Korhonen, Tuulio-Henriksson, and Kujala (2016) conducted a study using data provided by 642 pairs of Finnish twins, to investigate the association between physical activity over a baseline period of 15 years and use of anti-depressant over a ten-year follow up period. The mean age of participants was 44.2 years at the last year of the baseline period, with an age range of 33 to 60 years. Active participants were defined as those with a high level of self-reported physical activity, while inactive participants referred to those with a low level of self-reported physical activity. Use of antidepressants was measured by participants’ purchase of anti-depressants, with each purchase expected to provide for up to three months of anti-depressant medication. Records for purchase of anti-depressants over a ten year period, starting from five years after the baseline period, were obtained from the Finnish Social Insurance Institution. Participants also provided baseline data for depression, measured by the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock & Erbaugh, 1961). Seventy-eight pairs of twins who either had moderate to severe depression at baseline or had
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missing BDI data at baseline were excluded from further analyses. It was found that among
564 pairs of twins, individuals who had been active over a 15 year baseline period were less
likely than their inactive twins to use anti-depressants on an occasional basis, defined as
purchase of anti-depressants once or twice during a ten-year follow-up period, suggesting that
midlife physical activity has protective benefits for mild depression, implied by occasional
use of antidepressants (Waller et al., 2016).

Midlife physical activity has also been found to have protective benefits on mental
health in late adulthood, regardless of level of cognitive functioning in late adulthood. In a
study conducted by Chang et al. (2016) to investigate the association of midlife physical
activity with depressive symptoms experienced in late adulthood, physical activity at midlife
was found to predict lower levels of depressive symptoms over an average follow-up period
of 25 years. This study was conducted using data from the Age Gene/Environment
Susceptibility-Reykjavik Study (AGES-RS), a longitudinal study conducted among men and
women living in Reykjavik, Iceland (Harris, Cronkite, & Moos, 2006). Data from 4140
individuals with no history of major depressive disorder or dementia, and with a mean age of
52 years at baseline was used for the analyses. Participants provided self-reports of physical
activity, with those indicating no physical activities for both summer and winter months
categorised as inactive and those indicating any duration of physical activities for both
summer and winter months categorised as active. Level of depressive symptoms was
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**More immediate health and wellbeing benefits of engaging in physical activity at midlife**

Besides contributing towards the maintenance of health and functioning in late adulthood, engaging in regular physical activities at midlife also provides benefits for more immediate health and well-being. For midlife women, sleep disturbance experienced during the menopausal transition has been found to be associated with elevated levels of depressive symptoms (Brown, Gallicchio, Flaws, & Tracy, 2009; Dennerstein, Guthrie, Clark, Lehert, & Henderson, 2004). Regular physical activity, however, has been found to improve quality of sleep and reduce levels of depression among midlife women. For instance, in a study
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investigating the relationship between physical activity levels and sleep across 21 days and 20 nights, Kishida and Elavsky (2016) found a positive association between physical activity levels and duration of sleep. This study was conducted among 103 community-dwelling American women aged 40 to 60. Specifically, Kishida and Elavsky (2016) found that on days when a participant engaged in more physical activity than was usual for her, she had a longer duration of sleep measured in minutes. In addition, Mansikkamäki et al. (2012) demonstrated that engaging in regular physical activity was efficacious in improving sleep quality in a randomised controlled trial conducted among a sample of 176 women, aged 43 to 63, and sedentary at baseline. In this study, the intervention was a 24-week unsupervised aerobic training programme with instructions for participants to engage in physical activities such as walking and Nordic walking for 50 minutes per session four times per week. Sleep quality was measured daily via mobile phone responses to the question “How did you sleep last night?”, and responses ranged from 5 representing “good” to 1 representing “poor”.

Mansikkamäki et al. (2012) found that intervention condition participants had significantly greater levels of improvement in sleep quality compared to control condition participants, and this difference between intervention and control condition participants could be observed from as early as six to ten weeks into the intervention. The findings thus suggest that physical activity uptake at midlife could have more immediate benefits to well-being, manifested as improved sleep quality, even for previously sedentary women.
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In other studies that have directly investigated the association between levels of depressive symptoms experienced at midlife and physical activity levels, higher levels of regular physical activity have been found to be negatively associated with depressive symptoms. For instance, Gallicchio, Schilling, Miller, Zacur, and Flaws (2007) found in their cross-sectional study of 634 community-dwelling American women aged 45 to 54, that approximately 25% of their participants were experiencing depressive symptoms, defined in this study as a score on the Centre for Epidemiologic Studies-Depression Scale (CES-D) (Radloff, 1977) of 16 and above. In addition, peri-menopausal status and the engagement in little or no moderate and vigorous physical activities were found to be factors that correlated positively with experiencing depressive symptoms (Gallicchio et al., 2007).

Engaging in physical activity has been found to have protective benefits on mental health at midlife, even for previously sedentary individuals. Brown, Ford, Burton, Marshall, and Dobson (2005) found that among 9207 Australian women aged 45 to 50 at baseline, increasing physical activity levels from midlife predicted lower risks of experiencing depressive symptoms. Specifically, using cross-sectional and prospective data collected from the Australian Longitudinal Study on Women’s Health in 1996 (baseline), 1998 (S2) and 2001 (S3), Brown et al. (2005) found that women who had very low levels of physical activities at baseline, but who reported increases in physical activities such as walking, swimming and jogging, at S3, had lower odds of reporting depressive symptoms at S3,
Improving attitudes to ageing to increase physical activity compared to women whose physical activities remained very low. In this study, the presence of depressive symptoms was defined as a score of ten or more measured with the CES-D 10 (Andresen, Malmgren, Carter, & Patrick, 1994), a brief version of the CES-D, and a score of 52 or less on the mental health subscale of the SF-36 (Ware & Sherbourne, 1992). The findings of Brown et al. (2005) thus suggest that even for women who had previously been sedentary, the uptake of physical activities at midlife might still be able to contribute significantly towards the maintenance of mental health and well-being.

Further evidence for guidelines on the specific duration and frequency of physical activity recommended for reducing the odds of experiencing a high level of depressive symptoms at midlife can be found from a study conducted by Dugan, Bromberger, Segawa, Avery, and Sternfeld (2015). Using data collected from 2891 American women from five different ethnicities who participated in the Study of Women’s Health across the Nation (SWAN), Dugan et al. (2015) investigated the relationship between midlife physical activity level and level of depressive symptoms across a ten year follow-up period. Participants were aged 42 to 52 years at baseline, and included women from five different ethnicities. These five ethnicities were Caucasian, African American, Japanese, Chinese and Hispanic. Self reported physical activity for the past year was measured at baseline, and at three year, six year and nine year follow-up. Level of depressive symptoms was measured with the CES-D (Radloff, 1977) at baseline, and annually during the follow-up period (Sowers et al., 2000).
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Physical activity level was operationalised into three discrete levels. Women who were engaging in physical activities that lead to at least a moderate increase in heart rate and breathing, more than once a week, for at least 120 minutes per week, and for more than nine months of the year were categorised as “meeting physical activity guidelines”. Women who were engaging in physical activities, but not of the frequency, duration or intensity of the former category were defined as “below physical activity guidelines”. Women who reported no physical activities at all were defined as “inactive”. A high level of depressive symptoms was defined as having a score on the CES-D of 16 and above (Dugan et al., 2015). It was found that even after controlling for covariates such as experiencing upsetting life events, women meeting physical activity guidelines during the year were half as likely to experience a high level of depressive symptoms during the following year. Moreover, even women who engaged in physical activities at a level not meeting guidelines were still one-fifth less likely to experience a high level of depressive symptoms the following year, compared to women who did not engage in physical activities at all. These findings thus collectively suggest that engaging in physical activities, especially of the recommended duration, frequency and intensity, has protective benefits on mental health and well-being, which could be especially important for midlife women (Dugan et al., 2015), given the association between hot flashes experienced during the menopausal transition at midlife and increased risk of experiencing clinically significant levels of depressive symptoms (Bromberger et al., 2010).
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Regular physical activity at midlife not only contributes to the delay and prevention of cardiovascular diseases and diabetes in late adulthood, but has also been found to reduce the risk of these diseases at midlife. In a study using data obtained from 39372 female health professionals from the United States and Puerto Rico, aged 45 and above at baseline, Lee, Rexrode, Cook, Manson, and Buring (2001) found that even engaging in light to moderate intensity physical activity, such as walking for at least an hour per week, significantly reduced the risk of being diagnosed with coronary heart disease over a five-year follow-up period. Moreover, Lee and colleagues (2001) found that the time spent walking, but not walking pace which indicated intensity of physical activity, was associated with risk of being diagnosed with coronary heart disease. Further support for the association between higher physical activity levels and lower risks of cardiovascular diseases comes from a longitudinal observational study (de Souto Barreto, Cesari, Andrieu, Vellas, & Rolland, 2017) using data dated 2004 to 2013, collected from the biannual Survey of Health, Ageing, and Retirement in Europe (SHARE) conducted among men and women aged 50 and above from 16 European countries. In this longitudinal study observational study, de Souto Barreto et al. (2017) found that engaging in vigorous physical activity at least once a week, compared to not engaging in physical activity at all, was significantly associated with reduced risks of developing heart diseases, and engaging in moderate intensity physical activity at least once a week was significantly associated with reduced risks of developing diabetes and cerebrovascular
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diseases such as stroke. Moreover, the magnitude of association for these relationships
increased with increased frequency in physical activity per week. In this study, participants
were included in the analyses if they had participated in at least two waves of SHARE data
collection. Frequency and intensity of physical activity, as well as presence of diseases were
self-reported (de Souto Barreto et al., 2017). The findings of Lee et al. (2001) and de Souto
Barreto et al. (2017) thus collectively suggest that although light physical activity such as
walking for just an hour per week might be sufficient to reduce the risk of developing
coronary heart disease, higher intensity and frequency of physical activity engagement might
be necessary for the prevention of a wider range of diseases, pointing to the utility of further
increasing physical activity levels for midlife individuals who are already engaging in
physical activity, but are still open to further increasing the frequency of their physical
activity engagement.

Conclusion

In this chapter, the literature examining the benefits of engaging in regular physical
activities to physical and mental health in midlife and late adulthood was reviewed in detail.
The ageing process has been associated with various age-related diseases and decline in
physical and cognitive functioning, as well as decline in mental well-being. Nevertheless, the
uptake of regular physical activities in late adulthood has been found to contribute
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significantly towards the maintenance of physical and cognitive functioning. Moreover, research has demonstrated that the uptake of regular physical activities from as early as midlife contributes towards the delay and prevention of age-related diseases, and the maintenance of physical and cognitive functioning in late adulthood. In addition, more immediate benefits to mental health and sleep quality can also be enjoyed from the uptake of regular physical activities in midlife. In the next chapter, psychosocial factors that influence levels of physical activities in midlife are introduced, with a particular focus on the factors within the theoretical framework of the Theory of Planned Behaviour.
Chapter 3: Behaviour change theories and their relevance for understanding physical activity levels

Overview

In the previous chapter, the more immediate and long-term health benefits of engaging in physical activity during midlife and late adulthood were reviewed. Despite the well-established benefits of engaging in regular physical activity, midlife women tend to have lower levels of physical activity compared to men of the same age (Bennie et al., 2016).

Theories of behaviour could shed light on reasons behind such low levels of physical activity, as they seek to explain how various factors exert their influence on behaviour. These theories have also been widely employed as frameworks for behaviour change as they posit how behaviour could change when there are changes to one or more of these factors.

With the extensive literature generated by research on theories of behaviour, this chapter does not endeavour to provide a comprehensive review of the literature, but will instead highlight, with examples, the relevance of theories of behaviour in understanding physical activity levels, with a particular focus on the Theory of Planned Behaviour (TPB) (Ajzen, 1985, 1988, 1991) and an extended variation of the TPB (Extended TPB: Armitage, 2005; Armitage & Conner, 1999), which are among the most widely used theories for
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understanding health behaviours. This will be followed by elaboration of individual factors
within the Extended TPB framework, and a discussion of how some of these factors might be
especially relevant to influencing physical activity levels of midlife women.

**Theories that seek to explain health behaviour change**

Many factors have been found to exert an influence on behaviour. These ranges from
individual factors, such as health locus of control, a construct that indicates how much
individuals attribute control of health outcomes to their own efforts (Rotter, 1966), to broader
factors, such as socioeconomic status (Ding, Do, Schmidt, & Bauman, 2015). Theories of
behaviour seek to explain how these factors operate together to influence behaviour in a
holistic manner. These theories also suggest how behaviour change can be brought about
through changing one or more of the factors that influence behaviour.

Theories of behaviour can be broadly categorised as investigating non-autonomous or
autonomous behaviour change (Strack & Deutsch, 2004). Non-autonomous behaviour change
refers to non-conscious behaviour change that is either spontaneous or has become habitual,
while autonomous behaviour change refers to conscious behaviour change, and requires the
explicit intention for change, as well as planning, for the purpose of executing the change
(Strack & Deutsch, 2004). Strack and Deutsch (2004) posited that increases in physical
activities might at times be a planned behaviour change (e.g. setting time aside to go
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swimming at the public pool), and at other times unplanned (e.g. spontaneously joining a line
dancing group while passing by the park). In the remainder of the chapter, both theories of
non-autonomous and autonomous behaviour change will be reviewed.

The habit formation framework (Lally & Gardner, 2013) is an example of a theory
explaining how non-autonomous behaviour could be developed through habit cultivation.
Similar to changes in autonomous behaviour, the initial uptake of behaviour requires the
motivation or intention to perform the behaviour. The behaviour to be introduced is paired
with a consistent contextual cue, such as doing simple stretching exercises while keeping an
eye on the kettle. This cue-behaviour association is strengthened as the behaviour is repeated
day after day. The habit of doing simple stretching exercises is formed when putting the
kettle on to boil automatically elicits this behaviour (Lally & Gardner, 2013). Habit formation
could be a particularly suitable behaviour change strategy for older adults as the performance
of the behaviour places fewer demands on attention and memory once the behaviour to be
introduced has become a habit, and could be automatically elicited by the associated
contextual cue (Danner, Aarts, & de Vries, 2007).

Despite the utility of the habit formation framework, there are some limitations. These
include the lack of suggested antecedents for changes in levels of behavioural intention that
lead to habit formation. This is a limitation as the framework is unable to provide an
explanation for factors that motivate individuals to change their behaviour, which could
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inform the design of interventions that aim to effect behavioural change through facilitating the factors that motivate behaviour. The habit formation framework might also be insufficient to explain the formation of habits that require more complex planning for behavioural execution, such as going for gym workouts every day despite occasional changes in one’s daily schedule as a result of changes in work and family commitments. Therefore, autonomous behaviour change theories might provide more suitable frameworks to investigate behaviour change for behaviours that might be amenable through interventions, such as physical activity behaviour that might require complex planning to execute.

In contrast to non-autonomous behaviour change theories, autonomous behaviour change theories emphasise the importance of conscious appraisal of the behaviour, and intention or motivation to engage in the behaviour in achieving behaviour change. The Social Cognitive Theory is an example of an autonomous behaviour change theory, and it posits that perceived self-efficacy, or the perception that one is capable of performing the behaviour, is the key predictor of behavioural intention, as well as the key predictor of behaviour (Bandura, 1986). If an individual possesses a higher level of perceived self-efficacy, he or she is more likely to be motivated to perform the behaviour, and to persist in his or her efforts to achieve the behaviour in the face of obstacles than someone with lower levels of perceived self-efficacy (Bandura, 1986).

The Social Cognitive Theory is useful in suggesting strategies for behaviour change
Improving attitudes to ageing to increase physical activity through the development of perceived self-efficacy, such as through successful performance of the behaviour or observing behaviour performance by role models. However, the theory does not provide an explanation for antecedents of behavioural intention for behaviours which individuals might have initial low levels of perceived self-efficacy, but nevertheless would like to adopt given the benefits associated with performance of the behaviour. Indeed, in a meta-analysis conducted by Plotnikoff, Costigan, Karunamuni, and Lubans (2013) on 23 studies using social cognitive frameworks to investigate factors predictive of physical activity levels among adolescents, studies employing the Social Cognitive Theory explained only 24% of the variance in physical activity behaviour. This suggests the importance of considering theories that might be able to offer more comprehensive explanations of factors that influence physical activity levels.

The Theory of Reasoned Action and the Theory of Planned Behaviour (TPB)

In contrast to the Social Cognitive Theory, the Theory of Reasoned Action (TRA) argues that attitudes towards the behaviour, instead of perceived self-efficacy, are the sole predictor of behavioural intention (Ajzen & Fishbein, 1980). In presenting attitudes as the sole predictor of behavioural intention, which is in turn the sole predictor of behaviour, the TRA was thus limited in its prediction of behaviours that depend on the availability of opportunities and skills of the individual (Fishbein, 1993).
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To address The Theory of Reasoned Action’s limitations in explaining predictors of behaviours over which individuals have incomplete control, the TPB introduced perceived behavioural control into its framework (Ajzen, 1985, 1988, 1991). Perceived behavioural control refers to an individual’s perception of how much control s/he has over behaviour, and includes perceptions of control over opportunities, time, financial resources and skills in relation to achievement of the behaviour. By including perceived behavioural control as a predictor of actual behaviour, the TPB attempts to provide a more refined explanation of the driving forces behind behaviours for which individuals have varying degrees of control.

Within the TPB framework as illustrated by Figure 3.1, both intention and perceived behavioural control are key components that predict behaviour, and are known as proximal predictors of behaviour (Ajzen, 1985, 1988, 1991). Intention refers to the amount of effort one is willing to invest to achieve the behaviour, and perceived behavioural control refers to the amount of confidence one has in one’s ability to achieve the behaviour. Attitudes towards the behaviour, perceived behavioural control and subjective norms are in turn predictors of intention, and are known as distal predictors of behaviour that exert their influence via the mediator of intention. Subjective norms refer to the amount of social pressure perceived by one to engage (or not engage) in a behaviour, and this social pressure is received from important others whose opinions are valued, such as family members and friends.
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Figure 3.1. A diagrammatic representation of the TPB (based on Ajzen, 1985, 1988, 1991)

In addition to the Theory of Planned Behaviour, other contemporary behavioural change theories such as the Health Belief Model and Temporal Self-regulation Theory also provide frameworks for understanding health behaviours such as engaging in physical activity. The Health belief model (Rosenstock, 1974; Becker, 1974) posits that the antecedents of behavioural change include an internal or external cue to trigger behavioural change, such as receiving health advice, as well as health beliefs such as perceived vulnerability (how much one perceives one is at risk of ill health if behavioural change is not achieved), perceived disease severity (the severity of associated diseases if behavioural change is not achieved), self-efficacy and level of motivation for behavioural change.

Temporal self-regulation theory (Hall & Fong, 2007) posits that whether health behavioural change occurs is contingent on factors such as connectedness beliefs (how much one believes that current health behaviour contributes to future health), temporal valuation (for example, in the context of physical activity behaviour, how much one values current enjoyment of a sedentary lifestyle compared to how much one values future health benefits that regular
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physical activity might bring), behavioural prepotency (habitual response in a given context) and self-regulation capacity. A number of studies (Booker & Mullan, 2013; Carpenter, 2010) have demonstrated the validity of the Health belief model and Temporal self-regulation theory in predicting health behaviour change, but neither of these behaviour change theories takes into consideration cultural factors that might influence physical activity behaviour. Participation in physical activity could occur within a social context, for example group physical activities, and motivation for engaging in group physical activities could have cultural influences (e.g. Sit, Kerr and Wong, 2008). In comparison to the Health belief model and Temporal self-regulation theory, the TPB provides a more comprehensive theoretical framework in understanding the antecedents of behavioural change in a culturally inclusive manner, as two of the antecedents posited by the TPB, attitudes and subjective norms, might be shaped by cultural influences regarding the behaviour under investigation.

The TPB has been used to predict a wide variety of behaviours. These behaviours range from rule-breaking behaviour at pedestrian railway crossings (Darvell, Freeman, & Rakotonirainy, 2015) to pro-environmental behaviour in the workplace (Blok, Wesselink, Studynka, & Kemp, 2015). The relative importance of each factor in predicting behaviour might depend on the type of behaviour concerned. For instance, in a study of 119 young pedestrians aged 18 and under, Darvell et al. (2015) found that attitudes and subjective norms, but not perceived behavioural control, significantly predicted intentions to violate traffic rules at pedestrian railway crossings, and that young pedestrians were more likely to deliberately violate traffic rules at railway crossings rather than make a mistake when crossing. The findings of Darvell et al. (2015) thus illustrate how attitudes and subjective
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norms might be relatively more important antecedents of intention, which is in turn the key proximal antecedent in predicting a relatively volitional behaviour such as violating traffic rules. In contrast, Blok et al. (2015) found in their study of a sample of 441 staff members at a Dutch university that intention was the most significant predictor of pro-environmental behaviour, and that perceived behavioural control was the strongest predictor of intention. The findings of Darvell et al. (2015) and Blok et al. (2015) thus collectively suggest how attitudes and subjective norms might be relatively more important antecedents of intention, which is in turn the key proximal antecedent in predicting a relatively volitional behaviour such as violating traffic rules (Darvell et al., 2015). On the other hand, perceived behavioural control might be a relatively more important antecedent of intention for behaviour, such as pro-environmental behaviour (Blok et al., 2015), that requires external factors to facilitate the behaviour, such as recycling facilities. Furthermore, in a meta-analysis of 237 prospective tests using the TPB framework to investigate predictors of health behaviours including physical activity, McEachan, Conner, Taylor, and Lawton (2011) found that the TPB framework explained the greatest amount of variance (29.3%) in physical activity, in comparison to other health behaviours, suggesting that it may be particularly relevant to explaining change in physical activity levels.

Despite the utility of the TPB, researchers have pointed out some of its limitations, and have suggested extensions to the theory in order to address these limitations. For instance, Armitage and Conner (1999) argued that the concept of perceived behavioural control, which refers to how much one believes one is capable of performing a behaviour (Ajzen, 1985, 1988, 1991), did not differentiate between perceived control over internal
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resources, such as confidence in one’s ability, and external resources, such as opportunities, time, financial resources and the cooperation of others that make behaviour possible. Differentiation between the constructs of perceived control over internal resources and perceived control over external resources might contribute towards more specific directions for intervention to bring forth behaviour change (Armitage & Conner, 1999). In their study using the TPB as a framework to investigate factors predicting a low-fat diet among a sample of 221 men and women aged 17 to 55, Armitage and Conner (1999) demonstrated, with a factor analysis, that seven items measuring participants’ perceived behavioural control mapped onto two distinct factors. These seven items were items measuring perceptions of control adopted from the TPB literature. The two factors that were derived from the factor analysis were termed “self-efficacy”, which refers to confidence in one’s ability to perform the behaviour, and “perceptions of control over the behaviour”, which refers to one’s perception of their level of control over external factors (such as time and financial resources) that influence behaviour (Armitage & Conner, 1999). In addition, Armitage’s 12 week study (Armitage, 2005) of physical activity uptake and maintenance among 94 participants aged 16 to 65 demonstrated that increased physical activity levels led to subsequent increases in perceived behavioural control, thus providing empirical evidence of a bi-directional relationship between perceived behavioural control and behaviour.

Within an extended TPB framework as illustrated by Figure 3.2, based on Ajzen’s TPB (1985, 1988, 1991) and extended through the work of Armitage and Conner (1999), and Armitage (2005), behaviour is directly predicted by three broad factors, namely: intention to perform the behaviour (intention), perceived self-efficacy, and perceived control over external factors (such as the weather or one’s work schedule). Intention is in turn predicted by
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the factors of attitude towards the behaviour, perceived self-efficacy, perceived control over external factors, as well as subjective norms. In addition, successful performance of the behaviour in turn predicts subsequent increases in perceived self-efficacy and perceived control over external factors.

![Diagram of the Extended TPB](image)

*Figure 3.2. A diagrammatic representation of the Extended TPB (based on Ajzen (1985, 1988, 1991), and extended through the work of Armitage and Conner (1999) and Armitage (2005))*

The next sections outline the individual factors within the extended TPB, with a focus on their relevance for influencing physical activity levels.

**Intention**

Intention refers to how motivated an individual is to perform a particular behaviour, and how much effort he or she is willing to expend in order to perform that behaviour (Ajzen, 1985, 1988, 1991). The more volitional the behaviour, the more accurately intention predicts
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Intention has been found to be one of the strongest predictors of physical activity behaviour in many studies. In their meta-analysis of 237 prospective studies investigating predictors of health behaviours, McEachan et al. (2011) found that intention outperformed perceived behavioural control as a stronger predictor of physical activity behaviour across studies with samples ranging from adolescents (17 years of age or under), through to university students and adults. For instance, in their secondary analysis of data from an intervention study promoting regular physical activity among men and women (aged 35 to 55) with Type 2 diabetes who were not meeting recommended guidelines for physical activity levels, Boudreau and Godin (2014) found that intention was the strongest predictor of increase in physical activity levels at one-month follow-up. In addition, in a follow-up longitudinal study to a cross-sectional study, conducted among 149 English-speaking Canadian women aged 39 to 68 to investigate the predictive validity of TPB variables and the Self-Determination Theory variables of autonomous and controlled motivation on physical activity behaviour change, Fortier, Kowal, Lemyre, and Orpana (2009) found that intention to increase physical activity measured at baseline significantly predicted change in physical activity levels at six-month follow-up.

Other studies have suggested that intention might be more important for predicting short-term than longer-term behaviour change. For instance, in his study of men and women attending a private gym, Armitage (2005) found that intention, unlike perceived behavioural control, was not a significant predictor of participants’ gym attendance levels at 12-week follow-up. Similarly, McEachan et al.’s meta-analysis (2011) found that intention was a better predictor of physical activity levels for studies with a follow-up period of five weeks or less, compared to studies with a follow-up period of more than five weeks. The findings of
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Armitage (2005) and McEachan et al. (2011) provide support for the role of perceived behavioural control in the persistence of efforts to achieve behaviour change (Ajzen, 1991). Perceived behavioural control will be discussed in further detail later in this chapter. The mixed findings for intention as a predictor of physical activity levels over longer time periods (Armitage, 2005; Fortier et al., 2009; McEachan et al., 2011) might be attributable to methodological issues. Although Fortier et al. (2009) found that intention was a predictor of behavioural change over a six-month follow-up period, physical activity levels at baseline and six-month follow-up were measured by participants’ self-report of the frequency and duration of physical activities in a typical week over the past month. Hence, there is a possibility that changes in physical activity levels measured had not been sustained over a six-month period, but instead reflected change over a shorter follow-up period of one month.

There is thus a need for further research with improvements in methodology to investigate intention as a predictor of physical activity over longer time periods.

Although studies have found that intention is an important predictor of physical activity, the importance of intention as a predictor of physical activity behaviour has also been found to be contingent on individual characteristics such as socioeconomic status and cultural background. For instance, Shüz, Li, Hardinge, McEachan, and Conner (2017) conducted a meta-analysis of 99 studies to investigate the moderating effect of socioeconomic status on the relationship between TPB variables and physical activity behaviour. Socioeconomic status in this meta-analytic study was defined by a combination of indicators including education level, income and occupational status, and analyses were conducted to investigate the moderating effect of each respective socioeconomic indicator on the relationship between TPB variables and physical activity. Although income and occupational status were not found to be moderators, education level was found to be a significant moderator of the relationship between intention and physical activity behaviour, such that studies conducted among samples with higher level of education reported higher
Improving attitudes to ageing to increase physical activity correlations between intention and behaviour.

Shüz et al. (2017) suggested two explanations for the moderating effect of education level on the intention-behaviour relationship. Firstly, it is possible that individuals with a higher level of education might form more stable intentions (Godin et al., 2010) that are more resilient against competing cognitions, resulting in a higher probability of translating intention into actual physical activity behaviour. Godin et al. (2010) did not elaborate on their reason for this interpretation on why individuals with higher education levels might form more stable intentions. However, a possible reason for this interpretation of the moderating role of education level could be that individuals with more years of education would have had more opportunities to develop discipline through executing the intention to focus on their studies, despite competing cognitions for recreational activities. Secondly, it is possible that individuals with a higher education level are able to formulate better implementation intentions, which refer to concrete plans to execute their intention for physical activity, hence increasing the chances of successfully translating intention into actual behaviour (Allan, Sniehotta, & Johnston, 2013). The finding of Shüz et al. (2017) that socioeconomic status, operationalised as education level, is a moderator, thus offers a possible explanation for differences in findings regarding intention as a predictor of physical activity behaviour.

A further factor thought to influence intention is culture. Shukri, Jones and Conner (2015) conducted a cross-sectional study among 278 men and women from the United Kingdom, with a mean age of 40.0 years, and 325 Malaysian men and women, with a mean age of 34.0 years, to investigate the influence of culture and occupational demands on the relationship among TPB variables. The United Kingdom participants and Malaysian participants were recruited as samples respectively representative of individuals from an individualistic culture and a collectivistic culture (Hofstede, 2001). It was found that while attitudes to physical activity were a significant predictor of intention among the United Kingdom participants, attitudes did not significantly predict the intention for physical activity among the Malaysian participants, suggesting that attitudes, as a manifestation of an
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individual’s cognition towards physical activity behaviour, might exert a more powerful influence on intention, for individuals from individualistic compared to collectivistic cultures (Shukri et al., 2015). Nevertheless, given the significant difference in mean age between the United Kingdom participants, who were entering midlife, and the Malaysian participants, who had not reached midlife yet, further research on participants with similar age might need to be conducted to confirm the findings of Shukri et al. (2015). The collective findings of Shüz et al. (2017) and Shukri et al. (2015) thus highlight the need to take into account sample demographic characteristics when interpreting findings on social cognitive predictors of physical activity behaviour. The next section introduces attitudes, an antecedent of intention within the Extended TPB framework.

**Attitudes**

Attitudes towards physical activity refer to how individuals evaluate physical activity, and these attitudes are formed from the behavioural beliefs that individuals hold regarding physical activity (Ajzen, 1985, 1988, 1991). Moreover, attitudes towards physical activity can be further categorised into instrumental attitudes and affective attitudes. Instrumental attitudes refer to the evaluation of engaging in physical activity as beneficial or harmful. These can be positive behavioural beliefs that associate engaging in physical activities with favorable outcomes, such as improvement in physical and mental health, and which contribute to the development of positive instrumental attitudes towards physical activity, or negative behavioural beliefs that associate engaging in physical activities with drawbacks such as injuries that might be sustained when doing physical activities contribute to negative instrumental attitudes. On the other hand, affective attitudes towards physical activity refer to the evaluation of engaging in physical activity as enjoyable or unenjoyable, and affective attitudes are associated with beliefs regarding the pleasantness of engaging in physical activity (Ajzen, 2001).
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Although there is empirical support for discriminant validity between instrumental and affective attitudes (Ajzen & Driver, 1991; Breckler & Wiggins, 1989; Rhodes & Courneya, 2003), there have been mixed findings on whether measuring attitudes as two distinct factors of instrumental and affective attitudes contributes to additional variance in the prediction of physical activity behaviour with TPB variables (Ajzen & Driver, 1991; Rhodes & Courneya, 2003). Nevertheless, attitudes towards physical activity have been found to be the strongest predictor of intention among adult, university student and adolescent samples (McEachan et al., 2011). For instance, in their study of changes in predictors of physical activity among a sample of 195 college students, Lemoyne, Valois, and Wittman (2016) found that attitudes, along with perceived behavioural control, were the strongest predictors of intention to be active. In this study, a seven-item semantic scale measured attitudes towards regular physical activity with six-point bipolar adjectives, both instrumental (for example beneficial-harmful) and affective (for example fun-dull) (Lemoyne et al., 2016). In addition, Fortier et al. (2009) found that attitudes and subjective norms were significant predictors of intention to increase physical activity levels, while perceived behavioural control was not a significant predictor of intention. Attitudes were measured with a six-item semantic scale that measured both instrumental and affective attitudes. Fortier et al. (2009) suggested that a possible explanation for this finding could be the high levels of physical activity among this sample of women at both baseline and six-month follow-up. Although midlife is a period when physical functioning starts to decline, physical activity could still be perceived as a relatively volitional behaviour for midlife adults who are physically active. Fortier et al.’s finding (2009) thus provides empirical support for the importance of attitudes as a predictor of intention for relatively volitional behaviours such as increasing physical activity levels among non-sedentary midlife and older adults.

There is also evidence to suggest that endorsement of the health benefits of physical
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activity, that shape instrumental attitudes towards physical activity, are important sources of motivation for physical activity across different cultures. In a cross-sectional study conducted to investigate motives for and barriers to engaging in physical activity among 360 Chinese women from Hong Kong, aged 30 to 59, Sit, Kerr and Wong (2008) found that maintenance or improvement of fitness and health was the top-ranked type of motive for physical activity. In this study, motives for physical activity were measured using the Revised Motivation for Physical Activity Measure, a 30 item instrument which measures reasons for physical activity in the five categories of improvement or maintenance of fitness and health, enjoyment of the activity, improvement of appearance, social motives, and challenges provided by physical activity (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Therefore, the findings of Sit et al. (2008), together with the findings of Fortier et al. (2009) provided evidence that collectively suggests the importance of instrumental beliefs that influence motivation for physical activity among women from different cultures.

Although attitudes towards physical activity are the strongest predictor of intention in many populations (McEachan et al., 2011), studies with specific sample populations such as patients with Type 2 diabetes (Boudreau & Godin, 2014) have found perceived behavioural control to be the strongest predictor of intention, highlighting the relatively non-volitional nature of physical activity for individuals who are more likely to face physical limitations when they engage in physical activities. In a survey of physical activity levels and the social cognitive determinants of exercise among a community sample of 1602 Canadian men and women aged 18 to 65, Plotnikoff, Brez, and Brunet (2003) also found that the defining differences between participants with diabetes, compared to those without diabetes, included lower levels of perceived behavioural control and self-efficacy. For individuals with Type 2 diabetes, as well as other populations among whom there might be a tendency to have lower levels of perceived behavioural control in relation to doing physical activities, perceived behavioural control might thus be the most important determinant of intention.
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**Perceived behavioural control**

To understand the role of perceived behavioural control in influencing intention and behaviour, it is first necessary to understand its two components, namely, perceived self-efficacy and perceived control over external factors. Perceived self-efficacy might be understood as how much one believes one has the ability to perform a behaviour, such as making dietary change or increasing levels of physical activity (Ajzen, 1991; Bandura, 1982). Comparing two individuals who might be equally motivated to increase their physical activity levels, the one with a higher level of self-efficacy might be more likely to persevere and invest more effort in achieving the goal of increasing physical activity levels (Ajzen, 1991). Perceived control over external factors can be understood as the level of control individuals perceive that they have over external factors that might influence the accomplishment of the behaviour, such as amount of time available for performing the behaviour, which might be influenced by work schedules and family commitments. The roles of each of these components in perceived behavioural control are discussed in more detail below.

**Perceived self-efficacy**

Findings from a number of studies have suggested that self-efficacy plays a role in predicting increases in physical activity levels. For example, Peeters, Brown, and Burton (2015) investigated the psychosocial factors that predict increases in physical activity levels in their two-year longitudinal study, which had a sample of 692 low active middle-aged Australian men and women who were experiencing arthritis. Peeters et al. (2015) found that intention surveyed at baseline was a significant predictor of increases in self-reported physical activity levels two years later. In addition, participants who reported increases in self-efficacy over the two-year period were 2.2 times more likely to demonstrate increase in physical activity levels compared to participants who did not report increases in self-efficacy, suggesting the importance of self-efficacy in sustaining efforts put in for behaviour change.
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Nevertheless, given the concurrent increase in self-efficacy and physical activity levels, Peeters et al. (2015) highlighted the possibility of self-efficacy being both a predictor and consequence of increased physical activity levels, and suggested that future studies should disentangle these potential roles. In another study of predictors of intention to exercise, among a sample of 114 men and women with diabetes who were aged 18 to 78, Miežienė, Sinkariova, and Jankauskienė (2014) found that perceived behavioural control was a significant predictor of intention, while attitudes were not significant predictors of intention. This is in line with Boudreau and Godin’s study (2014) of physical activity uptake among participants with Type 2 diabetes, which found that perceived behavioural control was a stronger predictor of intention relative to attitudes towards physical activity. In addition, Aparicio-Ting, Farris, Courneya, Schiller, and Friedenrich (2015), found in their study of predictors of the maintenance of physical activity uptake among 126 postmenopausal women aged 50 to 74, that self-efficacy was the strongest predictor of physical activity levels one year post-participation in the intervention group for a one-year exercise intervention programme.

Moreover, the importance of self-efficacy in influencing physical activity of midlife women has also been suggested by research conducted on the specific population of midlife women. McGuire, Seib, and Anderson (2016) investigated predictors of perceived barriers to physical activity in a cross-sectional study with participants who were 225 Australian women, aged 40 to 65. In this study, perceived barriers to exercise were measured using the Exercise Benefits and Barriers Scale, with 46 items measured using a Likert type scale with responses ranging from “Strongly agree” to “Strongly disagree”. Among the 46 items, 14 items measured perceived barriers to exercise in four categories (Sechrist, Walker, & Pender, 1987), including physical exertion and time expenditure, which were the two types of barriers to exercise that received the highest level of agreement among this sample of midlife women (McGuire et al., 2016). McGuire et al. (2016) found that higher levels of exercise self
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efficacy significantly predicted lower levels of perceived barriers to exercise. Although McGuire’s et al.’s findings (2016) highlight the role of exercise self-efficacy in predicting the level of self-perceived difficulty of exercise for the specific population of midlife women, it should be noted that this study did not investigate the direct relationship between self efficacy and levels of physical activity among midlife women, and further studies that directly investigate self-efficacy as a predictor of physical activity levels of midlife women are needed. In another cross-sectional study, Anderson, Anderson and Hurst (2010) investigated predictors of health behaviour changes that occurred during midlife, using data collected from 564 Australian women, aged 51 to 66, who participated in the second stage of the Healthy Aging for Women Study. Predictors that were investigated included socio demographic factors such as education level, as well as self-efficacy, measured by Bandura’s scale for exercise self-efficacy (Bandura, 1997), as a predictor of physical activity behaviour change. Structural equation modeling revealed that exercise self-efficacy was a significant predictor of increases in physical activity that occurred during midlife, and that education level was a predictor of exercise self-efficacy, such that women with higher education levels had higher levels of exercise self-efficacy (Anderson et al., 2010). Nevertheless, given that Bandura’s scale for exercise self-efficacy measured an individual’s level of confidence in overcoming a range of both internal barriers, such as feeling tired, as well as external barriers, such as bad weather, to achieve physical activity, further research is necessary to investigate the unique contributions of self-efficacy and perceived control over external factors as predictors of physical activity behaviour.

Research investigating perceived behavioural control as a mediating variable has also shed light on possible antecedents of perceived behavioural control, and by extension, perceived self-efficacy, which is part of the concept of perceived behavioural control. Caltabiano and Ghafari (2011) conducted a cross-sectional study, among 140 Australian participants aged 18 to 73, which investigated the distal influence of social comparison on
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physical activity levels via the mediators of perceived behavioural control and perceived health threat. In this study, participants responded to two items that measured their tendency for type of social comparison, namely upward or downward social comparison (Gerrard, Gibbons, Stock, & Lane, 2005). Perceived behavioural control was measured by eight items on a visual analogue scale, among which five items measured the concept of self-efficacy, for example asking participants for their level of confidence in being physically active when they feel tired (Lippke & Plotnikoff, 2006). Hierarchical regression analyses revealed that perceived behavioural control was the strongest predictor of self-reported physical activity level, among other predictors investigated, including level of upward social comparison, perceived similarity with active prototypes, and level of perceived health threat. In addition, it was found that perceived behavioural control mediated the positive association between upward social comparison and higher levels of physical activity. Thus, Caltabiano and Ghafari’s findings (2011) suggested that upward social comparison of positive role models could be an antecedent of perceived self-efficacy for physical activity. Nevertheless, given the cross-sectional design of the study, an alternative explanation that higher levels of physical activity predicting higher levels of self-efficacy that orientate individuals towards striving for further physical activity achievements via upward social comparison cannot be ruled out. Further research that is either longitudinal in design or includes an intervention component comparing the effects of introducing active role models with the effects of the absence of active role models in the control condition are necessary to shed more light on antecedents of perceived behavioural control.

Taken together, the findings of Aparicio-Ting et al. (2015), Boudreau & Godin (2014), McGuire et al. (2016), Miežien et al. (2014) and Peeters et al. (2015) collectively suggest that, in contrast to volitional behaviours such as violating traffic rules, engaging in physical activities is a relatively less volitional behaviour for individuals who might face various physical limitations in doing physical activities, such as individuals with health conditions including type 2 diabetes. Therefore, for these individuals, who might include midlife women
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facing gradual physical decline, perceived behavioural control might be relatively more important than positive attitudes towards the behaviour as a predictor of physical activity intention and behaviour.

Perceived behavioural control has also been found to be the most important predictor of physical activity behaviour in studies with follow-up periods of five weeks or longer (Aparicio-Ting et al., 2015; McEachan et al., 2011; Armitage, 2005), suggesting a bi-directional relationship between perceived behavioural control and physical activity behaviour. Indeed, Armitage (2005) found that increases in physical activity levels predicted subsequent increases in perceived behavioural control, demonstrating a bi-directional relationship between perceived behavioural control and physical activity behaviour. Moreover, in a randomized controlled trial conducted to investigate the efficacy of an intervention to increase physical activity, Wu, Hwang, Chen and Chuang (2011) found evidence for the intervention increasing both short-term exercise self-efficacy and long-term physical activity levels. In this study with a follow-up period of nine months, the participants were 135 Chinese men and women at risk of Type 2 diabetes, aged 45 to 64. Exercise self-efficacy was measured with a five-item instrument developed by Markus, Selby, Niaura, and Rossi (1992), and participants responded to each item on a seven point Likert scale ranging from 1 (not confident) to 7 (very confident). A sample item is “I am confident I can participate in regular exercise when I am tired” (Markus et al., 1992). It was found that those who had been randomized to the intervention group of home-based exercise demonstrated significantly higher levels of exercise self-efficacy at three-month follow-up and significantly higher levels of physical activity at nine-month follow-up, compared to their control condition counterparts. The findings of Wu et al. (2011) thus provide empirical support for Ajzen’s suggestion that individuals with higher levels of self-efficacy are more likely to persist in their efforts to attain behaviour change (Ajzen, 1991), and suggests a bi-directional relationship between self-efficacy and physical activity behaviour, known as a feedback loop.
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(Lima et al., 2017), where successful performance of physical activity increases self-confidence in doing physical activities, which provides further motivation to persist in efforts to increase physical activity levels.

**Perceived control over external factors**

Studies have found evidence for perceived control over external factors as a construct that is distinct from self-efficacy. For instance, Rhodes and Courneya (2003) conducted two studies with the aim of investigating the conceptual separation between affective and instrumental attitudes, self-efficacy and perceived control over external factors (termed the controllability concept in their studies), and injunctive and descriptive norms. The first study was conducted among 300 undergraduate students with a mean age of 20 years, and the second study was conducted among 272 cancer survivors with a mean age of 61 years. Both studies demonstrated discriminant validity between self-efficacy and perceived control over external factors. It was also found that self-efficacy, but not perceived control over external factors predicted exercise intention among both sample populations (Rhodes & Courneya, 2003), further demonstrating their conceptual distinction.

Evidence for the conceptual distinction between self-efficacy and perceived control over external factors has also been found among adolescents. In a study of factors predicting moderate to vigorous physical activity among 488 students aged 12 to 16 in Shanghai, China, Wang and Zhang (2016) conducted a factor analysis of six items measuring self-efficacy and perceived control over external factors (which they termed PBC). Results of the factor analysis revealed a two-factor model with three items mapping onto one factor (with factor loadings ranging from .81 to .82) and three items mapping onto another factor (with factor loadings ranging from .50 to .52). The contents of the items that loaded on the first factor measured self-efficacy and the contents of the items that loaded on the second factor measured perceived control over external factors. Wang and Zhang (2016) also found that, although both self-efficacy and perceived control over external factors were significant
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predictors of intention to engage in physical activities, self-efficacy was the stronger predictor, providing further empirical evidence of the differentiation between the two constructs.

Although there are mixed findings for the proximal effect of perceived control over external factors on exercise intention, as it was found to be a significant predictor of intention to engage in physical activities among Chinese adolescents (Wang & Zhang, 2016), but not found to be a significant predictor of exercise intention for undergraduates and cancer survivors (Rhodes & Courneya, 2003), it is not yet clear what the influence of this factor might be among the specific population of midlife women. For this group, work and familial commitments might take time away from physical activities, and thus perceived control over external factors such as time might be an especially important predictor of both physical activity intention and behaviour. Studies have found that lack of time is one of the highest ranked barriers to physical activity among midlife women. For instance, in a study on perceived barriers to physical activity and physical activity levels among 1877 women living in rural Midwest America (aged 18 to 94 and among whom 36.3% of respondents were women aged 45 to 64), Osuji, Lovegreen, Elliot, and Brownson (2006) found that the number of barriers reported by respondents was significantly associated with their physical activity levels. Of these barriers, lack of time (cited by 61.1% of respondents) and bad weather (cited by 59.4% of respondents) were the second and third most frequently cited, with the most frequently cited being “too tired” (cited by 70.6% of respondents), thus supporting the possibility that level of perceived control over external factors such as time and a conducive environment is an especially important predictor of physical activity levels for midlife women.

For many midlife women who might be juggling various family and work commitments, perceived control over external factors (for example whether they feel that they are in control of their schedules to allocate time for physical activities in addition to work and familial responsibilities) might play an especially important role in influencing their
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physical activity levels. This is supported by the work of McGuire et al. (2016), who found that among the types of barriers to exercise investigated, time expenditure received the second highest level of agreement in comparison to three other types of barriers. In addition, King et al. (2000) found in their study of physical activity determinants among 2912 American women, around two thirds of whom were aged 40 to 59, that perceived lack of time and caregiving duties were frequently indicated as barriers to engaging in physical activities. It should be noted though, that since the studies of Osuji et al. (2006), McGuire et al. (2016) and King et al. (2000) did not include comparisons with same-aged men, there is a possibility that barriers to physical activity, such as lack of time, might not be unique to women, and that perceived control over external factors could also be an equally important factor that influences physical activity of men at midlife.

Findings from other studies have suggested that perceived control over external factors, such as time, might be an especially important predictor of physical activity level for women, compared to men. For instance, Plotnikoff, Lubans, Penfold, and Courneya (2014) conducted a study using secondary data from the Alberta Diabetes and Physical Activity Trial (ADAPT) study (Plotnikoff et al., 2010), to investigate mediator variables of the ADAPT study’s intervention on increasing physical activity levels of men and women with Type 2 diabetes mellitus. Mediator variables investigated by Plotnikoff et al. (2014) included Theory of Planned Behaviour variables, such as intention to engage in regular physical activity, attitudes towards engaging in regular physical activity, perceived behavioural control and subjective norms (Ajzen, 1991), and the Protection Motivation Theory variable, barrier self efficacy (Rogers, 1975), which is also a variable of Social Cognitive Theory (Bandura, 2001). Perceived behavioural control measured participants’ level of confidence and control over engaging in regular physical activity over the following six months, and a sample item for
measuring this construct was “How much personal control do you feel you have over participating in regular physical activity in the next 6 months?” Hence, perceived behavioural control also measured the concept of perceived control over external factors. Barrier self-efficacy measured participants’ level of confidence in overcoming barriers against physical activity, including barriers such as feeling a little tired, time demands of physical activity and inclement weather. As the ADAPT intervention was only found to be efficacious among the female participants, Plotnikoff et al. (2014) conducted their analysis of the secondary data on a subsample of 93 ADAPT female participants with a mean age of 59.6 years. It was found that among the 14 mediator variables that were investigated, intention, perceived behavioural control and barrier self-efficacy were significant mediators of the effects of the intervention on physical activity levels. Moreover, a separate analysis using data from male participants of the ADAPT study was conducted to investigate if there were differences in underlying mechanisms of change in physical activity levels, and it was revealed that while barrier self-efficacy was also a significant mediator among men, perceived behavioural control was not a significant mediator. This finding that among individuals with Type 2 diabetes mellitus, perceived behavioural control was a significant predictor of physical activity among women, but not men, suggests that controlling for possible limitations in physical ability for physical activity, a sense of control over physical activity behaviour might be especially relevant in influencing women’s physical activity levels given conventional demands of familial obligations on midlife women. The finding that it was perceived behavioural control, and not barrier self-efficacy, that was relevant to women but not men further suggests that given the multiple barriers to physical activity found among midlife women (King et al., 2000; McGuire et al., 2016; Osuji et al., 2006), perhaps an overall sense of personal control over physical activity behaviour, that could be measured by perceived control over all external factors that influence physical activity, might be more relevant in influencing physical activity behaviour of women, compared to confidence in overcoming specific barriers, measured by barrier self-efficacy, as there could be many as yet unexpected barriers that
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might come into existence due to women’s familial obligations.

Besides evidence found among American women for lack of time being a barrier to physical activity (King et al., 2000; Osuji et al., 2006), lack of time has also been found to be a frequently perceived barrier to physical activity among Chinese midlife women. In their study that investigated motives for and barriers to physical activity, Sit et al. (2008) measured perceived barriers to physical activity with the Physical Activity for Risk Reduction, a 23 item instrument that measures barriers to physical activity in six categories on a scale of 1 (never) to 5 (very often), with higher scores indicating higher frequencies of a factor being perceived as a barrier to physical activity (Guan & Zhu, 1999). Self-reported physical activity was measured with the Stage of Change Measure (Marcus, Selby, Niaura, & Rossi, 1992), and in this study, more physically active women were defined as those in the preparation, action and maintenance stages, which referred to engaging in moderate intensity physical activities for at least five times a week or vigorous physical activities for at least three times a week for a period of less than a month to at least seven months. Sit et al. (2008) found that Chinese women, aged 30 to 59, for whom familial and work commitments are major responsibilities (Bee & Boyd, 2002), ranked the lack of time as the barrier that they most frequently perceive with regards to engaging in physical activity, with the second and third most frequently perceived barriers being lack of resources and lack of support from family and friends. It was also found that more physically active women, compared to their less physically active counterparts, indicated lower levels of perceived barriers to physical activity for all categories of barriers (Sit et al., 2008), suggesting that even among women who faced similar time constraints, those who had higher levels of perceived control over external factors such as their schedules were able to incorporate physical activity into their daily lives, compared to those who felt overwhelmed by the lack of time. Nevertheless, given the cross sectional nature of this study, the association between lower levels of perceived barriers and higher levels of physical activity could also suggest that successful performance of physical
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dactivity contributes to higher levels of confidence in women to overcome time constraints, and further research is needed to disentangle the temporal relationship between perceived control over external factors and behavioural performance.

**Subjective norms**

Another factor within the TPB framework that might exert an influence on physical activity behaviour through its influence on intention is subjective norms. Subjective norms refer to social pressure that one perceives to either perform or not perform a particular behaviour (Ajzen, 1985, 1988, 1991). This social pressure is received from people whose opinions regarding the behaviour one values, known as important referents. In the literature regarding social norms on behaviour, a distinction has been made between injunctive norms and descriptive norms. Injunctive norms refer to how much one perceives that important referents think one ought to perform a desirable behaviour, or not perform an undesirable behaviour. Descriptive norms refer to how common the behaviour is perceived to be among important referents (Deutsch & Gerard, 1955). Subjective norms can be understood as a manifestation of injunctive norms.

The strength of subjective norms is also believed to be influenced by the normative beliefs one holds regarding the behaviour. Normative beliefs are conceptualised as the product of how much one perceives important referents to approve or disapprove of one engaging in a particular behaviour, and how much one wants to comply with such perceived expectations. The stronger one’s normative beliefs are regarding the behaviour, the more one’s behavioural intention will be influenced by subjective norms regarding the behaviour (Ajzen, 1988, 1991). Although subjective norms could be understood as social pressure, they could also be interpreted as social support to perform the behaviour, received from people.
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whose opinions are valued.

With regard to physical activity, there are various reasons for midlife women to perceive social pressure to engage in this behaviour. Segar, Eccles, Peck, and Richardson (2007) conducted a cross-sectional study among 258 midlife American women, aged 40 to 60, to investigate the relationship between types of physical activity goals and types of behavioural regulation. Participants selected from a list of 18 physical activity goals that were obtained from a literature review the three goals that were most important to them, as well as one goal among the three selected that was the most important of all. Participants also selected three goals that were least important to them, as well as one goal among the three selected that was least important to them. Participants’ introjected regulation for physical activity was also measured on a scale ranging from one to seven, by two items asking participants how much they feel that they should engage in physical activity and how much they would feel guilty not engaging in physical activity, bearing in mind the physical activity goal that was most important to them. Additionally, intrinsic motivation was measured, also on a scale of one to seven, with two items asking participants how much they enjoy and how much they like pursuing the physical activity goal that was most important to them.

Introjected regulation is a type of extrinsic behavioural regulation which motivates individuals to engage in a behaviour, such as physical activity, because they feel that they should be, due to partially internalised social pressure to engage in the behaviour, while intrinsic behavioural regulation motivates individuals to engage in a behaviour because of the inherent sense of enjoyment and satisfaction derived from engaging in the behaviour (Ryan & Deci, 2002). Segar et al. (2007) found that health-related physical activity goals, endorsed by 40% of the participants, as well as weight-related goals, endorsed by almost a third of the participants, were associated with high levels of introjected regulation, compared to goals related to a sense of well-being or stress-reduction. The authors explained that midlife American women might have perceived social pressure from media messages that encourage the achievement of a socio-culturally idealised body type through exercise (Blaine &
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McElroy, 2002), or advice from health professionals to exercise for health or weight-loss reasons (Williams, 2002), to adopt health or weight-related physical activity goals as their motivation for physical activity. The findings thus suggest that sources of social pressure to engage in physical activity could come from the media or health experts, and reasons for perceiving this social pressure could be related to the health benefits or weight-loss effects that have been communicated to be benefits of physical activity.

Research has produced mixed results for the role of subjective norms in influencing physical activity intention and behaviour. In a cross-sectional study using data obtained from 3965 Australian midlife and older adults aged 55 to 65, with a mean age of 60.3 (SD = 3.2 years) and among whom approximately half were women, Van Dyck, Teychenne, McNaughton, De Bourdeaudhuij, and Salmon (2015) found that perceived social support from family and friends to engage in physical activity was significantly associated with higher levels of walking and cycling for commuting, leisure-time walking, as well as leisure time moderate to vigorous physical activity. In addition, White et al. (2012) found evidence for the short-term distal influence of subjective norms on physical activity via the mediator of intention. The authors conducted an intervention study that aimed to increase healthy eating and physical activities among a sample of 183 Australian older adults diagnosed with either Type 2 diabetes or cardiovascular disease. The intervention targeted the TPB variables of attitudes, perceived behavioural control, subjective norms and intention, as well as planning skills to facilitate behaviour change. TPB variables, as well as self-reported healthy eating and physical activity behaviours were measured pre-intervention, one-week post-intervention, and six weeks post-intervention. It was found that at one-week post-intervention, subjective norms significantly predicted intention, which in turn significantly predicted self-reported physical activities (White et al., 2012), providing support for the distal influence of subjective norms on physical activity behaviour within a relatively short time frame. However, the authors did not conduct meditational analyses for TPB variables one week post-intervention on physical activity behaviour at six weeks post-intervention, hence conclusions could not be
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drawn from this study on the distal influence of subjective norms on physical activity
behaviour within a longer time frame.

Other studies that have investigated the influence of subjective norms over longer
periods of time have not found evidence in support of the distal effect of subjective norms on
physical activity. For instance, in his study of British participants aged 16 to 65, Armitage
(2005) found that, although subjective norms were a significant predictor of intention,
intention was not a significant predictor of physical activity behaviour over 12 weeks,
suggesting that subjective norms might have limited distal influence on physical activity
behaviour that is operationalised over longer, versus shorter, follow up periods. In addition,
in their study on TPB factors that predict physical activity behaviour of first year Canadian
university students, Kwan, Bray, and Martin Ginis (2009) found that, although subjective
norms were a significant predictor of intention, intention was not a significant predictor of
physical activity behaviour at eight-week follow-up. Kwan et al. (2009) suggested that,
although first year university students might be positively influenced by their peers, and
might have started the semester intending to engage in physical activities, the demands of
adjusting to university life might have interfered in their efforts to translate this intention into
actual physical activity behaviour during the semester.

Among a specific sample of midlife women, Fortier et al. (2009) found that subjective
norms measured at baseline significantly predicted baseline levels of intention to increase
physical activity. Baseline levels of intention to increase physical activity measured also
significantly predicted change in physical activity behaviour over a six-month follow-up
period (Fortier et al., 2009), providing some evidence for the distal influence of subjective
norms on physical activity behaviour over a longer time period. However, Fortier et al.’s
findings (2009) should be interpreted with caution as physical activity levels at six-month
follow-up were only measured once with self-reported levels of physical activity in the month
preceding the time of follow-up, instead of consistent recordings of physical activity levels at
regular intervals during the six-month follow-up period. Therefore, it is not possible to rule
out the explanation that subjective norms were only able to exert a proximal effect on baseline intentions, and that the increase in physical activity in the month preceding the time of follow-up might not be a distal effect of baseline subjective norms via baseline intention to increase physical activity level over the following six-months. The mixed findings on subjective norms thus suggest that although subjective norms have been demonstrated to be a significant predictor of behavioural intention, more research needs to be done to investigate the distal influence of subjective norms on actual behaviour, especially for longer time frames.

On the other hand, there is emerging evidence suggesting that perceived societal expectations, which give rise to social pressure not to make time for personal needs such as physical activity, might act as barriers to physical activity for many midlife women (Hendry, Solmon, Choate, Autrey, & Landry, 2010). For example, data from a qualitative study of 20 midlife women residing in the United States suggested that societal expectations of women in their roles as mothers could act as barriers to physical activity, when women perceive that taking time off caregiving duties to attend to personal needs such as physical activity might be frowned upon (Hendry et al. 2010). Due to the mixed findings on the role of subjective norms as a distal predictor of physical activity (Armitage, 2005; Fortier et al., 2009; Kwan et al., 2009; White et al., 2012), as well as the emerging evidence that points to the importance of societal expectations as an influence of physical activity behaviour (Hendry et al., 2010), this thesis focuses on subjective norms in the investigation of social influences on physical activity levels of midlife women. As many previous studies investigating the influence of TPB variables on physical activity behaviour were conducted among sample populations which either did not include, or were not focused on, midlife women, there is a need for further research to investigate the role of subjective norms in influencing physical activity levels over longer time periods in the specific population of midlife women.
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The role of subjective norms in influencing physical activity under specific cultural contexts also requires further investigation. In particular, the majority of studies (e.g. Armitage, 2005; Kwan et al., 2009; White et al., 2012) within the literature on TPB and physical activity have been conducted on populations within Western cultures. However, given that collectivist cultures tend to emphasise group goals over individual goals (Triandis, 1989) it is possible that subjective norms might exert a greater distal influence on physical activity behaviour over the longer term among individuals who identify with more collectivist values. Indeed, research by Rentzalas (2009) found that among participants with a mean age of around 22 years, self-construals, which refer to how individuals define the self, moderated the relationship between subjective norms and self-reported physical activities. Participants who had interdependent self-construals, and defined themselves according to their relationships with others, were more likely to be influenced by subjective norms to engage in physical activities. In addition, Hagger et al. (2007) found in their cross-cultural study investigating the generalizability of the TPB in predicting physical activity behaviour among high school students from Britain (n = 432), Estonia (n =268), Greece (n = 150), Hungary (n =235) and Singapore (n =133), that while intentions predicted self-reported physical activity for all five cultures, subjective norms were a significant predictor of intention only for Hungarian students, but not students from the other four countries. Hagger et al. (2007) suggested that the relative importance of subjective norms in influencing intention among Hungarian students could be attributed to the collectivistic nature of Hungarian culture. However, it should be noted that Hagger et al.’s (2007) hypothesis of subjective norms having relatively greater influence within collectivistic cultures was only partially supported as subjective norms were not a significant predictor of intention within the Singaporean context, which the authors included in the study as an example of another collectivistic culture. Given the mixed findings of Hagger et al. (2007), as well as the age group of the participants in Hagger et al. (2007) and Rentzalas (2009), further research is needed to investigate if subjective norms exert a stronger distal influence on physical activity behaviour.
Improving attitudes to ageing to increase physical activity among midlife women who identify with collectivistic versus individualistic cultures. In addition to possible differences between collectivistic and individualistic cultures in magnitude of influence of subjective norms on physical activity behaviour, attitudes towards physical activity could also differ as a function of culture, with implications for level of influence of subjective norms on physical activity behaviour. While Asian midlife women tend to be discouraged from participating in outdoor physical activities since childhood and perceive suitable physical activities as those that are integrated into daily household chores, such as cleaning, and walking for transport purposes, Caucasian women might prefer to participate in physical activities that they have made time for, such as going to the gym or for a hike (Im et al., 2012). Moreover, while Asian midlife women prioritise socialising within their own cultural communities (Im et al., 2012), Caucasian women tend to prioritise engaging in physical activity for the enjoyment that they derive from physical activities (Berg, Cromwell, & Arnett, 2002). Nevertheless, regardless of cultural background, a major barrier against physical activity for midlife women is a lack of time when they are faced with various family commitments (Im et al., 2012; King et al., 2000). Against this context of time constraints, Asian midlife women might be able to demonstrate higher levels of physical activity, compared to Caucasian midlife women, if they perceive social pressure to do so, from important referents such as health professionals, by incorporating more physical activities such as walking and household chores into their daily routines. On the other hand, given the relative importance attached to deriving fun and enjoyment from physical activities, subjective norms might not be able to exert such a great influence on physical activity levels of Caucasian women if they are unable to find time for physical activities that they especially enjoy.
Conclusion

This chapter has reviewed theories of behaviour for non-autonomous and autonomous behaviour change, with a specific focus on the TPB and its extended variations. Individual factors within the extended TPB have also been introduced and their validity in predicting physical activity behaviour and intention for physical activities reviewed. The role of culture in shaping attitudes to physical activity and influencing level of importance of subjective norms among midlife women has also been discussed. Attitudes and subjective norms could thus be understood as factors with contextual influences from one’s sociocultural environment, such as culture, while perceived self-efficacy and perceived control over external factors are individual-level factors that are influenced by individual perceptions of internal and external resources that facilitate the behaviour. For example, among midlife women who have started experiencing the physical effects of ageing, self-efficacy might be an especially important factor influencing physical activity levels. For midlife women who are experiencing higher levels of family commitments, compared to younger or older individuals who do not have child rearing responsibilities, perceived control over external factors might become especially important. Level of perceived control over external factors, one of which is lack of time (Osuji et al., 2006), might be one of the most significant predictors of physical activity behaviour for midlife women, as middle adulthood is a developmental phase when women tend to juggle various familial and work commitments (Lachman et al., 1994). Theories of behaviour for autonomous behaviour change are therefore most appropriate for understanding factors influencing physical activity levels of midlife women as midlife women’s increase in physical activity levels would require conscious planning that allocates time for physical activities within their busy schedules. Among the theories of behaviour for autonomous behaviour change, the most established are the TPB and extended variations of the TPB, which also reflect how culture influences physical activity behaviour via its influence on attitudes and subjective norms. The next
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chapter will introduce the concept of attitudes to ageing, and factors influencing attitudes to ageing, including age stereotypes that differ from culture to culture.
Chapter 4: Attitudes to ageing and their relevance for understanding physical activity levels among midlife and older adults

Overview

In the last chapter, theories of behaviour and their utility in understanding physical activity levels and changes in physical activity were reviewed, with a particular focus on the TPB and the Extended TPB. Although the TPB (Ajzen, 1985, 1988, 1991) and Extended TPB (Armitage, 2005; Armitage & Conner, 1999; Ajzen, 1985, 1988, 1991) are among the most established frameworks employed to investigate factors influencing physical activity levels, they have mainly been employed to investigate sample populations over a wide age range (e.g. Armitage, 2005) or with adolescent and university student populations (Wang & Zhang, 2015; Kwan et al., 2009), and there is limited research that has focused specifically on midlife women. A particular focus of this thesis is on the potential role of attitudes to ageing in influencing physical activity levels of midlife women, in addition to the roles of perceived self-efficacy, perceived control over external factors and subjective norms. Research suggests that positive attitudes to ageing activate health behaviours, such as physical activity, in older adults. (Levy & Myers, 2004). A comprehensive understanding of factors influencing physical activity levels of midlife women, who are starting to experience the physical effects of ageing (Brown et al., 2015), might therefore only be enhanced by an understanding of how attitudes to ageing influence physical activity levels within the framework of the Extended TPB.

In this chapter, attitudes to ageing will be discussed, and their potential role in influencing physical activity levels of midlife and older adults reviewed. Specifically, different definitions of attitudes to ageing and instruments used to measure attitudes to ageing, including the Attitudes to Ageing Questionnaire (AAQ) (Laidlaw et al., 2007), will
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be introduced. Factors that shape attitudes to ageing, including demographic factors and sociocultural influences, will also be reviewed. In addition, studies that suggest a role of attitudes to ageing in influencing physical activity levels among older adults will be reviewed, with a particular focus on how these study findings could also be applicable to midlife women.

**Defining attitudes to ageing**

The term ‘attitudes to ageing’ can refer to how individuals view their own ageing experiences (Gething, 1994; Laidlaw et al., 2007; Lawton, 1972; Sarkisan, Hays, Berry, & Mangione, 2002), or how individuals view older adults (Fraboni, Saltstone, & Hughes, 1990; Palmore, 1977). This thesis focuses on the former. Definitions for attitudes to ageing have evolved over the past five decades. Lawton (1972) defined attitudes to ageing as a reflection of the inner states of older adults. Sarkisian et al. (2002) defined attitudes to ageing as older adults’ expectations of their own physical and mental functioning in late adulthood. Gething (1994) defined attitudes to ageing as individuals’ evaluations of their own ageing experiences. The work of Laidlaw et al. (2007) contributed further knowledge to the literature by providing a more comprehensive conceptualisation of attitudes to ageing as positive or negative evaluations of one’s own ageing experiences in the three domains of physical change, psychosocial loss and psychological growth. The physical change domain refers to evaluations of one’s overall experience of ageing, the importance that one attaches to physical activity as a means of health maintenance, and also captures one’s expectations of physical functioning as one ages. The psychosocial loss domain refers to evaluations of perceived losses in one’s social connections and the corresponding psychological impact during the ageing process, while the psychological growth domain refers to evaluations of positive aspects of ageing, including growth and life satisfaction (Laidlaw et al., 2007). By reflecting expectations of physical functioning, as well as both positive and negative psychological states during the ageing process, Laidlaw et al.’s conceptualisation (2007) of
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attitudes to ageing is thus one of the most comprehensive conceptualisations in the literature.

To measure these various conceptualisations of attitudes to ageing, a number of different instruments have been developed. The Expectations Regarding Aging (ERA)-38 survey was developed to measure expectations regarding ageing (Sarkisian et al., 2002). The ERA-38 survey consists of 38 items that measures expectations regarding ageing in ten domains including General Health, Cognitive Function, Mental Health and Pain, and has been validated among 429 community-dwelling English-speaking (mostly Caucasian) adults aged 65 and above, who were living in Los Angeles, United States. (Sarkisian et al., 2002). Although it demonstrated satisfactory internal consistency reliability, with Cronbach’s alphas exceeding .70 for nine out of its ten subscales, (Sarkisian et al., 2002), there are several limitations to the ERA-38 survey. Firstly, the Pain subscale demonstrated low internal consistency reliability (Sarkisian et al., 2002). Secondly, the ERA-38 survey has not been validated among samples within non-English speaking cultures. The ERA-38 survey also does not capture older adults’ expectations regarding relatively subjective aspects of ageing, such as maintaining an active social life and having life satisfaction, which are generally included in definitions of healthy ageing (Phelan & Larson, 2002). The Philadelphia Geriatric Centre (PGC) Morale Scale is another instrument that has been developed to measure attitudes to ageing (Lawton, 1972). The PGC Morale Scale, which consists of 22 items, measures the inner states of older adults with six subscales, namely Attitudes to Own Aging, Agitation, Lonely Dissatisfaction, Acceptance of Status Quo, Optimism and Surgency. However, studies that attempted to validate the PGC Morale Scale (Lawton, 1975; Morris & Sherwood, 1975) have found that only the subscales of Attitudes to Own Aging, Agitation and Lonely Dissatisfaction were stable and replicable.

Besides these two instruments, the Attitudes to Ageing Questionnaire (AAQ) (Laidlaw et al., 2007) is another instrument developed to measure attitudes to ageing, and it is one of the best validated measures of attitudes to ageing. The AAQ was developed to address the lack of instruments that reflect not only negative aspects of ageing, but also positive
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aspects such as continual growth and development (Laidlaw et al., 2007), which would provide a more comprehensive understanding of how older adults actually view their own ageing experiences (Vaillant, 2002). Following a field trial during which a pilot version of the AAQ was administered among 5566 participants aged 60 and above, the data was submitted to factor analysis and item-reduction, which confirmed a three-factor solution with the three corresponding subscales of physical change, psychosocial loss and psychological growth with eight items each. The 24-item AAQ has been validated in many different cultures, including American, Australian, Chinese and Japanese (Laidlaw et al., 2007; Laidlaw, Wang, Coelho, & Power, 2010), and has also been validated for use with midlife women (Brown et al., 2015). In a study using data from a sample of 259 older women, aged 60 to 98, and a sample of 517 midlife women aged 40 to 60, Brown et al. (2015) found that the AAQ measured the same attitude constructs using the same measurement scale among both groups of participants, older women and midlife women, demonstrating the validity of the AAQ in measuring the attitudes to ageing of midlife women.

Individual level factors that shape attitudes to ageing

Many factors have been shown to shape attitudes to ageing, and these include societal level factors, as well as individual level factors. Among individual level factors that have been investigated, demographic factors have been found to be associated with attitudes to ageing. In a study investigating the association between attitudes to ageing, and physical and mental health among 421 older adults living in rural Australia, aged 60 and above, Bryant et al. (2012) found that having a partner was associated with more positive attitudes to ageing in the psychosocial loss and psychological growth domains. Bryant et al. (2012) suggested that these findings could be explained by Pressman and Cohen’s findings (2005) that having a partner not only acts as a direct source of positive emotion, but also buffers against the stress of socio-emotional losses associated with ageing. In addition, Bryant and colleagues (2012)
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found that higher socioeconomic status was associated with more positive attitudes in the physical change and psychosocial loss domains.

Another relatively stable factor, personality traits, (Berg, Hassing, Thorvaldsson, & Johansson, 2011), has also been found to be associated with attitudes to ageing. For instance, Moor, Zimprich, Schmitt, and Kliegel (2006) found in their study of 362 German older adults, aged 60 to 64, that individuals who reported higher levels of neuroticism had more negative self-perceptions of ageing. In addition, Bryant et al. (2016) found in their study of 419 Australian older adults aged 60 and above that self-reported personality traits at baseline were significantly associated with attitudes to ageing as measured by the AAQ at ten-year follow-up. In particular, higher levels of extraversion and agreeableness at baseline predicted more positive attitudes in the psychosocial loss domain at follow-up, suggesting that having more interpersonal relationships, that might be facilitated by being more extraverted and agreeable, could buffer against feelings of loss of socio-emotional connections during the ageing process. In addition, higher levels of openness at baseline predicted more positive attitudes in the physical change domain at follow-up, suggesting that flexibility in adapting to physical changes that accompany the ageing process and receptiveness to new perspectives might facilitate how one could view ageing positively despite physical decline (Bryant et al., 2016).

Levy (2008) found evidence for the personality trait of rigidity as a significant predictor of negative self-perceptions of ageing, with negative ageing stereotypes partially explaining why higher levels of rigidity predict more negative self-perceptions of ageing. In a study conducted among 405 American men and women, aged 50 to 84 at baseline, Levy (2008) found that higher levels of rigidity measured at baseline predicted more negative ageing stereotypes, and that more negative ageing stereotypes at baseline predicted more negative self-perceptions of ageing, over a 20-year follow-up period. In Levy’s study (2008), rigidity was measured by the Rigidity Scale (Gough, 1969), with items such as “There is usually only one best way to solve a problem.” Ageing stereotypes were measured by the
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Stereotype Scale (Atchley & Stanley, 1997) which assessed participants’ stereotypes regarding retirement, a salient phase during the ageing process (Neugarten, 1996). Self perceptions of ageing were measured by the Attitudes toward Own Aging Subscale (Liang & Bollen, 1983), with a sample item being “Things keep getting worse as I get older.” Levy (2008) also found that negative ageing stereotypes at two-year follow-up partially mediated the relationship between baseline level of rigidity and subsequent self-perceptions of ageing measured in four waves from four to 20-year follow-up. On the other hand, higher baseline levels of flexibility, which were indicated by lower scores on the measure for rigidity, were found to significantly predict less negative ageing stereotypes (Levy, 2008). Levy (2008) suggested that individuals who are more rigid, and have less tolerance for ambiguity (Frenkel-Brunswik, 1949), have a higher tendency to categorise people using existing societal stereotypes. Thus, more rigid individuals tend to accept and internalise predominantly negative age stereotypes that exist within American society, while individuals who are more flexible tend to question these stereotypes and might subsequently reject them. She also argued that during the ageing process, internalised ageing stereotypes become relevant to the self, shaping how one perceives one’s own ageing experiences. Negative ageing stereotypes become self-fulfilling prophecies for older adults with higher levels of rigidity, as they are more likely to behave in ways that conform to the age stereotypes that they are already familiar with, and less likely to revise their self-perceptions of ageing based on their actual ageing experiences (Levy, 2008).

Complementing studies that demonstrate how relatively stable factors, such as demographic factors and personality traits, are associated with attitudes to ageing, relatively transient factors, such as physical and mental well-being, including level of depression, have also been found to be associated with attitudes to ageing. In a study reporting the development and validation of the Brazilian version of the AAQ, among 424 Brazilian older adults, aged 60 and above, Chachamovich, Fleck, Trentini, Laidlaw and Power (2008) found that level of depression measured by the Geriatric Depression Scale 15-item version (Sheik &
Yesavage, 1986) was a significant factor predicting attitudes to ageing measured by the AAQ, with lower levels of depression predicting more positive attitudes to ageing. In addition, Bryant et al. (2016) found that better self-rated physical health at baseline, as well as more positive changes in self-rated mental health and less deterioration in self-rated physical health over a ten-year period, predicted more positive attitudes to ageing in the physical change and psychosocial loss domains at ten-year follow-up. In this study, the Medical Outcomes Short Form 12 (Ware, Kosinski, & Keller, 1996) was used to measure self-rated health, with the subscales of Physical Component Summary and Mental Component Summary measuring physical and mental health respectively.

Moreover, research suggests that among the various individual level factors, physical health and the personality trait of neuroticism might be particularly important predictors of attitudes to ageing among the midlife population, compared to the older adult population. In a study conducted in Germany among 501 midlife participants, aged 40 to 42 at baseline and among whom 408 continued in the study until 12-year follow-up, and 500 older adults aged 60 to 62 at baseline, among whom 352 continued in the study over a 12-year follow-up period, Miche, Elsässer, Schilling and Wahl (2014) found that while significant variation among trajectories of attitudes to ageing was not found in the older adult sample, there were significant inter-individual differences found among trajectories of attitudes to ageing in the midlife sample over a 12-year follow-up period. Moreover, trajectories in objective physical health, measured by in-depth medical check-ups conducted by one to two geriatricians at baseline, four-year follow-up and 12-year follow-up, predicted changes in attitudes to ageing over the same period, measured with the Attitudes to Own Aging subscale of the PGC Morale Scale (Lawton, 1972). Level of neuroticism at baseline, measured by the German version of the NEO Five-Factor Inventory (Borkenau & Ostendorf, 1993), predicted level of attitude to ageing at baseline for the midlife sample, but not the older adult sample. Although there was only partial evidence for measurement invariance of the Attitudes to Own Aging subscale for the older adult and midlife samples, these findings nevertheless suggest that negative
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devlopments in physical health might influence attitudes to ageing to a greater extent for the midlife population, for whom physical decline might still be a relatively new experience, compared to older adults who might view new diagnoses of diseases as an inevitable experience of ageing (Miche et al., 2014). In addition, the effects of neuroticism might be particularly salient in midlife, compared to late adulthood, in predicting attitudes to ageing, as individuals with higher levels of neuroticism might tend to attend to ambiguous age-related losses, and view transitions in midlife as negative experiences related to the ageing process, compared to midlife individuals with lower levels of neuroticism (Miche et al., 2014).

**Societal level factors that shape attitudes to ageing**

In addition to individual level factors, societal level factors, such as culture and demographic structure, have been found to shape attitudes to ageing.

**Stereotype Embodiment Theory**

The idea that attitudes to ageing are shaped by our cultural background, and are likely to differ as a function of cultural identification, has been developed through the work of Levy and colleagues (Levy, 1996; Levy & Langer, 1994), and was first posited by Levy (2009) with reference to her Stereotype Embodiment Theory. Levy (1996) conducted two studies that investigated the effects of priming age stereotypes on memory performance, self-efficacy for memory abilities, and implicit and explicit views on ageing, among the respective samples of 90 American older adults aged 60 to 90, and 60 younger American individuals aged 18 to 35. In the first study, it was found that older adults who were in the implicit intervention condition, and had been primed with words that described positive age stereotypes, such as “wise”, demonstrated post-intervention improvements in three out of five memory tasks, while participants in the implicit intervention condition who were primed with words describing negative age stereotypes, such as “senile”, demonstrated post-intervention decline in the same tasks. In addition, it was found that compared to the implicit intervention,
two explicit interventions that provided participants with positive feedback on baseline memory performance and respectively attributed performance to the effort of the participants, an internal cause, and a memory-enhancing light bulb that was present, an external cause, did not have an effect on post-intervention memory performance of the older adults assigned to these explicit intervention conditions. It was also found that implicit intervention condition participants who were positively primed had higher levels of self-efficacy for one of the memory tasks, photo recall, and more positive implicit views on ageing, compared to implicit intervention condition participants who were negatively primed. However, regardless of whether participants were in the implicit intervention or the two explicit intervention conditions, they generally expressed predominantly negative explicit views on ageing.

Levy (1996) suggested that these findings collectively indicate that older adults had internalised both positive and negative age stereotypes that exist within American culture, and the positive primes had activated the corresponding positive age stereotypes, beyond the conscious awareness of implicit intervention condition participants, to positively influence their memory performance, possibly through the mediator of self-efficacy for memory ability. On the other hand, negative age stereotypes that were activated by negative primes influenced participants in the corresponding condition to experience decline in memory performance.

Stereotypes are views that are shared within a society and are readily activated (Steele, 1997). Age stereotypes refer to how older adults are viewed, and are likely to differ from culture to culture (Levy, 2009). For example, Lockenhoff et al. (2009) found that cultures with higher levels of self-expression, such as Australian and American cultures, have more positive age stereotypes with regards to learning new knowledge, compared to cultures such as Chinese culture. Moreover, the success of the implicit intervention over the explicit interventions in influencing memory performance of the older adults suggest that the age stereotypes, both positive and negative, that had been activated to influence memory performance, had already
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been internalised as they were only activated beyond conscious awareness. Given the predominance of negative, compared to positive, age stereotypes within American culture (Levy & Langer, 1994), the majority of internalised age stereotypes of the participants tend to be negative, as expressed in explicit views on ageing that tend to be negative. Thus, the explicit intervention condition attributing baseline memory performance to effort might not have succeeded in improving post-intervention memory performance as participants might have discounted the positive feedback on their memory ability as an anomaly due to the predominance of negative age stereotypes that have, over time, become beliefs about their own ageing experiences.

In the second study conducted by Levy (1996), it was found that neither positive nor negative primes of age stereotypes influenced post-intervention memory performance of the younger participants, suggesting that though the younger participants might have internalised both positive and negative age stereotypes, these internalised stereotypes were not relevant to their self-concepts yet, as ageing might still have been a distant concept to them. Thus, the findings in these two studies conducted by Levy (1996) collectively suggest that for older adults who are experiencing the ageing process, internalised stereotypes of older adults, both positive and negative, in turn influence how they view their own ageing experiences.

Moreover, findings from two studies conducted by Hess, Hinson and Statham (2004) provide further empirical evidence for the effects of activation of internalised age stereotypes on memory performance of older adults. Building on the work of Levy (1996), who found that priming of age stereotypes had an effect on the memory performance of older adults, in the specific memory tasks of immediate recall, learned recall, delayed recall, photo recall, and auditory recall, Hess et al. (2004) found that older adults who were implicitly primed with words illustrating negative age stereotypes, compared to words illustrating positive age stereotypes, had worse performances on a free-recall memory task, while this implicit priming effect was not observed among younger adults, for whom ageing was not personally
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relevant yet. Moreover, Hess et al. (2004) observed in their first study an attenuation of the priming effects of negative age stereotypes, among older adults who were in the explicit priming condition, compared to the implicit priming condition, suggesting that older adults might be able to counteract the activation of internalised negative age stereotypes when they were consciously aware that they were being primed. However, in their second study, older adults who had been explicitly primed with positive age stereotypes had similar memory performances compared to older adults in both the explicit and implicit priming conditions who were negatively primed (Hess et al., 2004). A possible explanation provided by Hess et al. (2004) for this finding was the additional study procedure of informing participants that the free-recall task was a memory test to investigate the effects of ageing on memory, suggesting that the memory performance of older adults who had been explicitly primed with positive age stereotypes had been negatively affected by pressure associated with high perceived expectations (Shih et al., 2002). The findings of Hess et al. (2004) thus provide further empirical evidence for psychosocial explanations, such as activation of age stereotypes, of the negative associations between age and memory.

Evidence for differences in age stereotypes as a function of culture comes from a study conducted by Levy and Langer (1994). In a cross-cultural study conducted to investigate the processes through which age stereotypes might be associated with memory performance in late adulthood, Levy and Langer (1994) found evidence for differences in views towards ageing among participants from two different cultures. The study investigated views towards ageing and memory performance on four memory tasks among 30 American adults without hearing impairment, 30 American adults who were hearing impaired and 30 Chinese adults without hearing impairment. Among each subsample of participants, half were younger adults aged 15 to 30 years, and half were older adults aged 59 to 91 years. Views towards ageing were measured by open-ended responses of descriptions that come to mind.
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when thinking of somebody old, which indicate salient images of ageing, and responses to a quiz regarding ageing, which reflect perceptions of specific physical and cognitive capabilities during the ageing process. A composite score for memory performance was derived from scores of four memory tasks, for which performance has previously been found to decline with increase in age (Schacter, Kaszniak, & Kihlstrom, 1991). The authors explained that given the prevalence of negative age stereotypes in mainstream American culture (Kite & Johnson, 1988), American adults who were hearing impaired were included in the study as they might be relatively less influenced by negative age stereotypes that dominate everyday conversation and the media, while Chinese adults were included in the study given previous research that suggested the prevalence of positive age stereotypes within Chinese culture (Ikels, 1991). Levy and Langer (1994) found that regardless of age, the Chinese participants had the most positive views towards ageing, followed by the hearing-impaired American adults, while the hearing American adults had the most negative views towards ageing, providing empirical evidence for the assertion of the Stereotype Embodiment Theory (Levy, 2009) that individuals internalise age stereotypes, that are likely to differ from culture to culture, over the lifespan, without the tendency to question these stereotypes, and that these internalised age stereotypes come to influence how they view their own ageing experiences when ageing becomes a self-relevant concept to them. Moreover, while there were no significant differences found among the memory performance of the younger participants from the three subsamples, there was a significant difference in memory performance among the older adults as a function of their culture. The Chinese older adults had significantly higher memory performance scores, compared to both the hearing-impaired American older adults and the hearing American adults, who had the lowest memory performance score. In addition, it was found that while the Chinese older adults had a lower memory performance score compared to the younger Chinese, this difference was not
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significant. Mediation analyses were also conducted, and views towards ageing were found to mediate the effect of culture on memory performance among the older participants. While culture was found to predict views towards ageing among the younger participants, their views towards ageing were not positively associated with their memory performance. Taken together, these findings suggest that age stereotypes, which might differ from culture to culture, shape views towards ageing which become personally relevant during the ageing process, influencing the amount of effort older adults invest in, and the number of adaptive strategies they use for cognitive functioning, to contribute to differences in memory performance in late adulthood (Levy & Langer, 1994).

Findings from epidemiological studies corroborate evidence from experimental studies to demonstrate, via physiological pathways, the association between age stereotypes that individuals hold over the lifespan, and their health and functioning in late adulthood. In a longitudinal study conducted among 386 American adults, aged 18 to 49 at baseline, Levy, Zonderman, Slade, and Ferrucci (2009) found that individuals who had higher than average negative age stereotype scores at baseline, compared to those who had average or below average scores, had a greater likelihood of experiencing a first cardiovascular event at all time points during a 38 year follow-up period. Moreover, analysis of a subset of 229 participants aged 18 to 39 at baseline and who had their first cardiovascular event after age 60, revealed that those who held more negative age stereotypes at baseline were more likely to experience a cardiovascular event at an earlier age compared to those who held more positive age stereotypes at baseline, suggesting that age stereotypes held more than two decades prior could predict cardiovascular health in midlife and late adulthood. In this study, the operationalisation of cardiovascular events included a wide range of diseases such as congestive heart failure, myocardial infarction and stroke. Age stereotypes were measured using the 16-item subscale of the Attitude Toward Older People Scale (Tuckman & Lorge,
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1953). By following the same participants over a period of over three decades, Levy et al. (2009) thus provided epidemiological evidence for the effect of age stereotypes internalised over the lifespan on cardiovascular health during the ageing process, and these findings in turn suggest the utility of improving age stereotypes of individuals at earlier life stages given how age stereotypes held earlier in life can have long term effects on health in late adulthood. Findings from a study conducted by Levy, Hausdorff, Hencke, and Wei (2000) suggested that internalised negative age stereotypes are positively associated with an increased risk of cardiovascular diseases in late adulthood (Levy et al., 2009), as older adults who had been primed with negative age stereotypes have been found to demonstrate heightened cardiovascular responses to stress (Levy et al., 2000), and prolonged periods of elevated cardiovascular responses to stress is in turn associated with increased risk of cardiovascular diseases (Levy et al., 2009).

In addition to physiological pathways, the Stereotype Embodiment Theory also posits that negative age stereotypes are associated with lower levels of physical functioning in late adulthood via psychological and behavioural pathways (Levy, 2009). In another longitudinal study, conducted among 546 American older adults aged 70 and above at baseline, Levy, Slade, and Gill (2006) found that both negative age stereotypes and external age stereotypes independently predicted screened hearing at 36 month follow-up. External age stereotypes referred to age stereotypes pertaining to external features, such as physical appearance, that were associated with older adults. It was found that, controlling for age and baseline screened hearing performance, older adults who had more negative baseline age stereotypes, as well as those with more external baseline age stereotypes, had significantly worse performances for screened hearing at 36 month follow-up. Levy et al.’s study (2006) thus highlights the importance of psychosocial factors such as age stereotypes that influence hearing function in late adulthood, and suggests how positive age stereotypes could facilitate hearing
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performance of older adults on three levels. Firstly, positive age stereotypes encourage older adults to utilise cognitive strategies that compensate for biological decline in hearing function during the ageing process (Picora-Fuller, 2003). Secondly, through physiological pathways, positive age stereotypes reduce levels of stress-induced cytokines that have a negative physiological effect on a range of physical functions, for example, hearing (Adams, 2002; Levy, Hausdorff, Hencke, & Wei, 2000; Miller, Cohen, & Ritchey, 2002). Thirdly and very importantly, through psychological pathways, positive age stereotypes reduce the likelihood of older adults conforming to internalised negative stereotypes that lead to expectations that decline in hearing function are an inevitable outcome of the ageing process (Levy, Slade, Kunkel, & Kasl, 2002), and facilitate behavioural pathways that increase the possibility of proactive help-seeking behaviour when older adults experience biological decline in hearing function. This help-seeking behaviour could in turn facilitate preservation of hearing function (Levy et al., 2006).

Drawing on the findings of studies (e.g. Levy, 1996; Levy & Langer, 1994; Levy et al., 2006; Levy et al., 2009) that suggest the influence of age stereotypes on health and functioning in late adulthood, Levy (2009) posited through the Stereotype Embodiment Theory that age stereotypes, which refer to stereotypes of older adults, are internalised by individuals over their lifespan, and have an influence on how they come to perceive their own ageing experiences. More importantly, negative age stereotypes that are internalised over the lifespan can have adverse effects on health outcomes in late adulthood through physiological, psychological and behavioural pathways. Moreover, Levy pointed out that these age stereotypes reflect cultural and socioeconomic values of a society, and are likely to differ across societies. The Stereotype Embodiment Theory thus explains how a society’s cultural values shape individuals’ perceptions of older adults, which is known as age stereotypes, and how age stereotypes can in turn influence individuals’ attitudes towards their own ageing
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experiences, on a level beyond conscious awareness, when they believe in these age stereotypes, with possible adverse health consequences in late adulthood (Levy, 2009).

*Societal level differences in stereotypes of older adults*

Studies conducted on attitudes towards older adults and views on ageing have provided support for variability in age stereotypes as a function of differences in sociocultural values and demographic factors. In their study of views on ageing among 3435 college students from 26 different cultures, Lockenhoff et al. (2009) found that cultures lower in power distance tend to have more positive views on ageing with regards to age-related changes in wisdom. Power distance refers to the level of acceptance of differences in power and status within a society (Hofstede, 1980), and countries with cultures lower in power distance include Australia, the United Kingdom, and the United States, while an example of a country with higher power distance is China (Hofstede, 2001). Lockenhoff et al. (2009) also found that cultures high in self-expression (Inglehart & Baker, 2000), such as Australia, the United Kingdom, and the United States (Inglehart & Norris, 2003), also tend to have more positive views on ageing with regards to new learning.

Besides sociocultural values, the demographic structure of a society has also been found to interact with sociocultural values to influence societal age stereotypes. Although traditional Confucian values of filial piety and respect for elders espoused by Chinese culture (Cuddy, Norton, & Fiske, 2005; Zhan, 1996) might suggest that age stereotypes would be more positive in Chinese society, compared to societies that emphasise individualism, such as American society (McConatha, Schnell, Volkwein, Riley, & Leach, 2003; Wang & Mallinckrodt, 2006), Luo, Zhou, Jin, Newman, and Liang (2013) found evidence contrary to this assumption. In their comparative study of 332 American and 980 Chinese college students, Luo et al. (2013) found that Chinese college students had more negative attitudes towards older adults, measured by the Fraboni Scale of Ageism (Fraboni et al., 1990), compared to their American counterparts. In addition, Luo et al. (2013) conducted focus
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groups among 12 of the 332 American students and 12 Chinese college students who were not among the 980 participating in the quantitative study, which provided further insights into the cultural and socioeconomic forces shaping attitudes towards older adults. Findings from the focus groups suggested that although the Chinese respondents had been brought up with Confucian values of filial piety, the obligations to take care of their aged parents implied by these values, coupled with demographic changes brought about by the one-child policy, had exacerbated their perceived stress of caring for their aged parents, and contributed towards the build-up of their resentment towards older adults. In contrast, the American college students interviewed did not express perceived stress from cultural norms to provide caregiving for their aged parents (Luo et al., 2013). Although the negative attitudes towards older adults expressed by Luo et al.’s Chinese participants are in contrast to the positive views towards ageing found among the Chinese participants, regardless of age, in Levy and Langer’s study (1994), this difference could be interpreted as a reflection of gradual changes in sociocultural values within Chinese society, rather than findings that contradict. As the one-child policy was only enacted in 1979, 15 years before Levy and Langer’s study was published, the socioeconomic effect of this policy would not have impacted the majority, if not all, of Levy and Langer’s participants yet, the youngest of whom would have been born during the year that the policy came into effect. On the other hand, Luo et al.’s findings, published almost two decades after Levy and Langer’s study, reflected the gradual interaction between the longer-term socioeconomic impact of the policy with traditional cultural values, which occurred over a span of two decades and was reflected through a shift towards more negative attitudes towards older adults.

Awareness of systematic differences in attitudes to ageing influenced by societal level factors is important for two reasons. Firstly, most studies conducted on attitudes to ageing tend to be based on Caucasian sample populations (Bryant et al., 2016; Bryant et al., 2012; Chachamovich et al., 2008; Moor et al., 2006; Sarkisian et al., 2007; Wolff et al., 2014). Awareness of how attitudes to ageing might differ on a macro level under different cultural
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contexts highlights the need to replicate these studies with sample populations of different cultural identification before conclusions can be reached in terms of generalisability of results across different cultural contexts. Although the intervention study of Bardach, Gayer, Clinkinbeard, Zanjani, and Watkins (2010), which aimed to increase possible future selves and expectations regarding ageing, had three African-American participants among its sample population of 22, the majority of the participants were Caucasian. In addition, the study did not examine if cultural differences among participants moderated intervention efficacy.

Secondly, with the growth of cross-cultural migration and multi-cultural communities that countries such as Australia and the United States are experiencing (Australia Bureau of Statistics, 2017; Migration Policy Institute, 2017), a more nuanced understanding of the interplay of factors, including cultural influences, that shape attitudes to ageing, is pertinent so that interventions that aim to improve attitudes to ageing can be designed in a more inclusive manner to increase their efficacy for individuals of different cultural backgrounds within the same community.

The association between attitudes to ageing and health

Understanding factors shaping attitudes to ageing is important as attitudes to ageing can affect both physical and mental well-being. In two studies investigating the association between negative age stereotypes, a sociocultural factor that shapes attitudes to ageing, and Alzheimer’s Disease biomarkers, Levy et al. (2016) found that age stereotypes measured at baseline predicted rate of decline of hippocampal volume over a ten year follow-up period, as well as the accumulation of amyloid plaques and neurofibrillary tangles following brain autopsies of the participants. Participants of both studies were subsamples of participants from the Baltimore Longitudinal Study of Ageing, a longitudinal study on ageing that followed individuals who were aged 20 and above and healthy at baseline across their lifespan. In the first study conducted among 52 participants, with an average age of 68.54
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years at first measurement of hippocampal volume, it was found that the hippocampal volume of participants who held more negative age stereotypes at baseline declined at a rate that was three times as fast as participants who held more positive age stereotypes at baseline. In the second study conducted among 74 participants with an average age of 88.75 years at time of brain-autopsy, it was found that participants who held more negative age stereotypes at baseline had significantly higher accumulation of amyloid plaque and neurofibrillary tangles at time of autopsy. Previous experimental studies have demonstrated the impact of priming negative age stereotypes on increasing stress levels in humans (Levy et al., 2000), and the positive association between stress and reduced hippocampal volume (Lee, Jarome, Li, Kim, & Helmstetter, 2009), and greater accumulation of amyloid plaque and neurofibrillary tangles in rats and mice (Ahmadian-Attari et al., 2015; Carroll et al., 2011). These two studies thus extend the findings of previous studies by providing epidemiological evidence that negative age stereotypes held by individuals who were healthy at baseline significantly predicted Alzheimer’s Disease biomarkers at follow-up, suggesting that internalised negative age stereotypes that are brought into salience by regular contact with ageist images in the social environment can act as chronic stressors that in turn have detrimental effects on brain health over time (Levy et al., 2016).

Attitudes to ageing have also been found to be associated with well-being and mental health at midlife and beyond. In a study investigating the association of attitudes to ageing with physical and mental health, Bryant et al. (2012) found that more positive attitudes to ageing in the psychosocial loss domain were associated with lower levels of anxiety and depression. More recently, Freeman et al. (2016) found among their sample of over six thousand midlife and older adults residing in Ireland, that higher levels of negative ageing perceptions significantly predicted the onset of anxiety and depression, as well as the persistence of anxiety and depression, at two-year follow-up. Among the specific population of midlife women, Brown et al. (2015) found that more negative attitudes to ageing in the psychosocial loss domain predicted higher levels of interference in daily living attributed to
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hot flushes, a menopausal symptom. In addition, among 429 women for whom baseline data for subjective well-being, collected 10 years prior, was available, it was found that more positive attitudes to ageing in the psychosocial loss domain predicted increases or stable levels of well-being across a 10-year period, while more negative attitudes to ageing predicted increases in levels of negative affect, and decreases in levels of positive affect and life satisfaction. In this study, level of interference attributed to hot flushes was measured by the Hot Flush Interference Scale, which measured interference in ten life domains on a scale of 0 (do not interfere) to 10 (completely interfere), and level of interference attributed to hot flushes was calculated by summing scores across the ten domains (Carpenter, 2001).

Subjective well-being was measured with the Positive and Negative Affect Schedule, which measures positive and negative affect (Watson, Clark, & Tellegen, 1988), as well as the Satisfaction with Life scale (Diener, Emmons, Larsen, & Griffin, 1985). The findings of Brown et al. (2015) suggest that attitudes to ageing also play a significant role in influencing physical and mental well-being among the midlife population, and as Brown et al. (2015) highlighted, attitudes regarding the psychosocial aspect of ageing can also have a profound impact on the physical well-being of midlife women undergoing the menopausal transition.

The association between attitudes to ageing and physical activity

Studies conducted by Levy and colleagues (Levy & Myers, 2004; Levy et al., 2002) provide insights into the mechanisms explaining the association between positive attitudes to ageing and health. Levy et al. (2002) found among a sample of 660 American adults, aged 50 to 94 at baseline, that more positive self-perceptions of ageing measured at baseline predicted an increase in lifespan of up to 7.5 years, after controlling for age, gender, socioeconomic status, functional health and loneliness. Self-perceptions of ageing were measured by the five-item Attitudes to Own Aging subscale (Liang & Bollen, 1983). In a follow-up study, it
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was further found that this positive relationship between self-perception of ageing and longevity was partially mediated by will to live (Levy et al., 2002). Will to live was defined as a perception of the benefits of living outweighing the perceived hardships of living and was measured by three semantic differential items, with perceptions of retirement life as full, hopeful and worthy indicative of a stronger will to live. Shedding further light on the mechanisms via which positive self-perceptions of ageing contribute to longevity, Levy and Myers (2004) found that among a sample of 241 American adults aged 50 and above, positive self-perceptions of ageing at baseline predicted more preventive health behaviours, such as exercise, over a 20-year period. These findings indicated that midlife and older adults who did not tend to attribute illness as an inevitable part of ageing were more likely to engage in health behaviours such as exercise and consuming a healthy diet. Nevertheless, the authors acknowledged that given the predominantly Caucasian sample, generalisability of the study’s findings to individuals of other cultures is limited, as it is unclear how views on ageing would differ as a function of culture, and how they would interact with culture to influence health behaviours (Levy & Myers, 2004).

A small number of studies featuring interventions have demonstrated that it might be possible to increase physical activity levels through improving how one views his or her own ageing process. In a pilot study of 46 American adults aged 65 and above, Sarkisian et al. (2007) found that an intervention to increase participants’ expectations of their physical functioning during late adulthood led to an increase in their number of steps walked post-intervention. The intervention was designed using the theoretical framework provided by Weiner’s attribution theory of achievement motivation (1985), which posits that individuals attribute successes and failures to factors across the dimensionalities of locus of control, stability and controllability, with factors perceived as stable and uncontrollable reducing motivation for behavioural achievement. As sedentary behaviour among older adults is often attributed to old age (Sarkisian, Prohaska, & Mangione, 2003), which is a stable and
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uncontrollable factor, it was posited that an intervention to encourage attribution of sedentary
behaviour to lifestyle choices instead, which would be controllable and changeable, and thus
unstable, might increase physical activity levels among sedentary older adults (Sarkisian et al.,
2007). The intervention consisted of four one-hour weekly sessions during which trained
health educators facilitated discussions among participants and emphasised the message that
sedentary behaviour should be attributed, to the greatest extent possible, to controllable
causes and should not be viewed as an inevitable outcome of old age (Sarkisian et al., 2007).
The discussion session was followed by one-hour physical activity training sessions which
included training in strength, endurance and flexibility ((Sarkisian et al., 2007). Despite the
encouraging results of this study, the findings should be interpreted with caution as the study
did not have a control group.

A further investigation of attitudes to ageing and physical activity was undertaken by
Wolff et al. (2014). The authors found that among a sample of 234 German adults aged 65
and above, participants who had attended a one-session intervention to increase physical
activity, which included a component to promote positive views on ageing, demonstrated
more positive attitudes towards older adults in terms of viewing late adulthood with a broader
future time perspective, compared to participants who participated in sessions without the
component to promote positive views on ageing. In this intervention, the intervention to
increase physical activity included features such as information on the benefits of physical
activity in general and during late adulthood, goal-setting, action-planning, a short video
featuring a role model, to facilitate participants’ self-efficacy, and information on
opportunities for accessible physical activities for older adults. The additional component to
promote views on ageing included explanations on how positive views on ageing are
positively associated with health, as well as evidence-based information dispelling false
perceptions of ageing, such as older adults being incapable of learning new information. In
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In addition, participants were taught a cognitive technique, adapted from Hautzinger (2000, 2003), to replace automatic negative thoughts about ageing, such as older adults’ participation in physical activity being perceived as embarrassing, with neutral or positive thoughts. Importantly, Wolff et al. (2014) also found strong evidence that more positive attitudes towards older adults mediated the relationship between participating in the intervention with the component to improve attitudes and subsequent physical activity levels (90%CI, [.01, .07]). Wolff et al. (2014) suggested that when older adults are still future-orientated despite facing late adulthood, they might be more motivated to engage in health behaviours, such as physical activity, that might take time for benefits, such as better physical health, to be realised. Wolff et al.’s (2014) randomised controlled trial thus provides evidence for the efficacy of interventions that aim to increase physical activity via improving attitudes to ageing.

Despite the efficacy of interventions such as Sarkisian et al. (2007) and Wolff et al.’s studies among samples of older adults, the efficacy of such interventions among midlife women remains to be investigated. Although perceived self-efficacy for physical activity might be an important factor influencing midlife women’s physical activity levels, midlife women’s decisions to participate in physical activity might also be influenced by perceived control over external factors such as time constraints. Thus, future studies are needed to investigate the efficacy of interventions that aim to increase midlife women’s physical activity through pathways of improving their attitudes to ageing. Moreover, cross-cultural generalisability of the findings of Wolff et al. (2014) cannot be ascertained given the racial homogeneity of the sample. Given the small number of studies that have been conducted, more studies are also needed to further establish the association between positive attitudes to ageing and physical activity behaviour.
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Midlife as a window of opportunity for improving attitudes to ageing

Although the efficacy of interventions featuring components to improve attitudes to ageing with the eventual aim of increasing physical activity levels have not been investigated among midlife women, research suggests that such interventions might be applicable for midlife women. Attitudes to ageing might influence midlife women’s perceived self-efficacy and intention for physical activity. Levy et al. (2000) suggested that negative self-perceptions of ageing in the domain of physical functioning might lower self-efficacy for performance in the corresponding domain, leading to self-fulfilling prophecies of reduced levels of performance. On the other hand, positive self-perceptions of ageing increase self-efficacy that could facilitate performance (Levy et al., 2000). At a time in their lives when physical functioning might start to decline, for example through loss of bone density during the menopausal process (Shangold et al., 1998), perceived self-efficacy for physical activity might be a particularly salient factor in predicting midlife women’s levels of physical activity. Given the proposed psychological pathway through which attitudes to one’s own ageing experiences might influence levels of physical activity through the mediator of self-efficacy, attitudes to ageing, instead of attitudes to physical activity, might be a more suitable factor to investigate within the framework of the Extended TPB, to provide a more holistic understanding of factors influencing physical activity levels among the specific population of midlife women. Indeed, a qualitative study conducted by Hendry et al. (2010) explored barriers and facilitators of physical activity for women aged 45 to 60, and found that when women viewed themselves as fit and active at midlife, they were more likely to find ways to incorporate physical activity into their schedules, providing support for the proposed pathway of attitudes to ageing influencing physical activity levels via the mediator of self-efficacy among midlife women.
Moreover, midlife could also be an appropriate window for interventions to increase physical activity levels, as it could be a time when individuals start to be aware of changes in physical functioning that in turn provides the motivation for performing health behaviours. In addition to positive attitudes to ageing, another possible antecedent for the uptake of health behaviours, such as physical activity, is awareness of age-related change (AARC) (Diehl & Wahl, 2010). Diehl and Wahl (2010) defined AARC as an individual’s awareness of changes in physical functioning or way of experiencing life that she attributes to an increase in chronological age. AARC, such as awareness of age-related loss in bone density, could motivate self-regulatory strategies of maintenance of physical functioning, through health behaviours such as physical activity (Diehl & Wahl, 2010).

Higher levels of self-perceived physical fitness, control over health and health commitment also predict higher levels of physical activity at midlife. In a study investigating the relationship among health behaviours including leisure-time physical activity, health attitudes, self-appraisals of health and socio-demographic factors such as age, among a sample of 829 American women aged 40 to 75, Holahan, Holahan, Li, and Chen (2017) also found that although decreases in physical activity levels were associated with age increase, higher levels of self-perceived current physical fitness compared to five years ago were associated with higher levels of physical activity for both midlife participants aged 40 to 60 and older counterparts aged 61 to 75. Nevertheless, given the cross-sectional nature of Holahan et al.’s findings (2017), further research is necessary to disentangle the possible bi-directional relationship between higher levels of self-perceived physical fitness and physical activity levels among midlife women. In addition, it was found that higher levels of control over health (measured by statements such as “There are certain things I can do for myself to reduce the risk of heart attack”), higher levels of health commitment (measured by the statement “I work hard at trying to stay healthy” and endorsement of level of “thought and effort put into health”) and higher levels of prioritisation of fitness and strength for a good
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...life, were associated with higher levels of physical activity for both midlife and older participants (Holahan et al., 2017). Statements measuring control over health and health commitment in Holahan et al.’s study (2017) are similar to items measuring the importance of physical activity in maintaining health and fitness in the physical change domain of the AAQ (Laidlaw et al., 2007) (for e.g. “I keep myself as fit and active as possible by exercising”), and Holahan et al.’s findings (2017) suggest a possible relationship between more positive attitudes to ageing contributing to higher levels of physical activity through the mediator of intention measured by level of intended effort to put into physical activity. Future quantitative studies could thus investigate if more positive attitudes to ageing in the physical change domain increase perceived self-efficacy and intention for physical activity leading to increases in actual physical activity levels among midlife women.

Although improvements in attitudes to ageing can occur in late adulthood, midlife might be a comparatively better period for interventions to improve attitudes to ageing. It might be more efficient to improve attitudes to ageing at midlife, compared to late adulthood, in light of Miche et al.’s findings (2014) of greater inter-individual differences in trajectories of attitudes to ageing in midlife adults, compared to older adults, suggesting that more potentially modifiable factors influencing attitudes to ageing might exist at midlife. For example, negative attributions of midlife challenges to age-related losses could be targeted during interventions. More importantly, improvement of attitudes to ageing could lead to increase in physical activity, and midlife is an important window of opportunity to increase physical activity to harness the benefits to physical and mental health that are associated with physical activity uptake at midlife, reviewed in Chapter 2 of this thesis.

**Conclusion**

In this chapter, the concept of attitudes to ageing was introduced, together with different definitions and ways of measuring attitudes to ageing. Individual level and societal level factors that shape attitudes to ageing were also reviewed, with a focus on the interplay
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of sociocultural and demographic factors that shape societal stereotypes of older adults, which are internalised to influence attitudes to one’s own ageing experiences. In addition, the relationship between attitudes to ageing and health behaviours such as physical activity was explored with the introduction of intervention studies that aimed to increase physical activity via improving attitudes to ageing. Although these intervention studies have been conducted on older adults, they might also be applicable for increasing midlife women’s physical activity levels. In the next chapter, the aims and hypotheses for the current study will be introduced.
Chapter 5: Rationale, aims and hypotheses

Overview
In the previous chapter, different conceptualisations of and measurements for attitudes to ageing, and factors shaping attitudes to ageing were reviewed. Studies demonstrating the association of positive attitudes to ageing, with health, functioning and physical activity behaviour were also reviewed. In this chapter, the rationale and aims for this study will be explained, and the specific hypotheses that will be investigated will be introduced.

Rationale for the study
With the trends of population ageing (Australian Institute of Health & Welfare, 2016; Ortman, Velkoff, & Hogan, 2014) and cross-cultural migration (Australia Bureau of Statistics, 2017; Migration Policy Institute, 2017), which countries such as Australia and the United States are experiencing, the promotion of healthy ageing in a culturally inclusive manner has gained importance. Studies reviewed in Chapter 2 have shown that engaging in regular physical activity from midlife facilitates health maintenance in late adulthood (El Khoudary et al., 2015; Erikssen, 2001; Upchurch et al., 2015). However, the majority of adult women do not meet recommended physical activity levels (Schoenborn, Adams, & Peregoy, 2013). In Australia, only 44.1% of women aged 45 to 54 met recommended physical activity guidelines on at least 250 minutes of moderate intensity physical activity per week, and only around one in three women (37.5%) aged 55 to 64 met the same physical activity guidelines (Australian Bureau of Statistics, 2017), which are recommended for all adults aged 18 to 64. Increasing physical activity levels among midlife women is thus an important avenue to facilitate healthy ageing, with studies demonstrating the protective benefits of midlife physical activity on bone health (Heinonen et al., 1998;
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Shimegi et al., 1994), as well as physical and cognitive functioning in late adulthood (e.g. Brunner et al., 2017). Interventions that aim to increase physical activity by including a component related to improving attitudes to ageing have been found to be effective among older adults (Wolff et al., 2014; Sarkisian et al., 2007), though these interventions have not been investigated among the population of midlife women. Such interventions might also be applicable to midlife women at a time in their lives when they might start to demonstrate an awareness of ageing (Brown et al., 2015).

To address limitations of past studies with regards to the lack of cultural heterogeneity in older adult sample populations (Wolff et al., 2014; Sarkisian et al., 2007), the current study investigated a culturally relevant intervention for participants who broadly identified with two different cultures. Besides Caucasian participants, Chinese participants were included as there is a sizeable population of Chinese migrants in countries such as Australia and the United States (Australian Bureau of Statistics, 2017; Migration Policy Institute, 2017). The inclusion of participants from two different cultural backgrounds facilitates cultural inclusivity in the investigation of intervention efficacy, that is, the investigation of whether the current intervention can be effective to the same extent for participants from different cultural backgrounds. Cultural background of participants is an important consideration in the investigation of intervention efficacy, given studies that have suggested the influence of age-stereotypes in shaping attitudes to ageing might differ from culture to culture (e.g. Levy & Langer, 1994). Given the influence of culture on attitudes to ageing, the current intervention was thus designed to be culturally relevant to participants from different cultural backgrounds, specifically Australian and Chinese. In the context of the current intervention study, cultural relevance refers to participants from different cultural backgrounds being able to relate to the intervention contents, such as the role models featured. This is important as Bandura (1994) has highlighted that the more individuals perceive similarity between themselves and role
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models, the more likely individuals will emulate the behaviour of the role models. In the current intervention, cultural relevance is facilitated by featuring video clips of role models who are from similar cultural backgrounds and speak the languages that the current study’s participants are most comfortable with. To gain a more comprehensive understanding of factors influencing physical activity levels of midlife women and how these factors work in tandem with attitudes to ageing, a modified Extended Theory of Planned Behaviour framework was adopted, where attitudes to physical activity were substituted with attitudes to ageing. In the investigation of physical activity behaviour of midlife women within an Extended TPB framework, attitudes to ageing might be a more suitable target of investigation than attitudes to physical, as positive attitudes to ageing could facilitate self-efficacy (Levy, 2009), which is in turn posited to be a proximal predictor of behaviour (Ajzen, 1991).

Study Aims

The main aims of the present study, investigated within a modified Extended TPB framework, as illustrated in Figure 5.1, are as follows:

1. To investigate if a culturally relevant intervention that included a component focused on improving attitudes to ageing among midlife women would be effective in improving attitudes to ageing and increasing physical activity levels, and if participants’ cultural identification would moderate intervention efficacy.

2. To investigate if intention to increase physical activity and perceived self-efficacy to increase physical activity respectively mediate the relationship between attitudes to ageing and physical activity level, and if perceived self-efficacy would also strengthen intention to increase physical activity.
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3. To investigate if perceived control over external factors would be a proximal predictor of physical activity level, as well as a distal predictor via the mediator of intention to increase physical activity. The influence of physical activity level at follow-up on subsequent levels of perceived self-efficacy and perceived control over external factors will also be investigated.

4. To investigate if subjective norms would be a distal predictor of physical activity levels via the mediator of intention to increase physical activity, and if this mediating relationship would be stronger for participants who identify with Chinese culture, compared to Australian culture.

Figure 5.1. A diagrammatic representation of the modified Extended TPB with attitudes to ageing replacing attitudes to physical activity
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Aim 1: To investigate intervention efficacy and cultural identification as a moderator of intervention efficacy

In this study, Caucasian and Chinese role models introduced during the intervention session for the respective domains of physical change, psychosocial loss and psychological growth will provide positive age stereotypes for intervention condition participants, with the aim of positively influencing their attitudes to ageing. Evidence-based information on how positive attitudes to ageing and physical activity contribute to successful ageing that will be provided during the intervention are intended to improve intervention condition participants’ attitudes to ageing in the physical change and psychological growth domains, as interventions that provided similar information have been found to increase participants’ expectations of their own physical functioning (Sarkisian et al., 2007), and increase their future-orientation in late adulthood (Wolff et al., 2014). Studies have demonstrated that interventions designed to improve views on ageing (Wolff et al., 2014) and expectations regarding ageing (Sarkisian et al., 2007) among older adults also led to increase in physical activity levels. It is thus posited that improvement in attitudes to ageing among intervention condition participants will also lead to a significantly greater increase in their post-intervention physical activity levels over an eight week follow-up period. Moreover, greater improvement in intervention condition participants’ attitudes to ageing in the psychosocial loss domain is expected to lead to a significantly greater increase in their group physical activities over the eight-week follow-up period. Improvement in attitudes for the psychosocial loss domain would suggest a decrease in feelings of social isolation, manifested in lower levels of endorsement of AAQ items such as “I feel excluded from things because of my age.” (Laidlaw et al., 2007), and lower levels of social isolation might encourage midlife women to participate in more group activities, including group physical activities.
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Stereotype Embodiment Theory (Levy, 2009) would suggest that participants who identify with Australian, compared with Chinese culture, will be more influenced by positive views on age-related wisdom endorsed by Australian culture (Hofstede, 2001; Lockenhoff et al., 2009), and tend to have more positive attitudes in the psychological growth domain. Laidlaw et al. (2010) also found that Chinese older adults living in China expressed more negative attitudes to ageing in the physical change and psychosocial loss domains, compared with Scottish older adults and Chinese older adults living in Scotland. It is posited that this study’s Chinese participants will also have more negative pre-intervention attitudes to ageing, and that the negative age stereotypes that they have internalised will continue to influence their attitudes to ageing following the intervention session, thus reducing intervention efficacy. A counter-argument is that the Chinese participants could experience greater intervention efficacy as there is more room for improvement in their attitudes to ageing. However, it was hypothesized that participants with Chinese cultural identification would experience less improvement in attitudes to ageing based on existing literature that Australians have more positive views on ageing (Hofstede, 2001; Lockenhoff et al., 2009) and Chinese older adults tend to have more negative attitudes to ageing (Laidlaw et al., 2010), which is expected to continue to influence their attitudes to ageing post-intervention, as posited by the Stereotype Embodiment Theory’s argument (Levy, 2009) that age stereotypes are internalised over the lifespan to influence one’s views on one’s own ageing experiences. Although the intervention is still expected to improve attitudes, and increase physical activity levels for participants who identify with Chinese culture, in comparison, participants who identify with Australian culture are expected to experience a greater improvement in attitudes to ageing, and a greater increase in physical activity levels.

Therefore, the hypotheses to be tested in relation to Aim 1 are as follows:

1. Participants who attend the intervention group session, compared with the control
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group session, will demonstrate a significantly greater increase in post-intervention physical activity levels.

2. Intervention condition participants with Australian, compared to Chinese, cultural identification, will demonstrate a significantly greater increase in post-intervention physical activity levels.

3. Participants who attend the intervention group session, compared with the control group session, will demonstrate significantly greater improvement in post-intervention attitudes to ageing in the three domains of physical change, psychosocial loss and psychological growth.

4. Participants with Australian, compared to Chinese, cultural identification, will demonstrate more positive pre-intervention attitudes to ageing in the three domains of physical change, psychosocial loss and psychological growth.

5. Intervention condition participants with Australian, compared to Chinese, cultural identification, will demonstrate greater improvement in post-intervention attitudes to ageing in all three domains.

**Aim 2: To investigate intention and perceived self-efficacy as mediators of the relationship between attitudes to ageing and physical activity**

It is expected that participants who have more positive attitudes in the physical change domain would place a greater emphasis on physical activity as a means of health maintenance, which would strengthen their intention to increase physical activity. In addition, participants who have more positive attitudes in the psychological growth domain would still look forward to the future despite the ageing process, and this future orientation suggests that they might be more inclined to engage in health behaviours such as physical activity that take a longer time to harvest health benefits (Levy & Myers, 2004). Stronger intention to increase physical activity would in turn predict higher levels of physical activity (Ajzen, 1985, 1988,
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Participants who have more positive attitudes in the physical change domain might demonstrate greater adaptability in exploring physical activities that are suitable to their current physical condition, which would increase their self-efficacy for physical activity. In addition, participants with more positive attitudes in the psychosocial loss domain are less likely to feel excluded from social activities, and might in turn have more confidence to participate in group physical activities. Greater perceived self-efficacy would in turn predict higher physical activity levels as individuals will tend to persist in their efforts to achieve a behaviour that they are confident of achieving (Ajzen, 1988, 1991). In line with the Theory of Planned Behaviour (Ajzen, 1988), it is also posited that perceived self-efficacy would be a proximal predictor of intention to increase physical activity. Therefore, the hypotheses to be tested in relation to Aim 2 are as follows:

1. Intention to increase physical activity will mediate the relationship between attitudes to ageing in the physical change and psychological growth domains, and physical activity levels.
2. Perceived self-efficacy to increase physical activity will mediate the relationship between attitudes to ageing in the physical change and psychosocial loss domains, and physical activity levels.
3. Perceived self-efficacy will be a proximal predictor of intention to increase physical activity.

Aim 3: To investigate perceived control over external factors’ role in influencing physical activity, and the bi-directional relationship between perceived self-efficacy and perceived control over external factors, and physical activity

Consistent with the findings of Wang and Zhang (2016), it is posited that perceived control over external factors will predict physical activity levels directly, as well as
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predict intention to increase physical activity, which will in turn predict physical activity levels. Increases in physical activity levels will increase subsequent perceived self-efficacy (Armitage, 2005), as one’s confidence for behavioural achievement will be further boosted by having prior experience of successfully achieving the behaviour, termed personal mastery experience (Bandura, 1986). Although Armitage (2005) did not explicitly investigate the bi-directional relationship between perceived control over external factors and physical activity levels, it is posited that increase in physical activity levels will also increase subsequent perceived control over external factors. One could draw upon past strategies used to successfully overcome external barriers against physical activity, such as incorporating physical activities into daily routines, thus further boosting one’s confidence to increase physical activity in spite of barriers such as lack of time. Therefore, the hypotheses to be tested in relation to Aim 3 are as follows:

1. Perceived control over external factors will predict physical activity level, both as a proximal factor, and as a distal factor via the mediator of intention.

2. Post-group session physical activity levels will predict subsequent perceived self-efficacy, as well as subsequent perceived control over external factors.

**Aim 4: To investigate subjective norms as a distal factor of physical activity via intention, and cultural identification as a moderator of this mediating relationship**

Under the framework of the Theory of Planned Behaviour (Ajzen, 1985, 1988, 1991), subjective norms is posited as a distal factor of behaviour that exerts its influence via the mediator of intention to engage in the behaviour. Although studies have supported the role of subjective norms as a proximal predictor of intention (Armitage, 2005; Kwan et al., 2009), findings on the distal influence of subjective norms on actual behaviour have been mixed (Armitage, 2005; Kwan et al., 2009; White et al., 2012). Despite these mixed findings,
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Hendry et al. (2010) found in their qualitative study on barriers and facilitators of physical activity among 20 interviewees who were midlife women residing in the United States that societal norms and expectations were factors that influenced their physical activity levels. Thus, there is reason to posit that subjective norms would be able to exert an influence on physical activity levels for the specific population of midlife women.

Moreover, it is suggested that cultural identification moderates the relationship between subjective norms and physical activity. Although there is a lack of research on the role of cultural identification as a moderator of the level of influence subjective norms exert on physical activity levels, research by Rentzalas (2009) demonstrated that individuals with interdependent self-construals, compared with independent self-construals, were more likely to be influenced by subjective norms and report higher levels of physical activity. Thus, it is posited that subjective norms would have a stronger influence on physical activity levels for participants who identify with Chinese culture, which is a relatively collectivistic culture that emphasises group goals, compared to Australian culture, which is a relatively individualistic culture that emphasises individual goals (McCormick & Shi, 1999). Therefore, the hypotheses to be tested in relation to Aim 4 are as follows:

1. Subjective norms will be a distal predictor of physical activity levels via the mediator of intention.

2. The mediating relationship of subjective norms predicting physical activity via intention will be stronger for participants who identify with Chinese culture, compared with Australian culture.
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Chapter 6: Method and measures

Method

This study was an intervention study that aimed to increase physical activity among midlife women by improving their attitudes to ageing. The intervention group session promoted positive attitudes to ageing, while the control group session topic focused on the components and benefits of a healthy diet.

Participants

Women were eligible to participate if they were between the ages of 45 and 60, wanted to increase their physical activity levels, and were proficient in either English or Chinese. Although the study initially aimed to recruit only women who were exercising below the recommended levels of at least 150 minutes per week (Australian Government Department of Health, 2017), this additional criterion made recruitment very challenging and thus it was eventually decided to allow women to participate in the study even if they were already physically active, as they could still receive health benefits from further increasing physical activity levels (de Souto Barreto et al., 2017). Participants were recruited through four different methods: 1) Two community centers 2) recruitment emails to potential participants among Royal Women’s Hospital staff members 3) recruitment advertisements published in two local Chinese publications 4) snowballing. For the first method, the study was introduced to potential participants during activities such as health talks held at two community centers. For the second method, emails introducing the project were sent to 600 staff members from the Royal Women’s Hospital. The second method was included as the Royal Women’s Hospital, where the principal investigator of the current study worked, has a large population of midlife women among its workforce. For the third method, recruitment advertisements that invited women to participate in a project aimed at increasing physical activity levels and promoting healthy ageing were published in two local Chinese
Improving attitudes to ageing to increase physical activity publications, and for the fourth method, participants were asked to introduce the study to friends and relatives who might be eligible and interested to participate.

For the second method, among the 57 women who responded to the recruitment email, 46 eventually participated in the study. It is not possible to indicate how many potential participants were introduced to the study through the first, third and fourth methods. A power analysis was conducted prior to data collection and the number of participants recruited was guided by the power calculation that was conducted with G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), which suggested 72 participants as the number of participants to recruit. The final sample of participants contained 100 women with ages ranging from 46 years to 60 years ($M = 54.00, SD = 4.00$) from Melbourne, Australia.

**Procedure**

Approval for this study was received from the Human Research Ethics Committees of the University of Melbourne, Australia, and the Royal Women’s Hospital, Melbourne, Australia. Please refer to Appendix A for the documents related to ethics approval. Before commencing participation in the intervention study, participants were informed that, as part of the study, they would be attending a group session consisting of a presentation and discussion either on the topic of healthy ageing or healthy diet. All participants then provided written informed consent to participate in the study before attending a one-to-one physiotherapist session that was approximately 30 minutes in duration. Details of the Plain Language Statement provided to participants can be found in Appendix B and details of the consent form can be found in Appendix C. Details of the Participant Information and Consent Form for Royal Women’s Hospital staff can be found in Appendix D.

In the one-to-one session, the physiotherapist assessed each participant’s health conditions and intention to increase physical activity, and discussed their fitness goals and action plans to increase physical activity in the eight weeks following the group session. Goal
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setting has been found to be effective in facilitating change in behaviours, including physical activity behaviour (Greaves et al., 2011). In the current study, the physiotherapists conducting the sessions were not informed of the condition that participants were allocated to. The form used to assess participants’ health and fitness goals can be found in Appendix E. Eligible participants were each equipped with a Yamax-Digiwalker SW-200 pedometer and a diary to record their physical activities until their group session in order to document baseline physical activity levels. The English and Chinese versions of the diary can be found in Appendix F. Participants were instructed to wear the pedometer after waking up every morning and to remove the pedometer before going to bed every night. The physiotherapist also advised each participant that the pedometer should be hip-mounted. Studies conducted by Welk et al. (2000) and Tudor-Locke (2001) have demonstrated that compared to self reports, pedometer readings are substantially more accurate in reflecting actual number of steps taken. In this study, both pedometer readings and physical activity diary records were taken as measures of physical activity levels, as the pedometer would not be able to record water-based physical activities or accurately reflect physical activities such as upper-body strength training. Participants also completed a baseline questionnaire which included demographic information, items regarding participants’ cultural identification, personal ideal age and attitudes to ageing, intention to increase physical activity, perceived self-efficacy, perceived control over external factors, subjective norms and depressive symptoms. Details of the baseline questionnaire can be found in Appendix G.

Approximately one week following the physiotherapist session ($M = 6.66$, $SD = 1.07$, range 3-11 days), participants attended a group session of approximately 90 minutes in duration. Participants signed up for whichever group session best suited their schedules. Prior to the start of each consecutive pair of sessions, each session was randomised to either the intervention or control condition. The topic of the group session was only revealed to participants when they arrived for the group session.

Following the group session, participants completed a questionnaire that included all
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items on the baseline questionnaire except items on demographic information and cultural identification. Details of this questionnaire can be found in Appendix H. Baseline physical activity diaries were also collected, physical activity diaries for the following eight weeks distributed and participants’ pedometers reset. Participants were then instructed to continue recording their physical activity for the following eight weeks. At the end of the eight weeks, a final questionnaire that was identical to the one completed after the group session was posted to participants, and participants completed the questionnaire before returning the questionnaire and eight-week diary. Materials provided to participants detailed in Appendix B, C, F, G, H, as well as the final questionnaire included both English and Chinese versions, and participants were provided with materials in the language of their choice. Appendix D included only the English version as Royal Women’s Hospital staff were assumed to be proficient in English.

**Intervention and control sessions**

The intervention to improve attitudes to ageing was delivered in a 90-minute group session. The intervention included a presentation on evidence-based research regarding healthy ageing. Evidence-based research regarding healthy ageing was also featured in the “Views on ageing” component of the intervention conducted by Wolff et al. (2014). In the current study, definitions of healthy ageing taken from Phelan and Larson (2002), as well as Tate, Leedine, and Cuddy (2003) were presented to participants, and Fry et al.’s finding (2007) on how individuals value physical health and independent functioning regardless of the cultures they belong to was emphasised. The current study’s presentation also highlighted Wolff et al.’s finding (2014) regarding how individuals with positive attitudes to ageing tend to do more physical activities, as well as El-Khoudary et al. (2015) and Wu et al.’s findings (2015) regarding how doing more physical activity reduces the risks of diseases. Participants were then shown six online video clips of around two minutes each, selected by the research team to introduce female role models who demonstrated positive attitudes to ageing. This use
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of role models to facilitate positive attitudes to ageing was based on Bardach et al.’s technique (2010) of increasing possible future selves and expectations regarding ageing by showing participants photographs depicting role models. In this current study, the first two clips aimed to encourage positive attitudes to ageing in the domain of physical change by recommending participation in regular physical activity for health maintenance, and also featured role models who engaged in physical activity. The third and fourth clips aimed to encourage positive attitudes to ageing in the domain of psychosocial loss by featuring role models who remained socially active through volunteering during late adulthood. The fifth and sixth clips aimed to encourage positive attitudes to ageing in the domain of psychological growth by highlighting that wisdom grows with age as demonstrated by the role models featured, who gave advice on facing problems in life positively, and forgiving others to achieve happiness. The first, fourth and fifth clips featured Chinese role models, while the second, third and sixth clips featured Caucasian role models, so that role models featured were culturally relevant to both Caucasian and Chinese participants. There was also a guided discussion using positive images of ageing, which are freely available on the internet, accompanied by statements adapted from the AAQ (Laidlaw et al., 2007), to facilitate participants’ reflection and consolidation of the session contents. Throughout the group session, discussion was encouraged, and participants were invited to share their views regarding the presentation contents, what their personal definition of healthy ageing was, and whether they would emulate the role models featured in the video clips.

The control group session was a 90-minute session on healthy diet. The control session included a presentation that introduced definitions of a healthy diet, as well as research-based information on how a healthy diet reduces risks of diseases, taken from Estruch et al. (2013), Martinez-Lapiscina et al. (2013) and Sofi, Abbate, Gensini, and Casini (2010). Participants then viewed six online video clips with duration of around one to six minutes each. The first two clips were regarding the willpower to adopt a healthy diet, and featured a talk given by a Caucasian psychologist and an interview with a Chinese woman.
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The third and fourth clips were regarding finding time to prepare healthy meals and featured a recipe demonstration by a Caucasian woman and an interview with a Chinese woman respectively. The last two clips were suggestions for affordable healthy meals and featured a recipe demonstration by a Caucasian woman and a talk given by a Chinese woman respectively. There was also a guided discussion featuring images encouraging a healthy diet, which are freely available on the internet, accompanied by positive and negative statements regarding adopting a healthy diet. During the group session, participants were also invited to give their opinions on the presentation contents and the video clips.

A total of 17 group sessions were conducted, of which seven included only Caucasian participants, five included only Chinese participants, and five included both Caucasian and Chinese participants. All group sessions were facilitated by the principal investigator in the project. Interpretation was provided, when needed, by the candidate (a bilingual English and Mandarin speaker) to facilitate the intervention and control group sessions.

For group sessions that were attended only by Caucasian participants, or group sessions with a majority of Caucasian participants and one Chinese participant who was proficient in English, some changes to the content was made. Specifically, the intervention video clip in Mandarin for the psychosocial loss domain was replaced with a video clip in English featuring a 95 year old Caucasian woman who remained socially active through volunteering, and three control video clips that were either in Cantonese or Mandarin were replaced with three video clips in English featuring a talk on the mindset to adopt to facilitate healthy eating and two recipe demonstrations respectively.

**Measures**

Before commencing the intervention study, a pilot study with eight women was conducted in order to test and revise the questionnaire measures. Revised versions of the Chinese translations for the AAQ and CES-D used in previous studies (Laidlaw et al., 2010; Yang, Jia, & Qin, 2015) were used for the pilot study, after obtaining permission to use and
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edit the translations so that the translated Chinese versions of the AAQ and CES-D used in this study would be as close as possible to the original English versions. All other measures that would eventually be used in the intervention study were translated into Chinese by the candidate, and a Chinese researcher working in Melbourne and independent of the study then back-translated the measures into English. Comparisons of the English version and back translated version of the measures were made and discussions were held when necessary to further edit the Chinese translated measures prior and during the piloting process.

**Revision of pilot study’s measures**

All pilot participants were instructed to complete a questionnaire, and to follow a think aloud protocol as they were answering the questionnaire (French, Cooke, McClean, Williams, & Sutton, 2007). Upon completing the questionnaire, pilot participants were also asked if there were any items that they had difficulty understanding or answering, and what they thought about the length of the questionnaire.

During the first round of piloting the measures, two participants provided feedback on the English measures, and two provided feedback on the Chinese measures. Feedback was received that the questionnaire took too much time to complete. Thus, the number of questionnaire items was reduced for the second round of piloting. For example, the number of items for the measures of perceived self-efficacy and perceived control over external factors was reduced from three items each to two items each. The two remaining items that were chosen for perceived self-efficacy and perceived control over external factors were adapted from the two highest loading items for the respective measures on Armitage and Conner’s study (1999).

Feedback was also provided regarding the phrasing of items, and the items were revised correspondingly. For example, participants advised that the operationalisation of physical activity as “level of physical activity” was ambiguous as this operationalisation could either be understood as time spent on physical activity or intensity of physical activity performed. Consequently, physical activity was operationalised as time spent on physical activity.
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activity as intensity of physical activity was not measured for this study.

A second round of piloting was conducted with two women providing feedback on the revised English measures and another two providing feedback on the revised Chinese measures. After the second round of piloting, phrasing for items were further revised. For example, the item for cultural identification was changed from “What is the cultural background you identify with?” to “What culture do you most belong to?” to allow Chinese participants who might identify with both Chinese and Australian cultures to clearly indicate the culture that has the most influence on them.

**Attitudes to ageing**

Participants’ attitudes to their own ageing were measured with the Attitudes to Ageing Questionnaire (AAQ) developed by Laidlaw et al. (2007). The AAQ consists of 24 items measuring attitudes to ageing in the three domains of physical change (e.g. “It is important to take exercise at any age.”), psychosocial loss (e.g. “Old age is a time of loneliness.”) and psychological growth (e.g. “Wisdom comes with age.”). Participants indicated their responses to each item on a Likert scale ranging from 1 (Strongly disagree/Not at all true) to 5 (Strongly agree/Extremely true). Participants’ total scores for each of the three domains were then calculated, so that higher scores for the physical change and psychological growth domains indicated more positive attitudes to ageing in each of these domains, and higher scores on the psychosocial loss domain indicated more negative attitudes to ageing in the domain. A missing response for a particular item was substituted by the mean of the participant’s responses within the same domain. If a participant had responses missing for more than two items in a particular domain, her total score for that domain was considered as missing. In the current study, there was no missing data for all three AAQ domains at baseline. However, the percentage of missing data for the three AAQ domains at post-group session was 10.42%. At eight-week follow-up, the percentage of missing data was 19.79% for the physical change domain, and 20.83% for the psychosocial loss and psychological growth domains. Given the
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relatively small amount of missing data, and that the missing data was mostly due to participant attrition, for which the respective reasons have been explained in Figure 7.1, the missing data is not expected to have implications on the findings of this study. The AAQ has demonstrated cross-cultural validity (Laidlaw et al., 2007), and also demonstrated validity amongst midlife women aged 40 to 60 (Brown et al., 2015). For this study, Cronbach’s alphas for the physical change, psychosocial loss and psychological growth domains at baseline are .75, .78 and .66 respectively.

Cultural identification

Participants indicated their cultural identification by responding to the following question: “What culture do you most belong to?” and selecting among the options “Australian”, “Chinese” or “Other (please specify)”. This item is similar to the measure of cultural identification used by Hong, Fang, Yang and Phua (2013).

Socioeconomic status

Participants indicated their financial status using a measure previously used by Bryant et al., (2012) as an indication of their socioeconomic status. For this, they were asked to select one of four options that best described their financial status: “Insufficient to meet needs”, “Adequate or just enough to meet needs”, “Sufficient to meet needs” and “More than enough to meet needs”.

Depression

Participants’ symptoms of depression were assessed with the Centre for Epidemiologic Studies-Depression Scale (CES-D) (Radloff, 1977), which consists of 20 items. Participants indicated their responses on a Likert scale ranging from 1 (“Rarely or none of the time”) to 3 (“Most or all of the time”). The responses to four items were reverse
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scored before the scores were summed. Higher summed scores reflect higher levels of depression. A missing response for a particular item was substituted by the mean of the participant’s responses to the other items. If a participant indicated two responses to an item, the responses to that item were considered invalid and substituted by the mean of the participant’s responses to the other items. CES-D scores were included in the study as a covariate, given research conducted by Chachamovich et al. (2008), which found that levels of depressive symptoms, measured by the Geriatric Depression Scale-15-item version ((Yesavage et al., 1983; Sheikh & Yesavage, 1986) correlated with attitudes to ageing measured by the AAQ. In the current study, CES-D scores were selected as a measure of level of depressive symptoms, as the CES-D has demonstrated internal reliability among sample populations in different countries, including China, with Cronbach’s αs above .80 (Leykin, Torres, Aguilera, & Muñoz, 2011; Yang, Jia, & Qin, 2015).

Intention to increase time spent on physical activity

Intention to increase time spent on physical activity (henceforth referred to as “intention”) was measured by three items adapted from Armitage and Conner’s study (1999). A sample item is “I intend to increase time spent on physical activity over the next two months.” Participants responded to each item on a scale of -3 (representing “Definitely do not”) to 3 (representing “Definitely do”). A measure of intention was obtained by taking the mean of the three items. A missing response for a particular item was substituted by the mean of the participant’s responses to the other two items. If a participant had responses missing for at least two items, her response for intention was considered as missing and excluded from the analysis. In the current study, there was no missing data for intention at baseline. However, the percentage of missing data for intention at post-group session was 10.42%. At eight-week follow-up, the percentage of missing data was 20.83%. Given the relatively small amount of missing data, and that the missing data was mostly due to participant attrition, the missing data is not expected to have implications on the findings of this study.
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**Perceived self-efficacy to increase time spent on physical activity**

Perceived self-efficacy to increase time spent on physical activity (henceforth referred to as “self-efficacy”) was measured by two items selected and adapted from Armitage and Conner’s four-item measure (Armitage & Conner, 1999). A sample item is “How confident are you that you will be able to increase the time you spend on physical activity in the next two months?” Participants indicated their responses on a Likert scale ranging from 1 (representing “Not very confident”/“Definitely do not believe”) to 7 (representing “Very confident”/ “Definitely do believe”). A measure of self-efficacy was obtained by taking the mean of the two items. As there were only two items for this measure, if a participant had a missing response to one item, her response for self-efficacy was considered missing and excluded from the analysis. In the current study, there was no missing data for self-efficacy at baseline. However, the percentage of missing data at post-group session was 10.42%. At eight-week follow-up, the percentage of missing data was 20.83%. Given the relatively small amount of missing data, and that the missing data was due to participant attrition, the missing data is not expected to have implications on the findings of this study. For this study, Cronbach’s alpha for perceived self-efficacy at baseline was higher at .90, compared to Armitage and Conner’s measure (1999) with a Cronbach’s alpha of .83 and from which the items for self-efficacy for this study have been adapted from, even though the scale for this study had been abbreviated following feedback from pilot study participants.

**Perceived control over external factors**

Perceived control over external factors was measured by two items selected and adapted from Armitage and Conner’s three-item measure (Armitage & Conner, 1999). A sample item is “How much do you feel that whether you increase the time you spend on physical activity in the next two months is beyond your control (due to factors such as bad weather, being busy with work etc.)?” Participants indicated their responses on a Likert scale.
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ranging from 1 (representing “Strongly disagree”/“Very little control”) to 7 (representing “Strongly agree”/“Complete control”). A measure of perceived control over external factors was obtained by taking the mean of the two items. As there were only two items for this measure, if a participant had a missing response to one item, her response was considered missing and excluded from the analysis. In the current study, the amount of missing data at baseline was 1.04%, 10.42% at post-group session and 20.83% at eight-week follow-up. Given the relatively small amount of missing data, and that the missing data was mostly due to participant attrition, the missing data is not expected to have implications on the findings of this study. For this study, Cronbach’s alpha for perceived self-efficacy at baseline was higher at .90, compared to Armitage and Conner’s measure (1999) with a Cronbach’s alpha of .83 and from which the items for self-efficacy for this study have been adapted from, even though the scale for this study had been abbreviated following feedback from pilot study participants. For this study, Cronbach’s alpha for perceived control over external factors at baseline was considerably lower at .41, compared to Armitage and Conner’s measure (1999) with a Cronbach’s alpha of .71 and from which the items for perceived control over external factors for this study have been adapted from. The implications on the tradeoff for scale reliability in abbreviating the scale following pilot participants’ feedback will be discussed in Chapter 12 as a limitation of this study.

**Global measure of subjective norms on physical activity**

A global measure of subjective norms (henceforth referred to as “subjective norms”) was assessed with four items adapted from Armitage and Conner’s study (1999). A sample item is “I feel under social pressure to increase the time I spend on physical activity.” Participants were asked to indicate their responses to each item on a scale of 1 to 7, with 1 representing “Strongly disagree/Should not increase the time I spend on physical activity/Disapprove of my increasing time spent on physical activity” and 7 representing
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“Strongly agree/Should increase the time I spend on physical activity/Approve of my increasing time spent on physical activity”. The mean of item responses was calculated to derive a composite score that reflects the overall societal pressure participants perceive for increasing physical activity levels. A missing response for a particular item was substituted by the mean of the participant’s responses to the other three items. If a participant had responses missing for at least two items, her response for the global measure of subjective norms was not included in the analysis. In the current study, the amount of missing data at baseline was 1.04%, 12.50% at post-group session and 21.88% at eight-week follow-up.

Given the relatively small amount of missing data, and that the missing data was mostly due to participant attrition, the missing data is not expected to have implications on the findings of this study. For this study, Cronbach’s alpha for the global measure of subjective norms at baseline was .75.

**Pedometer readings**

Baseline pedometer readings reflecting daily number of steps at baseline were obtained by dividing participants’ total number of steps accumulated between their physiotherapist and group session by the number of days between their physiotherapist and group session. Participants noted on their physical activity diaries if they had not worn the pedometer for part of a day or a whole day (for example if they had forgotten to wear the pedometer) and only pedometer readings for days when the pedometer was worn for the whole day (except when bathing, swimming etc.) were included in the analyses. Number of steps accumulated on the days of the physiotherapist session and group session were not included as these days would not include whole day pedometer readings. As an example, if there were six whole days between a participant’s physiotherapist and group session and if she had forgotten to wear the pedometer in the morning of one of the six days, her baseline pedometer readings would be the mean of the total number of steps accumulated over five
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whole days. Post-group session pedometer readings were obtained for eight weeks starting from the day after the group session, and the daily average number of steps per week was obtained by taking the mean of the accumulated pedometer readings over each week. Again, only whole day pedometer readings were included in the analyses. For example, if a participant had forgotten to wear the pedometer on two days of a particular week, the daily average number of steps for that week would be the accumulated number of steps over five days divided by five. However, if a participant only had one day’s data for a particular week, the data for that particular week would be considered missing. A measure of post-eight week pedometer readings was also calculated by taking the mean of daily average pedometer readings over the total number of weeks post-group session pedometer readings were available. Participants’ post-eight week pedometer readings were considered missing if they had less than four weeks of pedometer readings available. In the current study, there was no missing data at baseline, and the amount of missing data at eight-week follow-up was 10.47%. Given the relatively small amount of missing data, and that the missing data was due to participant attrition, the missing data is not expected to have implications on the findings of this study.

**Days per week of physical activity**

Days per week of physical activity (henceforth referred to as total physical activity days) was defined as the number of days per week when participants engaged in physical activities for at least 30 minutes continuously, either alone or with at least one other person. Participants provided information on total physical activity days by indicating on a physical activity diary adapted from that developed by Sherburn, Bird, Carey, Bø, & Galea (2011) physical activities that they had done (e.g. walking, jogging, line dancing, swimming etc.), duration of the activities, and if they had done the activities alone or with at least one other person. The baseline was obtained starting from the day after the physiotherapist session and
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inclusive of the day before the group session (whole days). If the duration between the physiotherapist and group sessions was more than a week, the first seven days after the day of the physiotherapist session was taken as the baseline period. If the baseline period was less than a week, the proportion of days per week with physical activities was multiplied by seven days to standardize the baseline period as seven days. If participants recorded data for fewer than seven days during one or more follow-up weeks, the proportion of days with physical activities was also multiplied by seven days. If there were fewer than four days’ worth (half a week) of data, that particular week’s data was considered missing. Post eight-week total physical activity days was obtained by taking the mean of the total physical activity days over eight weeks. Participants’ post eight-week total physical activity days were considered missing if they had less than four weeks of data available. In the current study, the amount of missing data at baseline was 1.16%, and 10.47% at eight-week follow-up. Given the relatively small amount of missing data, and that the missing data was mostly due to participant attrition, the missing data is not expected to have implications on the findings of this study.

**Days per week with at least 30 minutes of group physical activity**

Days per week with at least 30 minutes of continuous group physical activity (henceforth referred to as group physical activity days) was a subset of total physical activity days, and group physical activity was defined as physical activity done with at least one other person, as indicated on the physical activity diary. The baseline was obtained by adding the group physical activity days starting from the day after the physiotherapist session and inclusive of the day before the group session (whole days). If the duration between the physiotherapist and group sessions was more than a week, the first seven days after the day of the physiotherapist session was taken as the baseline period. If the baseline period was less than a week, the proportion of days per week with group physical activities was multiplied by seven days to standardize the baseline period as seven days. If participants recorded data for
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less than seven days during one or more follow-up weeks, the proportion of days with physical activities was also multiplied by seven days. If there were less than four days (half a week) of data, that particular week’s data was considered missing. A measure of post eight-week group physical activity days was obtained by taking the mean of group physical activity days over eight weeks. Participants’ post eight-week group physical activity days were considered missing if they had less than four weeks of data available. In the current study, the amount of missing data at baseline was 1.16%, and 11.63% at eight-week follow-up. Given the relatively small amount of missing data, and that the missing data was mostly due to participant attrition, the missing data is not expected to have implications on the findings of this study.

Data analytic plan

For the first research question, three sets of linear mixed model analyses will be conducted, one for each AAQ domain, to investigate if the intervention was efficacious in improving attitudes to ageing, and if cultural identification moderated intervention efficacy. Three sets of linear mixed model analyses will also be conducted using SPSS version 24, one for each of the physical activity measures, to investigate if the intervention was efficacious in increasing physical activity levels, and if intervention efficacy was moderated by cultural identification. For the second research question, mediation analyses will be conducted using the PROCESS script, to investigate if intention and self-efficacy mediated the relationship between attitudes to ageing and physical activity levels. For the third research question, Structural Equation Modelling (SEM) will be conducted using SPSS AMOS to investigate if perceived control over external factors predicted physical activity level, and if physical activity level predicted subsequent perceived control over external factors, as well as subsequent self-efficacy. For the fourth research question, mediation analyses will be conducted to investigate if subjective norms predicted physical activity level via the mediator of intention, and if the strength of this mediating relationship varied as a function of
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participants’ cultural identification.

Conclusion

In this chapter, the recruitment process and participants of the current study were introduced, together with the design and procedure for the study. The measures used in this study were also introduced. In the next chapter, the descriptive findings of this study will be reported.
Chapter 7: Descriptive statistics

Overview

In the previous chapter, the method and measures used for this study were introduced. In this chapter, descriptive statistics of participant characteristics and study variables will be reported, together with correlations among study variables.

Participant characteristics

Participants were 100 women with ages ranging from 46 years to 60 years (M = 54.00, SD = 4.00) from Melbourne, Australia. Among the 100 participants who provided consent to participate in the intervention study, three were ineligible to continue in the study following the physiotherapist session because of health issues or lack of intention to increase physical activity. Of the remaining 97 participants (one of whom did not provide baseline measures), 86 attended the group session, while 11 were absent due to reasons that included being ill on the day of the session, being busy, and feeling that the project was not a good fit for specific fitness goals. Among the 86 participants who attended the group session, 77 completed the study at eight-week follow-up. The retention rate of participants from consent to the eight-week follow-up was high at 77%. The flow diagram (Figure 7.1) illustrates the recruitment and retention of participants and is based on the suggestions of the CONSORT Group (Schulz, Altman, Moher, for the CONSORT Group, 2010). There were no significant differences in age, socioeconomic status, relationship status, education level, employment status, cultural identification and baseline attitudes to ageing in all three domains, between participants who completed the study at eight-week follow-up, compared to participants who had either not attended the group session or had attended the group session but were lost to follow-up.
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Figure 7.1. Flow diagram illustrating recruitment and study follow-up. Note. For mediation and path analyses, participants who have completed the eight-week follow-up but had missing variables for specific analyses, such as scores for post-group session subjective norms, were excluded from the corresponding analyses.

The majority of the participants who provided baseline data (n = 96) were married, employed, had sufficient financial resources to meet needs, and were university-educated, as reported in Table 7.1. Place of birth for the participants included Australia (43.75%), the UK (5.21%), Ireland (3.13%), and Chile (1.04%), China (25%), Hong Kong (6.25%), Taiwan (5.21%), Malaysia (5.21%), Singapore (2.08%) and Vietnam (1.04%). Information on place of birth was missing for two participants.
Improving attitudes to ageing to increase physical activity

Table 7.1

Demographic characteristics of participants by condition and cultural identification

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>Total</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage</td>
<td>Australian (n = 28)</td>
<td>Chinese (n = 19)</td>
<td>Australian (n = 25)</td>
<td>Chinese (n = 18)</td>
</tr>
<tr>
<td>Relationship status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>66.70%</td>
<td>57.14%</td>
<td>78.95%</td>
<td>60.00%</td>
<td>77.78%</td>
</tr>
<tr>
<td>Living with partner</td>
<td>8.33%</td>
<td>14.29%</td>
<td>0.00%</td>
<td>16.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Divorced</td>
<td>9.38%</td>
<td>10.71%</td>
<td>5.26%</td>
<td>4.00%</td>
<td>16.67%</td>
</tr>
<tr>
<td>Widowed</td>
<td>4.17%</td>
<td>3.57%</td>
<td>5.26%</td>
<td>4.00%</td>
<td>5.56%</td>
</tr>
<tr>
<td>Single</td>
<td>11.46%</td>
<td>14.29%</td>
<td>10.53%</td>
<td>16.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Employment status*</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>78.10%</td>
<td>100%</td>
<td>52.63%</td>
<td>92.00%</td>
<td>44.44%</td>
</tr>
<tr>
<td>Home duties</td>
<td>12.50%</td>
<td>0.00%</td>
<td>26.32%</td>
<td>4.00%</td>
<td>33.33%</td>
</tr>
<tr>
<td>Retired</td>
<td>5.21%</td>
<td>0.00%</td>
<td>10.53%</td>
<td>0.00%</td>
<td>16.67%</td>
</tr>
<tr>
<td>Unemployed or Other</td>
<td>4.17%</td>
<td>0.00%</td>
<td>10.53%</td>
<td>4.00%</td>
<td>5.56%</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient financial resources</td>
<td>4.17%</td>
<td>0.00%</td>
<td>5.26%</td>
<td>8.00%</td>
<td>5.56%</td>
</tr>
<tr>
<td>Just enough</td>
<td>20.83%</td>
<td>21.43%</td>
<td>21.05%</td>
<td>4.00%</td>
<td>16.67%</td>
</tr>
<tr>
<td>Sufficient</td>
<td>64.58%</td>
<td>64.29%</td>
<td>63.16%</td>
<td>76.00%</td>
<td>66.67%</td>
</tr>
<tr>
<td>More than enough</td>
<td>10.42%</td>
<td>14.29%</td>
<td>10.53%</td>
<td>8.00%</td>
<td>11.11%</td>
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<td>Education</td>
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<td></td>
<td></td>
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<tr>
<td>High School</td>
<td>9.38%</td>
<td>3.57%</td>
<td>21.05%</td>
<td>8.00%</td>
<td>11.11%</td>
</tr>
<tr>
<td>TAFE or trade training</td>
<td>27.08%</td>
<td>21.43%</td>
<td>26.32%</td>
<td>28.00%</td>
<td>33.33%</td>
</tr>
<tr>
<td>University education</td>
<td>63.54%</td>
<td>75.00%</td>
<td>52.63%</td>
<td>64.00%</td>
<td>55.56%</td>
</tr>
</tbody>
</table>

*Note. Demographic variables that are significantly different by cultural identification (within conditions and across conditions) are marked with *. 
As reported in Table 7.2, among the 53 Caucasian participants, 46 indicated that they belonged to Australian culture, two indicated that they belonged to British culture and three indicated that they belonged at least partly to a non-British European culture. Participants who indicated that they belonged to British culture were grouped together with participants who indicated that they belonged to Australian culture, as British culture is similar to Australian culture (Lockenhoff et al., 2009). Among the 43 Chinese participants, 37 indicated that they belonged to Chinese culture, three indicated that they belonged to Australian culture, and three indicated that they belonged to both Australian and Chinese cultures. As the variable for cultural identification was defined as a dichotomous variable (either Australian or Chinese cultural identification), participants who indicated that they belonged to both Australian and Chinese cultures could not be assigned to this dichotomous variable. Thus, participants who indicated that they belonged to both Australian and Chinese cultures, or to a non-British European culture, were coded as missing for the variable cultural identification. Among the Chinese participants who provided data on number of years lived in Australia (n = 37), the mean number of years lived in Australia was 18.16 (SD = 10.83), with a range of one to 40 years. An inspection of the participants allocated to each condition revealed that among the 48 participants who were allocated to the intervention condition, 28 identified with Australian culture while 19 identified with Chinese culture, and among the other 48 participants who were allocated to the control condition, 25 identified with Australian culture while 18 identified with Chinese culture.
Improving attitudes to ageing to increase physical activity

Table 7.2

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian</td>
<td>28</td>
<td>25</td>
<td>53</td>
</tr>
<tr>
<td>Chinese</td>
<td>19</td>
<td>18</td>
<td>37</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>48</td>
<td>96</td>
</tr>
</tbody>
</table>

Note. Missing = Coded as missing for the variable cultural identification.

Physical activity level

Overall, participants were generally already active at baseline, although there was considerable variation in the level of baseline physical activity. The mean baseline average daily pedometer reading of participants \((n = 86)\) was 8892.45 steps \((SD = 2810.81)\), with a range of 2426 steps to 19232 steps. The mean baseline total physical activity days \((n = 85)\) was 2.89 days \((SD = 1.93)\) per week, with a range of zero to seven days. Participants’ baseline group physical activity level \((n = 85)\) was lower, with the mean group physical activity days being 1.07 days \((SD = 1.26)\) per week, with a range of 0 to 5.83 days (refer to Table 1). At eight-week follow-up, the mean average daily pedometer readings of participants decreased slightly to 8792.06 steps \((SD = 2681.15)\). However, this decrease was not statistically significant, \(t (76) = .95, p = .34\). The mean post 8-week total physical activity days of participants increased to 3.70 days \((SD = 1.80)\), and this increase was statistically significant, \(t (76) = -3.08, p = .003\). The mean post 8-week group physical activity days of participants also increased significantly to 1.45 days \((SD = 1.21), t (75) = -2.06, p = .04\).

Table 7.3 reports the descriptive statistics for participants’ physical activity level by condition and Figures 7.2 to 7.4 illustrates participants’ physical activity levels at baseline and over eight weeks.
Improving attitudes to ageing to increase physical activity

Table 7.3

*Descriptive statistics for physical activity levels*

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Skew</th>
<th>Kurtosis</th>
<th>Post eight-week follow-up</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Control</td>
<td></td>
<td>Intervention</td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>Daily average pedometer readings</td>
<td>9647.15 (2732.91)</td>
<td>8137.75 (2711.88)</td>
<td>.70</td>
<td>1.59</td>
<td>9204.20 (2982.36)</td>
<td>8346.51 (2268.80)</td>
</tr>
<tr>
<td>Total physical activity days</td>
<td>3.12 (1.81)</td>
<td>2.66 (2.04)</td>
<td>.29</td>
<td>-.64</td>
<td>3.73 (1.69)</td>
<td>3.66 (1.93)</td>
</tr>
<tr>
<td>Group physical activity days</td>
<td>1.06 (1.12)</td>
<td>1.09 (1.39)</td>
<td>1.56</td>
<td>2.91</td>
<td>1.26 (1.13)</td>
<td>1.64 (1.28)</td>
</tr>
</tbody>
</table>

*Standard deviations are indicated in parentheses*

*Figure 7.2. Pedometer readings over baseline and eight-week follow-up*
Improving attitudes to ageing to increase physical activity

Figure 7.3. Total physical activity days over baseline and eight-week follow-up

Figure 7.4. Group physical activity days over baseline and eight-week follow-up
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**Attitudes to ageing, CES-D scores and personal ideal age**

Overall, participants’ scores on all three domains of the AAQ were positive at baseline as the mean score for the physical change and psychological growth domains were above the midpoint of a possible range of scores from 0 to 40, and the mean score for the psychosocial loss domain was below the midpoint of a possible range of scores from 0 to 40. Higher scores on the physical change and psychological growth domains indicate more positive attitudes, and lower scores on the psychosocial loss domain indicate more positive attitudes. As reported in Table 7.4, the mean score for attitudes in the physical change, psychosocial loss and psychological growth domains at baseline were 25.75 ($SD = 5.34$), 15.55 ($SD = 4.82$) and 28.09 ($SD = 4.29$) respectively. Mean AAQ scores for all three domains improved immediately after the group session, $t$(85) = -3.56, $p = .001$, $t$(85) = -2.03, $p = .046$, and $t$(85) = 2.91, $p = .005$ respectively for the physical change, psychological growth and psychosocial loss domains. Both intervention condition and control condition participants experienced improvements in mean AAQ scores for the physical change domain. For the psychological growth domain, intervention condition participants experienced an increase in their mean score but control condition participants’ mean score decreased. For the psychosocial loss domain, intervention condition participants experienced an improvement in their mean score, while control condition participants’ mean score remained approximately at baseline level.

At eight-week follow-up, mean scores for the physical change domain decreased slightly, while the mean score for the psychosocial loss domain improved slightly. However, these changes in AAQ scores from post-group session to post eight-week follow-up were not statistically significant, $t$(76) = 1.27, $p = .21$, and $t$(75) = .03, $p = .97$ respectively. There was a significant decrease in mean AAQ scores in the psychological growth domain, $t$(75) = 2.07, $p = .04$. An inspection of scores by condition revealed that intervention condition participants’ mean score decreased for this domain, while control condition participants’ mean score remained approximately the same as their post-group session mean score.
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There was considerable variation in participants’ CES-D scores at baseline, measured as a covariate of attitudes to ageing. The mean CES-D score decreased immediately after the group session, and this decrease was statistically significant, $t(85) = 2.52, p = .01$. There was a further decrease of mean CES-D scores at eight-week follow-up. However, this decrease was not significant, $t(76) = .76, p = .45$.

Overall, participants ($n = 91$) indicated at baseline a personal ideal age that was 11.40 years younger ($SD = 11.22$) than their chronological age. Immediately after the group session, the personal ideal age that participants ($n = 79$) indicated was on average 11.16 years younger ($SD = 11.00$) than their chronological age, with personal ideal ages that ranged from 34 years younger to 9 years older than their respective chronological ages. At eight-week follow-up, the mean personal ideal age indicated by participants ($n = 70$) increased to 9.84 years younger ($SD = 10.08$) than their chronological age, with personal ideal ages ranging from 32 years younger than their chronological age to their current age. However, the difference between participants’ mean personal ideal age and their mean chronological age did not differ significantly from baseline to post-group session ($t = -.34, p = .74$), and from post-group session to post eight-week follow-up ($t = -1.01, p = .32$)
Improving attitudes to ageing to increase physical activity

Table 7.4

*Descriptive statistics for AAQ, CES-D scores and difference between personal ideal age and chronological age by condition*

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-group session</th>
<th>Post eight-week follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (SD)</td>
<td>Intervention (SD)</td>
<td>Control (SD)</td>
</tr>
<tr>
<td>Physical change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.75 (5.34; range 14-40)</td>
<td>25.16 (5.48)</td>
<td>26.33 (5.18)</td>
<td>27.16 (5.53)</td>
</tr>
<tr>
<td>Psychosocial loss</td>
<td>15.55 (4.82; range 8-30)</td>
<td>15.92 (4.80)</td>
<td>15.19 (4.85)</td>
</tr>
<tr>
<td>Psychological growth</td>
<td>28.09 (4.29; range 18-39)</td>
<td>26.79 (4.30)</td>
<td>29.40 (3.92)</td>
</tr>
<tr>
<td>CES-D</td>
<td>10.90 (9.39; range 0-54)</td>
<td>11.98 (10.77)</td>
<td>9.79 (7.70)</td>
</tr>
<tr>
<td>Difference between personal ideal age and chronological age</td>
<td>-11.40 (11.22; range -32-32)</td>
<td>-10.47 (11.77)</td>
<td>-12.30 (10.71)</td>
</tr>
</tbody>
</table>

*Note. Standard deviations and range are indicated in parentheses.*
Improving attitudes to ageing to increase physical activity

**Theory of Planned Behaviour variables**

Overall, participants’ mean intention, self-efficacy, perceived control over external factors and subjective norms scores were above the midpoint value for their respective scales at baseline, decreased or remained approximately at baseline levels after the group session, and decreased again at eight-week follow-up. Scores for the variables are reported in Table 7.5. T-tests were conducted on baseline TPB variables to ascertain if there were differences between intervention and control condition participants on these measures. It was found that there were no baseline differences between intervention and control condition participants for intention, perceived control over external factors, and subjective norms. However, intervention condition participants’ baseline self-efficacy was found to be significantly lower, compared to control condition participants’ baseline self-efficacy. The potential implications of this baseline difference will be discussed in Chapter 12. Overall, participants’ mean score for intention decreased from baseline to post-group session ($t = 3.01, p = .003$) and again from post-group session to post eight-week follow-up ($t = 5.04, p < .001$). Scores for all participants on perceived control over external factors remained approximately the same from baseline to post-group session ($t = .57, p = .57$), and decreased from post-group session to post eight-week follow-up ($t = 3.11, p = .003$). Participants’ mean self-efficacy score remained approximately at baseline level after the group session ($t = 1.84, p = .07$) and decreased at post eight-week follow-up ($t = 3.12, p = .003$). For subjective norms, participants’ mean scores remained approximately at baseline levels after the group session ($t = .30, p = .77$), but decreased at post eight-week follow-up ($t = 2.26, p = .03$).
Improving attitudes to ageing to increase physical activity

Table 7.5

Descriptive statistics for TPB variables

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-group session</th>
<th>Post eight-week follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td>Intention</td>
<td>2.33</td>
<td>2.31</td>
<td>2.35</td>
</tr>
<tr>
<td></td>
<td>(.81; range -</td>
<td>(.78)</td>
<td>(.84)</td>
</tr>
<tr>
<td></td>
<td>1.00-3.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>5.26</td>
<td>4.86</td>
<td>5.66</td>
</tr>
<tr>
<td></td>
<td>(1.30; range</td>
<td>(1.37)</td>
<td>(1.12)</td>
</tr>
<tr>
<td></td>
<td>2.00-7.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived control</td>
<td>5.09</td>
<td>5.06</td>
<td>5.11</td>
</tr>
<tr>
<td>over external factors</td>
<td>(1.04; range</td>
<td>(1.05)</td>
<td>(1.04)</td>
</tr>
<tr>
<td></td>
<td>2.00-7.00)</td>
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<tr>
<td>Subjective norms</td>
<td>4.92</td>
<td>4.89</td>
<td>4.94</td>
</tr>
<tr>
<td></td>
<td>(1.07; range</td>
<td>(1.10)</td>
<td>(1.06)</td>
</tr>
<tr>
<td></td>
<td>1.50-7.00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Standard deviations and range are indicated in parentheses.
Correlations among variables

An inspection of the correlations among all the variables suggested an autoregressive relationship among the same variables that were measured over the three time points of baseline, immediately after the group session, and at eight-week follow-up. These findings are presented in Table 7.6. For example, there was a strong and positive relationship between AAQ scores in the physical change domain at baseline and AAQ scores in the same domain measured immediately after the group session, $r(84) = .78, p < .001$. Similarly, AAQ scores measured immediately after the group session were significantly and positively correlated with AAQ scores in the same domain measured at eight-week follow-up, $r(75) = .80, p < .001$.

Attitudes to ageing were also correlated with CES-D scores, and difference between personal ideal age and chronological age, respectively. Attitudes in the psychosocial loss domain measured immediately after the group session were significantly and positively correlated with CES-D scores, $r(84) = .54, p < .001$ measured at the same time point. However, attitudes in the physical change and psychological growth domains post-group session were not significantly correlated to CES-D scores measured at the same time point. At baseline, there was a positive relationship between attitudes in the physical change domain and the difference between personal ideal age and chronological age, $r(79) = .27, p = .01$, indicating that the more positive attitudes are in the physical change domain, the older one’s personal ideal age. On the other hand, there was a significant and negative relationship between attitudes in the psychosocial loss domain and the difference between personal ideal age and chronological age, $r(79) = -.31, p = .003$. The higher the scores in the psychosocial loss domain, the less positive attitudes to ageing are, and the younger the personal ideal age indicated by participants.

Among the Chinese participants, there was a marginally significant negative correlation between number of years lived in Australia and scores for the AAQ in the psychosocial loss domain, $r(35) = -.32, p = .05$, indicating that the greater the number of
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years lived in Australia, the more positive their attitudes to ageing in the psychosocial loss domain were at baseline. However, number of years lived in Australia were not correlated with baseline attitudes in the physical change nor the psychological growth domain, \( p = .31 \) and \( p = .59 \) respectively.

Attitudes to ageing measured immediately after the group session were significantly correlated with Theory of Planned Behaviour variables measured at the same time point. These findings are presented in Table 7.7. For instance, attitudes to ageing in the physical change and psychological growth domains were significantly and positively correlated to intention, \( r (84) = .31, p = .004 \) and \( r (84) = .35, p = .001 \) respectively, and to self-efficacy, \( r (84) = .40, p < .001 \) and \( r (84) = .23, p = .03 \) respectively. Attitudes to ageing in the physical change domain was also significantly and positively correlated to perceived control over external factors, \( r (84) = .34, p = .001 \). In addition, attitudes in the psychosocial loss domain was significantly and negatively correlated to self-efficacy, \( r (84) = -.28, p = .008 \).

Among the Theory of Planned Behaviour variables measured immediately after the group session, only perceived control over external factors was positively and significantly correlated with one of the physical activity measures, total physical activity days, at eight week follow-up, \( r (75) = .27, p = .02 \). These findings are presented in Table 7.8. There was a significant and positive relationship between physical activity level measured by pedometer readings and total physical activity days, \( r (83) = .27, p = .01 \) at baseline and \( r (75) = .27, p = .02 \) at eight-week follow-up. Total physical activity days at eight-week follow-up was also significantly and positively correlated with self-efficacy at eight-week follow-up, \( r (74) = .31, p = .006 \).

Baseline attitudes to ageing and baseline TPB variables were also correlated with participants’ socioeconomic status, relationship status and employment status. Specifically, socioeconomic status was negatively correlated with attitudes in the psychosocial loss domain, \( r(94) = -.24, p = .02 \), and positively associated with attitudes in the psychological growth domain, \( r(94) = .28, p = .03 \), intention, \( r(94) = .26, p = .01 \) and self-efficacy, \( r(96) \).
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= .33, \( p = .001 \). Relationship status was positively correlated with attitudes in the physical change domain, \( r(94) = .20, p = .047 \). Employment status was positively correlated with perceived control over external factors, \( r(93) = .23, p = .03 \), with participants who were employed more likely to have higher levels of baseline perceived control over external factors.
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Table 7.6

Pearsons correlations among AAQ domains and CES-D scores

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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</thead>
<tbody>
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<td>Baseline physical change</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline psychosocial loss</td>
<td>-0.39</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline psychological growth</td>
<td>0.52</td>
<td>-0.26</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-group session physical change</td>
<td>0.78</td>
<td>-0.23</td>
<td>0.51</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-group session psychosocial loss</td>
<td>-0.37</td>
<td>0.71</td>
<td>-0.20</td>
<td>-0.35</td>
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<tr>
<td>Post-group session psychological growth</td>
<td>0.54</td>
<td>-0.20</td>
<td>0.70</td>
<td>0.66</td>
<td>-0.35</td>
<td>1.00</td>
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</tr>
<tr>
<td>Post eight-week physical change</td>
<td>0.78</td>
<td>-0.22</td>
<td>0.47</td>
<td>0.80</td>
<td>-0.27</td>
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<td>1.00</td>
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<tr>
<td>Post eight-week psychosocial loss</td>
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<td>0.77</td>
<td>-0.17</td>
<td>-0.24</td>
<td>0.77</td>
<td>-0.34</td>
<td>-0.19</td>
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<tr>
<td>Post eight-week psychological growth</td>
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<td>0.74</td>
<td>0.55</td>
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<td>0.78</td>
<td>0.61</td>
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</tr>
<tr>
<td>Baseline CES-D</td>
<td>-0.03</td>
<td>0.08</td>
<td>-0.12</td>
<td>-0.26</td>
<td>0.41</td>
<td>-0.16</td>
<td>-0.19</td>
<td>0.37</td>
<td>-0.31</td>
<td>1.00</td>
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<td>0.05</td>
<td>-0.26</td>
<td>0.54</td>
<td>-0.33</td>
<td>-0.24</td>
<td>0.47</td>
<td>-0.42</td>
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<tr>
<td>Post eight-week CES-D</td>
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<td>-0.05</td>
<td>0.01</td>
<td>0.05</td>
<td>0.005</td>
<td>-0.02</td>
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<td>0.20</td>
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</tr>
</tbody>
</table>

Note. **p < .001; *p < .05.
Improving attitudes to ageing to increase physical activity

Table 7.7

*Pearson’s correlations among post-group session AAQ domains and post-group session TPB variables*

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
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<td>1 Post-group session physical change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>3 Post-group session psychological growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.66**</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>4 Post-group session intention</td>
<td></td>
<td></td>
<td></td>
<td>0.31**</td>
<td>-0.16</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>5 Post-group session self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.40**</td>
<td>-0.28</td>
<td></td>
</tr>
<tr>
<td>6 Post-group session perceived control</td>
<td></td>
<td></td>
<td>0.34**</td>
<td>-0.10</td>
<td>0.17</td>
<td>0.44**</td>
<td></td>
</tr>
<tr>
<td>7 Post-group session subjective norms</td>
<td>0.27*</td>
<td>-0.09</td>
<td>0.36**</td>
<td>0.27*</td>
<td>0.25*</td>
<td>0.20</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note.* **p < .001; * p < .05.
Improving attitudes to ageing to increase physical activity

Table 7.8

Pearson’s correlations among TPB variables and physical activity measures

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Post-group session intention</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 Post eight-week intention</td>
<td>0.43**</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Post-group session self-efficacy</td>
<td>0.58**</td>
<td>0.32**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Post eight-week self-efficacy</td>
<td>0.30**</td>
<td>0.70**</td>
<td>0.41**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Post-group session perceived control</td>
<td>0.44**</td>
<td>0.26*</td>
<td>0.57**</td>
<td>0.28*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6 Post eight-week perceived control</td>
<td>0.21</td>
<td>0.37**</td>
<td>0.39**</td>
<td>0.51**</td>
<td>0.50**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Post-group session subjective norms</td>
<td>0.27*</td>
<td>0.36**</td>
<td>0.25*</td>
<td>0.04</td>
<td>0.20</td>
<td>0.09</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Post eight-week subjective norms</td>
<td>0.37**</td>
<td>0.50**</td>
<td>0.37**</td>
<td>0.27*</td>
<td>0.17</td>
<td>0.25*</td>
<td>0.62**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Baseline pedometer readings</td>
<td>0.19</td>
<td>0.02</td>
<td>0.18</td>
<td>0.09</td>
<td>0.09</td>
<td>0.12</td>
<td>0.01</td>
<td>0.16</td>
<td>1.00</td>
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<td></td>
</tr>
<tr>
<td>10 Post eight-week pedometer readings</td>
<td>0.14</td>
<td>-0.06</td>
<td>0.01</td>
<td>0.13</td>
<td>-0.06</td>
<td>0.03</td>
<td>-0.14</td>
<td>-0.01</td>
<td>0.71**</td>
<td>1.00</td>
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<td></td>
</tr>
<tr>
<td>11 Baseline total physical activity days</td>
<td>-0.07</td>
<td>-0.01</td>
<td>0.06</td>
<td>0.07</td>
<td>0.14</td>
<td>0.09</td>
<td>-0.15</td>
<td>-0.14</td>
<td>0.27*</td>
<td>0.03</td>
<td>1.00</td>
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</tr>
<tr>
<td>12 Post eight-week total physical activity days</td>
<td>0.14</td>
<td>0.14</td>
<td>0.20</td>
<td>0.31**</td>
<td>0.27*</td>
<td>0.10</td>
<td>-0.08</td>
<td>0.08</td>
<td>0.25*</td>
<td>0.27*</td>
<td>0.49**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: **p < .001; * p < .05.
Improving attitudes to ageing to increase physical activity

Table 7.9

*Correlations between demographic variables, baseline AAQ domain scores and baseline TPB variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Age</td>
<td>1.00</td>
<td>-0.13</td>
<td>0.03</td>
<td>-0.28**</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.08</td>
<td>0.01</td>
<td>0.06</td>
<td>0.17</td>
<td>0.06</td>
</tr>
<tr>
<td>2 Cultural identification</td>
<td>1.00</td>
<td>-0.07</td>
<td>0.05</td>
<td>-0.17</td>
<td>-0.55**</td>
<td>0.09</td>
<td>0.07</td>
<td>-0.13</td>
<td>-0.20</td>
<td>-0.15</td>
<td>-0.16</td>
<td>-0.09</td>
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</tr>
<tr>
<td>3 Socioeconomic status</td>
<td>1.00</td>
<td>0.33**</td>
<td>0.14</td>
<td>0.04</td>
<td>-0.14</td>
<td>-0.24*</td>
<td>0.23*</td>
<td>0.26*</td>
<td>0.33**</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>0.37</td>
<td>0.20*</td>
<td>0.17</td>
<td>0.17</td>
<td>0.23*</td>
<td>-0.03</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5 Education background</td>
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<td>-0.13</td>
<td>0.16</td>
<td>-0.08</td>
<td>0.06</td>
<td>0.13</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>6 Employment status</td>
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<td>-0.13</td>
<td>0.05</td>
<td>0.01</td>
<td>0.17</td>
<td>0.17</td>
<td>0.08</td>
<td>0.23*</td>
<td></td>
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</tr>
<tr>
<td>7 Physical change</td>
<td>1.00</td>
<td>-0.39**</td>
<td>0.52**</td>
<td>0.18</td>
<td>0.31**</td>
<td>0.23*</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8 Psychosocial loss domain</td>
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<td>-0.26**</td>
<td>0.04</td>
<td>-0.10</td>
<td>-0.15</td>
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<td>9 Psychological growth</td>
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<td>0.21*</td>
<td>0.38**</td>
<td>0.21*</td>
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<td>10 Intention</td>
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<td>0.51**</td>
<td>0.25*</td>
<td>0.42**</td>
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</tr>
<tr>
<td>11 Self-efficacy</td>
<td>1.00</td>
<td>0.39**</td>
<td></td>
<td>0.22*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Perceived control over external factors</td>
<td>1.00</td>
<td>0.31**</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>13 Subjective norms</td>
<td>1.00</td>
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<td></td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Improving attitudes to ageing to increase physical activity

**Conclusion**

In this chapter, the means and standard deviations for variables were reported, together with the correlations among key variables. Overall, attitudes to ageing were already positive at baseline, and physical activity levels measured by pedometer readings were already high at baseline. Participants’ intention to increase physical activity levels was also already high at baseline, and this was expected given that one of the pre-requisites of participating in this study was having the intention to increase physical activity levels. In the next chapter, the efficacy of the intervention in improving attitudes to ageing will be investigated, and cultural identification will also be investigated as a moderator of intervention efficacy.
Chapter 8: Efficacy of intervention in improving attitudes to ageing

Overview

In the previous chapter, demographic characteristics of the current study’s participants were introduced, together with descriptive statistics of the study’s measures and correlations among the measures. Given that the first aim of the study was to investigate the efficacy of a culturally relevant intervention in improving attitudes to ageing among participants of different cultural identifications, this chapter will present the results of analyses examining intervention efficacy on attitudes to ageing, and cultural identification as a possible moderator of intervention efficacy.

Aim 1: Efficacy of intervention in improving attitudes to ageing

Hypothesis 1.3 was that, compared with the control group, participants who attended an intervention group session would demonstrate significantly greater improvement in post-intervention attitudes to ageing in the three domains of physical change, psychosocial loss and psychological growth. Three sets of linear mixed model analyses were conducted: one for each respective domain of attitudes to ageing. In order to capture possible differences in directions of change between from baseline to immediately after the group session, and from baseline to the end of the eight-week follow-up, two dummy variables were created to represent change in AAQ scores between baseline and post-group session, referred to as TD1, and change in AAQ scores between baseline and post eight-week follow-up, referred to as TD2. TD1 was created by coding the baseline as 0, the second time point that was immediately after the group session as 1 and the third time point at the end of the eight-week follow-up period as 0. TD2 was created by coding the baseline as 0, the second time point as 0 and the third time point as 1.

The linear mixed model analyses examined the main effects of cultural
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identification (Australian and Chinese), condition (intervention and control), TD1, TD2, socioeconomic status (insufficient or just enough to meet needs, and sufficient or more than enough to meet needs), relationship status (with partner and without partner), employment status (employed and not employed), education background (12 years of education or less, and more than 12 years of education) and age. Interaction effects were also examined as follows: condition by TD1, condition by TD2, condition by cultural identification, cultural identification by TD1, cultural identification by TD2, condition by TD1 by cultural identification, and condition by TD2 by cultural identification, on the respective trajectories of AAQ physical change, psychosocial loss and psychological growth scores. A summary of the main and interaction effects is presented in Table 8.1.

Table 8.1

*Main and interaction effects included in initial models of linear mixed model analyses for attitudes to ageing*

<table>
<thead>
<tr>
<th>Main effects</th>
<th>Interaction effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural identification (CI)</td>
<td>Condition by TD1</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition by TD2</td>
</tr>
<tr>
<td>TD1 (change from baseline to post-group session)</td>
<td>Condition by CI</td>
</tr>
<tr>
<td>TD2 (change from baseline to eight-week follow-up)</td>
<td>CI by TD1</td>
</tr>
<tr>
<td>Socioeconomic status (SES)</td>
<td>CI by TD2</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Condition by CI by TD1</td>
</tr>
<tr>
<td>Employment status</td>
<td>Condition by CI by TD2</td>
</tr>
<tr>
<td>Education background (Education)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
</tbody>
</table>

Random effects of the intercept, TD1 and TD2 were also included in the
Improving attitudes to ageing to increase physical activity

analyses for all three AAQ domains, and random effects of CES-D scores as a time varying covariate were included for the psychosocial loss domain, as CES-D scores were found to be significantly correlated with AAQ scores in the psychosocial loss domain, but not the other two domains, in the current study. The covariance model used for the random effects was identity, where there is constant variance and it is assumed that there is no correlation among the variables contributing to the random effects (International Business Machines Corporation Knowledge Centre, IBM Knowledge Centre, 2011). The covariance model used for the repeated effects was first order autoregressive, as this model illustrates that the correlations between measurements at adjacent time points are strongest and become weaker as the time points increase (Field, 2013). The statistical approach adopted was to conduct linear mixed model analyses as this approach provides unbiased estimates of missing data and accounts for the correlation among repeated measures.

A backward stepwise penalised likelihood strategy was adopted, with all variables included in the initial model, following which variables were removed one by one by comparing Bayesian Information Criterion (BIC) values of the more complex and the more refined models. The final model was decided upon when removal of additional variables did not reduce the BIC value of the more refined model by at least more than two points (Seltman, 2012). Although the BIC value of a model increases with model complexity, this guideline of a reduction of at least more than two points in BIC value in deciding whether to retain a variable in the model allows for a balance between model complexity and good fit of the model to the data (Seltman, 2012). Please refer to Table 8.2 for the BIC values of the initial models and the final models of the three sets of linear mixed model analyses, as well as the variables retained in the respective final models.
Improving attitudes to ageing to increase physical activity

Table 8.2

**BIC values of initial and final models, and variables retained in final models**

<table>
<thead>
<tr>
<th>Attitudes to ageing domain</th>
<th>BIC value of initial model</th>
<th>BIC value of final model</th>
<th>Variables retained in final model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical change</td>
<td>1439.05</td>
<td>1424.66</td>
<td>Condition, CI, SES, Education, TD1, TD2, Condition<em>CI, Condition</em>TD1, Condition<em>TD2, CI</em>TD1, CI<em>TD2, Condition</em>CI<em>TD1, Condition</em>CI*TD2</td>
</tr>
<tr>
<td>Psychosocial loss</td>
<td>1322.55</td>
<td>1301.15</td>
<td>Condition, CI, TD1, TD2, Condition<em>CI, Condition</em>TD1, Condition<em>TD2, CI</em>TD1, CI<em>TD2, Condition</em>CI<em>TD1, Condition</em>CI*TD2</td>
</tr>
<tr>
<td>Psychological growth</td>
<td>1342.01</td>
<td>1323.96</td>
<td>Condition, CI, SES, Education, TD1, TD2, Condition<em>CI, Condition</em>TD1, Condition<em>TD2, CI</em>TD1, CI<em>TD2, Condition</em>CI<em>TD1, Condition</em>CI*TD2</td>
</tr>
</tbody>
</table>

**Hypothesis 1.3a: Improvement in attitudes to ageing in the physical change domain**

Hypothesis 1.3a was that intervention condition participants, compared to control condition participants, would demonstrate a significantly greater improvement in attitudes to ageing in the physical change domain immediately after the group session, and that this improvement would be maintained at eight-week follow-up. A t test of participants’ baseline AAQ scores indicated that there were no significant baseline differences between intervention condition and control condition participants’ attitudes for the physical change domain ($t = 1.08, p = .28$). The output of the final linear mixed model indicated that the variance of the random effects was statistically
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significant, $b = 2.05, p = .01, SE = .79, 95\% CI [.96, 4.38]$ The Intra class correlation (ICC) was .08, indicating that 8% of the variance in AAQ scores of the physical change domain was due to the group structure and represented inter-individual differences in scores. A significant main effect of socioeconomic status was found ($t = -2.57, p = .01, 95\% CI [-5.85, -0.75]$). Please refer to Table 8.3 for a summary of fixed and random effects of the linear mixed model output for the physical change domain. However, a t-test revealed that there were no significant differences ($t = -1.42, p = .16$) in baseline AAQ scores between participants who had insufficient or just enough financial resources to meet needs ($M = 24.42, SD = 4.86$) and participants who had sufficient or more than enough financial resources to meet needs ($M = 26.19, SD = 5.44$). In addition, a significant main effect of education background was found ($t = 2.42, p = .02, 95\% CI [.76, 7.76]$). However, a t-test revealed that there were no significant differences ($t = .90, p = .39$) in baseline AAQ scores between participants who had 12 or fewer years of education ($M = 27.89, SD = 7.69$) and participants who had more than 12 years of education ($M = 25.53, SD = 5.04$).

There was no significant interaction effect of condition by TD1 ($p = .21$), or condition by TD2 ($p = .36$), indicating that the change in attitudes to ageing within the physical change domain did not differ significantly between intervention and control condition participants for each set of time points. Thus, the hypothesis that intervention condition participants would experience a significantly greater improvement in attitudes for the physical change domain was not supported.
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Table 8.3

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td><em>b</em></td>
<td><em>SE</em></td>
<td>95% CI</td>
</tr>
<tr>
<td>Baseline AAQ score</td>
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<td>1.57</td>
<td>22.48, 28.71</td>
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<tr>
<td>Condition</td>
<td>.23</td>
<td>2.17</td>
<td>-4.06, 4.53</td>
</tr>
<tr>
<td>CI</td>
<td>5.78</td>
<td>1.99</td>
<td>1.83, 9.72</td>
</tr>
<tr>
<td>SES</td>
<td>-3.30</td>
<td>1.28</td>
<td>-5.85, -.75</td>
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<tr>
<td>Education</td>
<td>4.26</td>
<td>1.76</td>
<td>.76, 7.76</td>
</tr>
<tr>
<td>TD1</td>
<td>-.84</td>
<td>.78</td>
<td>-2.38, .70</td>
</tr>
<tr>
<td>TD2</td>
<td>-.89</td>
<td>.98</td>
<td>-2.83, 1.06</td>
</tr>
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<td>Condition*CI</td>
<td>-2.73</td>
<td>2.86</td>
<td>-8.39, 2.92</td>
</tr>
<tr>
<td>Condition*TD1</td>
<td>1.42</td>
<td>1.12</td>
<td>-.79, 3.64</td>
</tr>
<tr>
<td>Condition*TD2</td>
<td>1.29</td>
<td>1.39</td>
<td>-.47, 4.05</td>
</tr>
<tr>
<td>CI*TD1</td>
<td>-2.06</td>
<td>1.01</td>
<td>-4.06, .06</td>
</tr>
<tr>
<td>CI*TD2</td>
<td>-.93</td>
<td>1.28</td>
<td>-3.47, 1.62</td>
</tr>
<tr>
<td>Condition<em>CI</em>TD1</td>
<td>-.20</td>
<td>1.46</td>
<td>-3.09, 2.69</td>
</tr>
<tr>
<td>Condition<em>CI</em>TD2</td>
<td>-.16</td>
<td>1.85</td>
<td>-3.82, 3.51</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Random effects</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated measures AR1 diagonal</td>
<td>21.24</td>
<td>4.17</td>
<td>14.46, 31.20</td>
</tr>
<tr>
<td>Repeated measures AR1 rho</td>
<td>.85</td>
<td>.04</td>
<td>.74, .92</td>
</tr>
<tr>
<td>Intercept + TD1 + TD2</td>
<td>2.05</td>
<td>.79</td>
<td>.96, 4.38</td>
</tr>
</tbody>
</table>

**Hypothesis 1.3b: Improvement in attitudes to ageing in the psychosocial loss domain**

Hypothesis 1.3b was that intervention condition participants, compared to control condition participants, would demonstrate a significantly greater improvement in attitudes to ageing in the psychosocial loss domain immediately after the group session, and that this improvement would be maintained at eight-week follow-up. A t test revealed that there were no significant baseline differences between intervention condition and control condition participants’ attitudes for the psychosocial loss domain (*t* = -.74, *p* = .46). The output of the final linear mixed model indicated that the variance of the random effects was statistically significant, *b* = .07, *p* = .002, *SE* = .02, 95% CI [.04, .14] The ICC was .006, indicating that .6% of the variance in AAQ scores of the psychosocial loss domain was due to the group structure and represented inter-individual differences in scores. There was also no significant interaction effect of condition by TD1 (*p* = .70), and no significant interaction effect of condition by TD2 (*p* = .63). Thus, hypothesis
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1.3b was not supported. Please refer to Table 8.4 for a summary of fixed and random effects of the linear mixed model output for the psychosocial loss domain.

Table 8.4

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th>b</th>
<th>SE</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline AAQ score</td>
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<td>1.20</td>
<td>10.42, 15.15</td>
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<tr>
<td>Condition</td>
<td>-.19</td>
<td>1.76</td>
<td>-.36, 3.28</td>
</tr>
<tr>
<td>CI</td>
<td>-1.54</td>
<td>1.56</td>
<td>-4.63, 1.54</td>
</tr>
<tr>
<td>TD1</td>
<td>.63</td>
<td>.64</td>
<td>-.64, 1.91</td>
</tr>
<tr>
<td>TD2</td>
<td>.55</td>
<td>.84</td>
<td>-1.10, 2.21</td>
</tr>
<tr>
<td>Condition*CI</td>
<td>3.88</td>
<td>2.32</td>
<td>-7.0, 8.46</td>
</tr>
<tr>
<td>Condition*TD1</td>
<td>-.35</td>
<td>.91</td>
<td>-2.16, 1.45</td>
</tr>
<tr>
<td>Condition*TD2</td>
<td>.58</td>
<td>1.19</td>
<td>-1.77, 2.93</td>
</tr>
<tr>
<td>CI*TD1</td>
<td>1.36</td>
<td>.83</td>
<td>-28, 2.99</td>
</tr>
<tr>
<td>CI*TD2</td>
<td>.97</td>
<td>1.10</td>
<td>-1.19, 3.13</td>
</tr>
<tr>
<td>Condition<em>CI</em>TD1</td>
<td>-1.94</td>
<td>1.19</td>
<td>-4.30, .43</td>
</tr>
<tr>
<td>Condition<em>CI</em>TD2</td>
<td>-2.54</td>
<td>1.58</td>
<td>.04, .14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random effects</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated measures AR1 diagonal</td>
<td>11.61</td>
<td>2.16</td>
<td>8.06, 16.72</td>
</tr>
<tr>
<td>Repeated measures AR1 rho</td>
<td>.74</td>
<td>.06</td>
<td>.60, .83</td>
</tr>
<tr>
<td>Intercept + ces-d + TD1 + TD2</td>
<td>.07</td>
<td>.02</td>
<td>.96, 4.38</td>
</tr>
</tbody>
</table>

Note. ces-d represents CES-D scores.

**Hypothesis 1.3c: Improvement in attitudes to ageing in the psychological growth domain**

Hypothesis 1.3c was that intervention condition participants, compared to control condition participants, would demonstrate a significantly greater improvement in attitudes to ageing in the psychological growth domain immediately after the group session, and that this improvement would be maintained at eight-week follow-up. A t test revealed that control condition participants’ baseline scores (M = 29.40, SD = 3.92) were significantly higher than intervention condition participants’ baseline scores (M = 26.79, SD = 4.30) for the psychological growth domain (t = 3.10, p = .003). The output of the final linear mixed model indicated that the variance of the random effects was statistically significant, b = 1.13, p = .04, SE = .54, 95% CI [.44, 2.86] The ICC was .07, indicating that 7% of the variance in AAQ scores of the psychological growth domain was due to the group structure and represented inter-individual differences in scores. Moreover, a
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significant main effect of socioeconomic status was found \(t = -3.16, p = .002, 95\% \text{ CI} [-5.09, -1.16]\). A t-test conducted on baseline AAQ scores revealed that participants who had insufficient or just enough financial resources to meet needs had significantly lower scores \((M = 26.42, SD = 4.14)\) than participants who had sufficient or more than enough financial resources to meet needs \((M = 28.65, SD = 4.23)\). A significant main effect of education background was also found \((t= 2.01, p = .048, 95\% \text{ CI} [.02, 5.40])\). However, a t-test conducted on baseline AAQ scores did not reveal significant differences \((t = .75, p = .46)\) in baseline scores between participants who had 12 or fewer years of education \((M = 29.11, SD = 4.73)\) and participants who had more than 12 years of education \((M = 27.99, SD = 4.26)\). In addition, a significant main effect of TD1 was found \((t = -2.13, p = .04, 95\% \text{ CI} [2.82, -.10])\). A t-test was conducted to compare changes in all participants’ scores from baseline to post-group session, and it was found that participants had a significant increase \((t = -2.03, p = .046)\) in AAQ scores in the psychological growth domain from baseline \((M = 28.17, SD = 4.24)\) to post-group session \((M = 28.91, SD = 4.33)\).

In relation to the hypothesis, a significant interaction effect of condition by TD1 was found \((t = 2.48, p = .02, 95\% \text{ CI} [.49, 4.39])\). An inspection of the descriptive statistics reported in Chapter 7 indicated that from baseline to immediately after the group session, the scores of intervention condition participants improved by two points while the scores of control condition participants decreased by .38 points. The findings of a significant main effect of TD1 and significant interaction effect of condition by TD1 collectively suggest that the intervention changed the direction of the relationship between attitudes in the psychological growth domain and the passage of time from baseline to after the group session. However, the effect size for the interaction effect of condition by TD1 was only .06. As Cohen (1988) has suggested that an effect size of .20 would be considered small, an effect size of .06 for the current study’s intervention’s effect in improving attitudes in the psychological...
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growth domain post-group session was very small. There was no significant
interaction effect of condition by TD2 (p = .35), indicating that the post-group session
improvement in attitudes of intervention condition participants was not maintained at
eight-week follow-up. Hence, hypothesis 1.3c was only partially supported. Please refer to
Table 8.5 for a summary of fixed and random effects of the linear mixed model output for the
psychological growth domain. Figure 8.1 illustrates changes in AAQ scores in the
psychological growth domain from baseline to eight-week follow-up.

Table 8.5

| Fixed and random effects of final linear mixed model for psychological growth domain |
|---------------------------------|---------|---------|
| **Fixed effects**               | **b**   | **SE_b**| **95% CI**  |
| Baseline AAQ score             | 28.03   | 1.31    | 25.43, 30.63 |
| Condition                      | -.75    | 1.82    | -4.36, 2.86  |
| CI                             | 2.53    | 1.67    | -.78, 5.83  |
| SES                            | -3.13   | .99     | -5.09, -1.16 |
| Education                      | 2.71    | 1.35    | .02, 5.40   |
| TD1                            | -1.46   | .69     | -2.82, -10  |
| TD2                            | -.21    | .87     | -1.94, 1.52 |
| Condition*CI                   | .10     | 2.41    | -4.66, 4.86 |
| Condition*TD1                  | 2.44    | .99     | .49, 4.39   |
| Condition*TD2                  | 1.29    | 1.39    | -1.28, 3.64 |
| CI*TD1                         | -.70    | .89     | -2.46, 1.06 |
| CI*TD2                         | -.22    | 1.14    | -2.48, 2.05 |
| Condition*CI*TD1               | 1.23    | 1.29    | -2.42, 2.67 |
| Condition*CI*TD2               | -.93    | 1.65    | -4.21, 2.35 |

| Random effects                 | **b**   | **SE_b**| **95% CI**  |
| Repeated measures AR1 diagonal | 13.52   | 2.57    | 9.32, 19.62 |
| Repeated measures AR1 rho      | .78     | .05     | .66, .87    |
| Intercept + TD1 + TD2          | 1.28    | .54     | .44, 2.86   |
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**Figure 8.1.** AAQ scores in the psychological growth domain

**Hypothesis 1.4: Baseline differences in attitudes to ageing as a function of cultural identification**

Before investigating cultural identification as a possible moderator of intervention efficacy on attitudes to ageing, baseline differences in attitudes to ageing as a function of cultural identification were examined to ascertain that there were indeed baseline differences between participants of Australian, compared to Chinese, cultural identification, among the study participants. It was hypothesized that participants who identified with Australian culture, compared to Chinese culture, would demonstrate more positive pre-intervention attitudes to ageing in all three domains.

The main effect of cultural identification on attitudes to ageing in the physical change domain was significant ($t = 2.90, p = .004, 95\% \text{ CI} [1.83, 9.72]$). However, a
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t-test indicated that there were no significant differences in baseline scores \( t = .88, p = .38 \) between participants of Australian \( (M = 26.20, SD = 4.89) \) and Chinese \( (M = 25.19, SD = 6.02) \) cultural identification. In addition, a significant cultural identification by TD1 interaction effect was found, \( t = -2.04, p = .04, 95\% \text{ CI } [-4.06, -.06] \). An inspection of the mean AAQ scores as a function of cultural identification at baseline and post-group session indicated that participants with Australian, compared to Chinese, cultural identification, had an increase in scores in the physical change domain that was 2.17 points greater. However, there was no significant main effect of cultural identification on AAQ scores in the psychosocial loss domain \( (p = .33) \). A t-test confirmed that there were no significant differences \( t = .65, p = .52 \) between participants of Australian \( (M = 15.75, SD = 5.34) \) compared to Chinese \( (M = 15.11, SD = 4.03) \), cultural identification with respect to baseline AAQ scores in the psychosocial loss domain. In addition, there was no significant main effect of cultural identification for AAQ scores in the psychological growth domain \( (p = .13) \). A t-test confirmed that there were no significant differences \( t = 1.21, p = .23 \) in baseline AAQ scores in the psychological growth domain between participants of Australian \( (M = 28.55, SD = 4.08) \), compared to Chinese \( (M = 27.43, SD = 4.57) \), cultural identification. Thus, the hypothesis that participants with Australian, compared to
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Chinese, cultural identification would have more positive baseline attitudes to ageing in all three domains was not supported.

**Hypothesis 1.5: Cultural identification as a moderator of intervention efficacy on attitudes to ageing**

Hypothesis 1.5 was that among the intervention condition participants, those who with Australian, compared to Chinese, cultural identification would demonstrate a significantly greater improvement in attitudes to ageing in all three domains.

For the physical change domain, findings from the linear mixed model analyses demonstrated that the interaction effects of condition by TD1 by cultural identification \( (p = .89) \), as well as condition by TD2 by cultural identification \( (p = .93) \) were non-significant, indicating that cultural identification was not a moderator of intervention efficacy. For the psychosocial loss domain, there were also no significant interaction effects for condition by TD1 by cultural identification \( (p = .11) \), and condition by TD2 by cultural identification \( (p = .11) \). Likewise, for the psychological growth domain, there were no significant interaction effects for condition by TD1 by cultural identification \( (p = .92) \), or condition by TD2 by cultural identification \( (p = .58) \). Hence, the hypothesis that cultural identification would moderate intervention efficacy such that among intervention condition participants,
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those with Australian, compared to Chinese, cultural identification, would have
greater improvement in attitudes to ageing following the intervention, was not
supported.

Conclusion

In this chapter, findings for the efficacy of the intervention in improving
attitudes to ageing, as well as cultural identification as a moderator of intervention
efficacy, were presented. It was found that the intervention was effective at improving
attitudes to ageing in the psychological growth domain, though this improvement was
not maintained at eight-week follow-up. However, the intervention was not effective
at improving attitudes in the physical change and psychosocial loss domains. Cultural
identification was also not found to be a moderator of intervention efficacy. In the
next chapter, findings for the efficacy of the intervention in increasing physical
activity level will be presented, along with findings that examine intention and self
efficacy as possible mediators of the relationship between attitudes to ageing and
physical activity level.
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Chapter 9: Efficacy of intervention in increasing physical activity, and investigation of intention and self-efficacy as mediators of relationship between attitudes to ageing and physical activity level

Overview

In the previous chapter, results regarding the efficacy of an intervention to improve attitudes to ageing, as well as cultural identification as a moderator of efficacy, were presented. Although intervention condition participants did not demonstrate a significantly greater improvement in attitudes to ageing in the physical change and psychosocial loss domains, they did demonstrate a significantly greater improvement in the psychological growth domain immediately following the group session. Given that the overall aim of the intervention was to increase physical activity levels of midlife women via improving their attitudes to ageing, this chapter will present the results of analyses undertaken to investigate the efficacy of the intervention in increasing physical activity levels over eight weeks, and whether intention and self-efficacy mediate any relationship between post-group session attitudes to ageing and physical activity levels over eight weeks. The aims and hypotheses were described in detail in Chapter 5.

Aim 1: Efficacy of intervention in increasing physical activity levels

Hypothesis 1.1 was that participants who attended the intervention group
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session, compared with those in the control group session, would demonstrate a significantly greater increase in post-intervention physical activity levels. As there were three measures of physical activity levels, namely pedometer readings, total physical activity days and group physical activity days, three sets of linear mixed model analyses were conducted for the respective outcome variables.

**Hypothesis 1.1a: Increase in physical activity as measured by pedometer readings**

Hypothesis 1.1a was that the intervention group would demonstrate a greater increase in daily average pedometer readings over an eight-week follow-up period compared with the control group. As participants’ daily average pedometer readings were already high at baseline, baseline daily average pedometer readings was also investigated as a continuous moderator of intervention effects, and it was hypothesized that participants in the intervention group who had lower baseline pedometer readings would experience a greater increase in post-group session pedometer readings than those with higher baseline readings. The main effects of condition, cultural identification, time, socioeconomic status, relationship status, employment status, education background, age and baseline pedometer readings were included in the initial model. The interaction effects of condition by time, condition
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by cultural identification, cultural identification by time, condition by time by cultural identification, condition by baseline pedometer readings, baseline pedometer readings by time, and condition by time by baseline pedometer readings were also included in the initial model for model selection, as reported in Table 9.1. The random effects of the intercept and time, and the repeated effects of time were also included. The covariance models used for the random and repeated effects were identity and first order autoregressive respectively. Please refer to Table 9.2 for the BIC values of the initial models and the final models of the three sets of linear mixed model analyses, as well as the variables retained in the respective final models.

Table 9.1

<table>
<thead>
<tr>
<th>Main effects</th>
<th>Interaction effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural identification (CI)</td>
<td>Condition by time</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition by time</td>
</tr>
<tr>
<td>Time</td>
<td>CI by time</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>Condition by CI</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Condition by baseline pedometer readings</td>
</tr>
<tr>
<td>Employment status</td>
<td>Baseline pedometer readings by time</td>
</tr>
<tr>
<td>Education background</td>
<td>Condition by time by baseline pedometer readings</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Baseline pedometer readings</td>
<td></td>
</tr>
</tbody>
</table>
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Table 9.2

*BIC values of initial and final models, and variables retained in final models*

<table>
<thead>
<tr>
<th>Physical activity measure</th>
<th>BIC value of initial model</th>
<th>BIC value of final model</th>
<th>Variables retained in final model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedometer readings</td>
<td>11864.48</td>
<td>11836.32</td>
<td>Condition, Time, CI, Baseline pedometer, Condition<em>CI, CI</em>Time, Condition<em>CI</em>Time, Condition<em>Baseline pedometer, Baseline pedometer</em>Time, Condition<em>Time</em>Baseline pedometer</td>
</tr>
<tr>
<td>Total physical activity days</td>
<td>672.26</td>
<td>649.13</td>
<td>Condition, CI, Time, Condition<em>CI, CI</em>Time, Condition<em>Time, Condition</em>CI*Time</td>
</tr>
<tr>
<td>Group physical activity days</td>
<td>325.04</td>
<td>311.88</td>
<td>Condition, CI, Time, SES, Relationship status, Condition<em>CI, CI</em>Time, Condition<em>Time, Condition</em>CI*Time</td>
</tr>
</tbody>
</table>

The output of the final linear mixed model indicated that the variance of the random effects was statistically significant, $b = 73500.71$, $p < .001$, $SE = 15576.78$, 95% CI [48517.57, 111348.42]. The ICC was .024, indicating that 2.4% of the variance in pedometer readings over nine weeks was due to the group structure and represented inter-individual differences in average daily pedometer readings over nine weeks. However, the interaction effect of condition by time was not significant ($p = .45$), indicating that changes in daily average pedometer readings over nine time points (baseline week and eight weeks’ follow-up post-group session) did not differ significantly between the intervention and control groups. In addition, it was also found that the interaction effect of condition by time by baseline pedometer readings was not significant ($p = .98$), indicating that baseline pedometer readings
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did not moderate intervention efficacy on physical activity levels measured by pedometer readings. Please refer to Table 9.3 for a summary of fixed and random effects of the linear mixed model output for pedometer readings.

Table 9.3

Fixed and random effects of final linear mixed model for pedometer readings

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th>$b$</th>
<th>$SE_b$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>98.64</td>
<td>969.37</td>
<td>-1814.86, 2012.14</td>
</tr>
<tr>
<td>Condition</td>
<td>2291.51</td>
<td>1341.50</td>
<td>-355.95, 4938.97</td>
</tr>
<tr>
<td>Time</td>
<td>402.24</td>
<td>241.01</td>
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</tr>
<tr>
<td>CI</td>
<td>261.21</td>
<td>496.20</td>
<td>-718.18, 1240.61</td>
</tr>
<tr>
<td>Baseline pedometer</td>
<td>.98</td>
<td>.99</td>
<td>81.16</td>
</tr>
<tr>
<td>Condition*Time</td>
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<td>-928.01, 410.95</td>
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<tr>
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<td>-1033.96</td>
<td>720.09</td>
<td>-2455.12, 387.19</td>
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<tr>
<td>CI*Time</td>
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<td>124.48</td>
<td>-431.54, 60.14</td>
</tr>
<tr>
<td>Condition<em>CI</em>Time</td>
<td>291.78</td>
<td>181.86</td>
<td>-67.36, 650.92</td>
</tr>
<tr>
<td>Condition*baseline pedometer</td>
<td>-.16</td>
<td>.13</td>
<td>-.41, .10</td>
</tr>
<tr>
<td>Time*baseline pedometer</td>
<td>-.04</td>
<td>.02</td>
<td>-.08, .004</td>
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<tr>
<td>Condition<em>Time</em>baseline pedometer</td>
<td>.0009</td>
<td>.03</td>
<td>-.06, .07</td>
</tr>
</tbody>
</table>

Random effects

| Repeated measures AR1 diagonal | .29     | .05     | .20, .38        |
| Intercept + Time               | 73500.71| 15576.78| 48517.57, 111348.42|

Hypothesis 1.1b: Increase in physical activity as measured by total physical activity days

Hypothesis 1.1b was that the intervention group would have a greater increase in total physical activity days over an eight-week follow-up period compared with the control group. All the main effects, except baseline pedometer readings, were included in the initial model. All interaction effects, except the interaction effects for baseline pedometer readings, were also included. Baseline total physical activity days was not investigated as a continuous moderator as it was not high ($M = 2.89$ days). Two time points, baseline and the mean of eight weeks’ follow-up data, were included in the analysis. The mean of eight weeks’ follow-up data was calculated by taking the average number of days per week of physical activity over eight weeks. The random effects of the intercept and the repeated effects of time
Improving attitudes to ageing to increase physical activity were included in the analysis. Covariance models used for the random and repeated effects were identity and first order autoregressive respectively.

The output of the final linear mixed model indicated that the variance of the random effects was not statistically significant, $b = 1.64$, $p = .997$, $SE = 441.69$, 95% CI [.00, 1.13E+229], suggesting that there were no significant inter-individual differences in total physical activity days at baseline. Moreover, a significant interaction effect of condition by time was not found ($p = .63$), indicating that there was no significant difference between the intervention and control groups in change of total physical activity days. Please refer to Table 9.4 for a summary of fixed and random effects of the linear mixed model output for total physical activity days.

Table 9.4

**Fixed and random effects of final linear mixed model for total physical activity days**

<table>
<thead>
<tr>
<th></th>
<th>$b$</th>
<th>$SE_b$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>2.20</td>
<td>.83</td>
<td>.56, 3.83</td>
</tr>
<tr>
<td>Condition</td>
<td>-.59</td>
<td>1.17</td>
<td>-2.92, 1.73</td>
</tr>
<tr>
<td>Time</td>
<td>.93</td>
<td>.48</td>
<td>-.03, 1.89</td>
</tr>
<tr>
<td>CI</td>
<td>.55</td>
<td>1.06</td>
<td>-1.56, 2.66</td>
</tr>
<tr>
<td>Condition*Time</td>
<td>.33</td>
<td>.69</td>
<td>-1.05, 1.71</td>
</tr>
<tr>
<td>Condition*CI</td>
<td>-.44</td>
<td>1.53</td>
<td>-3.48, 2.59</td>
</tr>
<tr>
<td>CI*Time</td>
<td>-.55</td>
<td>.63</td>
<td>-1.80, .70</td>
</tr>
<tr>
<td>Condition<em>CI</em>Time</td>
<td>-.01</td>
<td>.91</td>
<td>-1.82, 1.81</td>
</tr>
<tr>
<td><strong>Random effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated measures AR1 diagonal</td>
<td>1.79</td>
<td>441.69</td>
<td>0.00, 4.39E+209</td>
</tr>
<tr>
<td>Repeated measures AR1 rho</td>
<td>-.04</td>
<td>256.37</td>
<td>-1.00, 1.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.64</td>
<td>441.69</td>
<td>0.00, 1.13E+229</td>
</tr>
</tbody>
</table>

**Hypothesis 1.1c: Increase in physical activity as measured by group physical activity days**

Hypothesis 1.1c was that the intervention group would demonstrate a greater increase in group physical activity days over an eight week follow-up period than the
Improving attitudes to ageing to increase physical activity control group. The distribution of group physical activity days was positively skewed at baseline. Therefore, baseline and post eight-week group physical activity days were transformed by taking the square root of baseline group physical activity days and the mean of eight weeks’ follow-up (two time points) before performing the linear mixed model analysis. The linear mixed model analysis that was conducted was identical in set-up to the analysis conducted for total physical activity days.

The output of the final linear mixed model indicated that the variance of the random effects was not statistically significant, \( b = .18, p = .998, SE = 22.46, 95\% \text{ CI} [.00, .] \), suggesting that there were no significant inter-individual differences in group physical activity days at baseline. A significant interaction effect of condition by time was found, \( (t = 2.67, p = .009, 95\% \text{ CI} [.15, 1.03]) \). Contrary to hypothesis 1.1c, an inspection of the descriptive statistics reported in Chapter 7 indicated that the control group had a significantly greater increase in group physical activity days that was .35 days more than the increase demonstrated by the intervention group. This greater increase of .35 days in group physical activity days demonstrated by the control group can also be interpreted as the absolute effect size indicating the magnitude of the difference between change in group physical activity days demonstrated by the control group, compared to the intervention group, from baseline to 8-week follow-up (Sullivan & Feinn, 2012). Sullivan and Feinn (2012) suggested that reporting of the absolute effect size is appropriate when the outcome measure has an intrinsic value, such as number of hours, or in the context of the current study, number of days per week for which participants engaged in group physical activities. Please refer to Table 9.5 for a summary of fixed and random effects of the linear mixed model output for group physical
Improving attitudes to ageing to increase physical activity

activity days.

Table 9.5

Fixed and random effects of final linear mixed model for group physical activity days

<table>
<thead>
<tr>
<th></th>
<th>b</th>
<th>SEb</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.69</td>
<td>.27</td>
<td>.16, 1.22</td>
</tr>
<tr>
<td>Condition</td>
<td>-.46</td>
<td>.38</td>
<td>-1.20, .29</td>
</tr>
<tr>
<td>Time</td>
<td>.10</td>
<td>.15</td>
<td>-.21, .41</td>
</tr>
<tr>
<td>CI</td>
<td>.16</td>
<td>.34</td>
<td>-.52, .84</td>
</tr>
<tr>
<td>SES</td>
<td>-.31</td>
<td>.18</td>
<td>-.66, .04</td>
</tr>
<tr>
<td>Relationship status</td>
<td>-.31</td>
<td>.16</td>
<td>-.62, .0002</td>
</tr>
<tr>
<td>Condition*Time</td>
<td>.59</td>
<td>.22</td>
<td>.15, 1.03</td>
</tr>
<tr>
<td>Condition*CI</td>
<td>.33</td>
<td>.49</td>
<td>-.64, 1.30</td>
</tr>
<tr>
<td>CI*Time</td>
<td>-.09</td>
<td>.20</td>
<td>-.31, .50</td>
</tr>
<tr>
<td>Condition<em>CI</em>Time</td>
<td>-.64</td>
<td>.29</td>
<td>-1.23, -.06</td>
</tr>
<tr>
<td><strong>Random effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated measures AR1 diagonal</td>
<td>.18</td>
<td>91.59</td>
<td>.00, .</td>
</tr>
<tr>
<td>Repeated measures AR1 rho</td>
<td>-.03</td>
<td>511.94</td>
<td>-1.00, 1.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>.18</td>
<td>91.59</td>
<td>.00, .</td>
</tr>
</tbody>
</table>

Aim 1: Cultural identification as a moderator of intervention efficacy

The first broad aim of the study, as described in Chapter 5, also included the investigation of whether cultural identification would moderate the efficacy of the intervention to increase physical activity levels, as measured by daily average pedometer readings, total physical activity days, and group physical activity days.

Hypothesis 1.2

It was hypothesized that within the intervention group, those who identified with Australian culture, compared to Chinese culture, would demonstrate a greater increase in daily average pedometer readings, total physical activity days and group
Improving attitudes to ageing to increase physical activity physical activity days over an eight-week follow-up period.

A significant interaction effect of condition by time by cultural identification of the linear mixed model analysis conducted for pedometer readings was not found ($p = .11$), indicating that cultural identification was not a moderator. In addition, no significant interaction effect of condition by time by cultural identification from the linear mixed model analysis conducted for total physical activity days was found ($p = .99$), indicating that there was no significant difference between intervention condition participants who identified with Australian and Chinese culture in terms of change in total physical activity days. There was a significant condition by time by cultural identification interaction effect ($t = -2.21$, $p = .03$, 95% CI [-1.23, -.06]). An inspection of the data indicated that among the control group, those with Chinese, compared to Australian, cultural identification had a greater increase in group physical activity days that was 1.10 days greater, which could be understood as the absolute effect size. This significant interaction effect was, however, not in the direction hypothesized, and thus did not support the hypothesis.

**Aim 2: Intention and self-efficacy as mediators of the relationship between attitudes to ageing and physical activity levels**

The second broad aim of the study was to investigate whether intention and
Improving attitudes to ageing to increase physical activity

self-efficacy, respectively, mediated the relationship between post-group session
attitudes to ageing and physical activity levels. In order to investigate the mediating
roles of intention and self-efficacy within the relationship between attitudes to ageing
in the three domains and physical activity levels, mediation analyses were run via
bootstrapping using the PROCESS script (Hayes, 2013). This approach to mediation
was chosen over Baron and Kenny’s four-step regression approach (Baron & Kenny,
1986) for two reasons. Firstly, by inspecting the confidence interval of the indirect
effect that the predictor variable had on the outcome variable via the mediator
variable, instead of comparing significance levels of the outcome variable regressing
on the predictor variable without and with the mediator variable, the possibility of
Type I and Type II errors would be reduced (Field, 2013). For example, when the p
value of the regression of outcome variable on predictor variable changes from
significant (e.g. \( p = .049 \)) to marginally not significant with the addition of the
mediator variable (e.g. \( p = .051 \)), even though there is little difference between the
respective effect sizes, a Type I error could be made by concluding that the mediation
was significant (Field, 2013). Secondly, conducting mediation analyses using the
PROCESS script enables the investigation of multiple mediators within the same
analysis, which provides insight into how multiple mediators, such as intention and
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self-efficacy, might operate simultaneously to influence the outcome variable, such as physical activity level. For the mediation analyses conducted in this chapter, the confidence interval was set at 95% for all mediation analyses, and significance of the indirect effect of the predictor variable on the outcome variable via the mediator variable was determined if the confidence interval did not include 0.

For the first set of analyses, post-group session attitudes in the physical change domain was assigned as the predictor variable, post-group session intention and post group session self-efficacy were assigned as mediator variables, and post eight-week pedometer readings was assigned as the outcome variable. The analysis was then repeated with post-group session attitudes in the psychosocial loss domain assigned as the predictor variable. Another mediation analysis was then conducted with post group session attitudes in the psychological growth domain as the predictor variable, post-group session intention as the mediator variable and post eight-week pedometer readings as the outcome variable. These analyses are illustrated by Figures 9.1 to 9.4.

In the second set of analyses, the outcome variable of pedometer readings was replaced by post eight-week total physical activity days, and the same mediation analyses were conducted. For the third set of mediation analyses, the outcome variable was group physical activity days, and mediation analyses similar to the first
Improving attitudes to ageing to increase physical activity

two sets of analyses were repeated.

Figure 9.1. Proposed mediating relationship of attitudes to ageing in the physical change domain on physical activity via intention. *p < .05. **p < .01. Only coefficients of significant pathways are included in the figure.

Figure 9.2. Proposed mediating relationship of attitudes to ageing in the physical change domain on physical activity via self-efficacy. *p < .05. **p < .01. Only coefficients of significant pathways are included in the figure.
Improving attitudes to ageing to increase physical activity

Hypothesis 2.1

Hypothesis 2.1 was that intention to increase physical activity would mediate the relationship between attitudes to ageing in all three domains, and physical activity levels. However, the results indicated that independent of intention and self-efficacy, attitudes in the physical change and psychosocial loss domains did not significantly
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predict post eight-week pedometer readings, $b = 65.78, t = 1.15, p = .25$ and $b = 129.69, t = -1.84, p = .07$ respectively. Moreover, independent of intention, attitudes in the psychological growth domain did not predict pedometer readings, $b = 84.17, t = 1.15, p = .26$. Similarly, attitudes in the physical change, psychosocial loss, and psychological growth domains did not predict total physical activity days, $b = .03, t = .71, p = .48$, $b = -.07, t = -1.40, p = .16$ and $b = .03, t = .55, p = .58$ respectively.

Attitudes in the three domains also did not predict group physical activity days, $b = .04, t = 1.57, p = .12$, $b = .007, t = .21, p = .84$, and $b = .06, t = 1.99, p = .05$ respectively. For these analyses, the approach of estimating mediation effects by comparing effect sizes, using confidence intervals as a guideline, has been adopted, instead of a hypothesis testing approach that uses $p$ values as a guideline (Cumming, 2013; Field, 2013). Thus, there is theoretical ground to report the indirect effects of attitudes on physical activity levels via intention and self-efficacy, and the effects of the predictor variables of attitudes in the three domains on the mediator variables of intention and self-efficacy, even though it was found that the predictor variables of attitudes in all three domains did not predict the outcome variables of pedometer readings, total physical activity days, and group physical activity days. Please refer to Table 9.6 for a summary of the parameters for the respective direct and indirect effects for the three
Improving attitudes to ageing to increase physical activity

sets of mediation analyses.

Table 9.6

Direct and indirect effects from mediational analyses

<table>
<thead>
<tr>
<th>Attitudes in physical change domain on pedometer readings</th>
<th>b</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes in physical change domain on total PA days</td>
<td>.002</td>
<td>-.08, .08</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on total PA days</td>
<td>.009</td>
<td>-.10, .11</td>
</tr>
<tr>
<td>Attitudes in physical change domain on group PA days</td>
<td>.02</td>
<td>-.02, .05</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on group PA days</td>
<td>.02</td>
<td>-.04, .09</td>
</tr>
</tbody>
</table>

Indirect effects via intention

<table>
<thead>
<tr>
<th>Attitudes in physical change domain on pedometer readings</th>
<th>25.47</th>
<th>-15.82, 112.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes in psychosocial loss domain on pedometer readings</td>
<td>-15.31</td>
<td>-98.03, 6.49</td>
</tr>
<tr>
<td>Attitudes in physical change domain on total PA days</td>
<td>.004</td>
<td>-.02, .03</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on total PA days</td>
<td>-.0021</td>
<td>-.03, .01</td>
</tr>
<tr>
<td>Attitudes in physical change domain on group PA days</td>
<td>.02</td>
<td>-.01, .06</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on group PA days</td>
<td>.02</td>
<td>-.0015, .05</td>
</tr>
<tr>
<td>Attitudes in physical change domain on group PA days</td>
<td>-.01</td>
<td>-.05, .0015</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on group PA days</td>
<td>.01</td>
<td>-.002, .05</td>
</tr>
</tbody>
</table>

Indirect effects via self-efficacy

<table>
<thead>
<tr>
<th>Attitudes in physical change domain on pedometer readings</th>
<th>-25.85</th>
<th>-153.48, 34.24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes in psychosocial loss domain on pedometer readings</td>
<td>26.59</td>
<td>-28.00, 143.56</td>
</tr>
<tr>
<td>Attitudes in physical change domain on total PA days</td>
<td>.02</td>
<td>-.009, .08</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on total PA days</td>
<td>.02</td>
<td>-.07, .008</td>
</tr>
<tr>
<td>Attitudes in physical change domain on group PA days</td>
<td>-.006</td>
<td>-.03, .02</td>
</tr>
<tr>
<td>Attitudes in psychosocial loss domain on group PA days</td>
<td>.0014</td>
<td>-.02, .03</td>
</tr>
</tbody>
</table>

Contrary to the hypothesis, intention was not found to be a significant mediator of the relationship between attitudes to ageing in any of the three domains and physical activity levels measured by pedometer readings, total physical activity days or group physical activity days. There was no significant indirect effect on pedometer readings via intention, for attitudes in the physical change domain, \( b = 25.47 \), 95% CI [-15.82, 112.01], psychosocial loss domain, \( b = -15.31 \), 95% CI [ ]
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-98.03, 6.49] or psychological growth domain, $b = 22.76$, 95% CI [-19.58, 118.23].

Intention was also not found to be a mediator of the relationship between attitudes to ageing in all three domains, and total physical activity days. There was no significant indirect effect on total physical activity days via intention, for attitudes in the physical change domain $b = .004$, 95% CI [-.02, .03], psychosocial loss domain $b = -.0021$, 95% CI [-.03, .01], or psychological growth domain, $b = .02$, 95% CI [-.01, .06].

Similarly, there was no significant indirect effect on group physical activity days via intention, for attitudes in the physical change domain $b = .02$, 95% CI [-.0015, .05], psychosocial loss domain $b = -.01$, 95% CI [-.05, .0015], or psychological growth domain, $b = .01$, 95% CI [-.02, .05]. However, it was found that both attitudes in the physical change domain, $b = .05$, $t = 2.60$, $p = .01$, and in the psychological growth domain, $b = .07$, $t = 3.18$, $p = .002$, significantly predicted intention.

**Hypothesis 2.2**

Hypothesis 2.2 was that perceived self-efficacy to increase physical activity would mediate the relationship between attitudes to ageing in the physical change and psychosocial loss domains, and physical activity levels.

Contrary to the hypothesis, there was no significant indirect effect found on
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pedometer readings via self-efficacy, for attitudes either in the physical change domain, $b = -25.85$, 95% CI [-153.48, 34.24], or in the psychosocial loss domain, $b = 26.59$, 95% CI [-28.00, 143.56]. There was also no significant indirect effect found on total physical activity days via self-efficacy, for attitudes either in the physical change domain, $b = .02$, 95% CI [-.009, .08] or in the psychosocial loss domain, $b = -.02$, 95% CI [-.07, .008]. Similarly, there was no significant indirect effect found on group physical activity days via self-efficacy, for attitudes either in the physical change domain, $b = -.006$, 95% CI [-.03, .02] or in the psychosocial loss domain, $b = .0014$, 95% CI [-.02, .03]. However, it was found that attitudes to ageing in the physical change and psychosocial loss domains significantly predicted self-efficacy, $b = .08$, \( t = 3.33, p = .001 \) and $b = -.07$, \( t = -2.31, p = .02 \) respectively.

**Aim 2: Self-efficacy as a predictor of intention**

The second broad aim of the study also included the investigation of whether self-efficacy contributed to strengthening intention, which was hypothesized to mediate the relationship between attitudes to ageing and physical activity.

**Hypothesis 2.3**

Hypothesis 2.3 was that post-group session self-efficacy would significantly predict post-group session intention. The correlation between post-group session self-efficacy
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and post-group session intention that was reported in Table 7.8 in Chapter 7 indicated that there was a significant correlation between these two variables, \( r(84) = .58, p < .001 \). The positive and significant correlation between self-efficacy and intention thus provide support for Hypothesis 2.3 that having higher levels of self-efficacy are associated with having higher levels of intention.

**Conclusion**

In this chapter, the efficacy of the intervention on increasing physical activity levels was investigated, and it was found that the intervention was not effective in increasing physical activity levels. In addition, neither intention nor perceived self-efficacy to increase time spent on physical activities were significant mediators of the relationship between attitudes to ageing and physical activity levels, though attitudes to ageing in the physical change and psychosocial loss domains significantly predicted self-efficacy, and attitudes in the physical change and psychological growth domains significantly predicted intention. In the next chapter, perceived control over external factors will be investigated as a predictor of physical activity levels, to gain a more comprehensive understanding of factors influencing physical activity levels of midlife women. In addition, in line with the Extended Theory of Planned Behavior, the bi-directional relationship of perceived self-efficacy and perceived control over external factors, and physical activity levels will also be investigated.
Overview

The previous chapter reported results pertaining to the first and second broad aims of the study, namely to investigate the efficacy of the intervention in increasing physical activity levels, and the proposed mediating roles of intention and self-efficacy in the relationship between attitudes to ageing and physical activity levels. It was found that the intervention was not effective in increasing physical activity levels, and cultural identification was not a moderator of intervention efficacy on physical activity levels. In addition, attitudes to ageing were not found to predict physical activity levels, nor were intention and self-efficacy found to be proximal predictors of physical activity. Intention and self-efficacy were not found to mediate the relationship between attitudes to ageing and physical activity levels.

Although intention and self-efficacy have been found to be the most important predictors of physical activity (Armitage, 2005; Boudreau & Godin, 2014), these studies have not focused on the specific population of midlife women, for whom other factors, such as a lack of time (Osuji et al., 2006), might be additional barriers to
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physical activity. Midlife women with a higher level of perceived control over external factors influencing physical activity behavior (such as lack of time for physical activity) could perceive themselves to have a higher level of control over their schedules despite various work and family commitments, and thus be more willing and able to try to incorporate physical activity into their schedules, such as walking instead of taking the bus to a nearby supermarket. Hence, in order to facilitate a more comprehensive understanding of factors influencing midlife women’s physical activity levels, the results of analyses undertaken to investigate the role of perceived control over external factors in predicting physical activity level will be reported in this chapter. An investigation of proposed bi-directional relationships between physical activity levels with perceived control over external factors and self efficacy will also be presented in this chapter. The aims and hypotheses were described in detail in Chapter 5.

**Aim 3: The role of perceived control over external factors in predicting physical activity levels**

**Hypothesis 3.1**

Hypothesis 3.1 was that perceived control over external factors will predict physical activity level, both as a proximal factor, and as a distal factor via the
Improving attitudes to ageing to increase physical activity
mediator of intention. To test this, path analyses were conducted using SPSS AMOS
version 23. The manifest variables of: 1) post-group session perceived control over
external factors (the mean of the two items measuring this construct), 2) post-group
session intention (the mean of the three items measuring this construct), 3) Post-group
session self-efficacy (the mean of the two items measuring this construct) and 4)
physical activity level (measured by post-group session pedometer readings) were
included in the model. Post-group session self-efficacy was also included in the model
as it was found to be a significant predictor of post-group session intention in the
mediation analyses reported in chapter 8. Manifest variables, instead of latent
variables, were used due to the increased tendency of latent variables measured by
only two items to produce negative variances in the output, also known as Heywood
cases (Chen, Bollen, Paxton, Curran, & Kirby, 2001).

Perceived control over external factors was designated as an exogenous
variable that predicted the endogenous variables of intention and post-group session
pedometer readings. Manifest variables were each assigned a residual term, as
illustrated by Model 1 in Figure 10.1 and Figure 10.2. The residual terms for post
group session perceived control over external factors and post-group session self
efficacy were hypothesized to be correlated as these two constructs have been found
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to be correlated in previous research (Armitage & Conner, 1999). Maximum
likelihood was selected as the estimation method. As multivariate normality of
manifest variables is an assumption of Maximum likelihood estimation (Blunch,
2008), and intention was negatively skewed, bootstrapping was performed when
running the path analyses. Participants with missing data for the variables investigated
in the path analyses were not included in the path analyses, as bootstrapping cannot be
performed with missing data. The path analysis was then repeated with total physical
activity days replacing post-group session pedometer readings, so that the effect of the
predictor variables on different measures of physical activity levels could be
investigated.

Overall model fit was assessed using the fit indices of Chi-square ($\chi^2$),
Standardized Root Mean Square Residual (SRMR) and Comparative Fit Index (CFI).
A non-significant $\times 2$ value with $p \geq .05$, SRMR value of $\leq .08$ and CFI value of $\geq .95$
would indicate that the model was a satisfactory fit to the data (Hu & Bentler, 1999;
Iacobucci, 2009; Schreiber, 2016). The Root Mean Square Error of Approximation
(RMSEA) was not adopted as one of the fit indices as this study had a small sample
size ($n \leq 250$), and over-rejection of true-population models is more likely when
RMSEA is used to assess model fit for small samples (Hu & Bentler, 1999)
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Figure 10.1. Model 1 investigating path analysis of perceived control over external factors predicting post-group session pedometer readings as both a proximal and distal predictor.

Figure 10.2. Model 1 investigating path analysis of perceived control over external factors predicting post-eight-week total physical activity days as both a proximal and distal predictor.

Inspection of the fit indices of Model 1, which is illustrated in Figures 10.1 and Figure 10.2, suggested that the model did not demonstrate satisfactory fit to the data. For the model featuring post-group session pedometer readings, χ²(2, n = 76) = 24.27, p < .001, CFI was .56 and SRMR was .19. For the model featuring total physical activity days, χ²(2, n = 76) = 24.44, p < .001, CFI was .59 and SRMR was .20. Inspection of the modification indices suggests that model fit might be improved.
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by including a correlation between the residual terms for post-group session self

efficacy and post-group session perceived control. A revision to the model was thus

made to incorporate this change, illustrated by Model 2 in Figure 10.3 and Figure

10.4. There is also theoretical ground to incorporate this change as self-efficacy has

been found to be significantly correlated to perceived control in this current study.

Figure 10.3. Model 2 investigating path analysis of perceived control over external factors predicting post group session pedometer readings as both a proximal and distal predictor. *p < .05; ** p < .01

Figure 10.4. Model 2 investigating path analysis of perceived control over external factors predicting post eight-week total physical activity days as both a proximal and distal predictor. *p < .05; ** p < .01

Inspection of the fit indices of Model 2 suggested that the model demonstrated
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satisfactory fit to the data. For the model featuring post-group session pedometer readings, $\chi^2 (1, n = 76) = .12, p = .73$, CFI was 1.00 and SRMR was .009. For the model featuring total physical activity days, $\chi^2 (1, n = 76) = .29, p = .59$, CFI was 1.00 and SRMR was .01.

Inspection of the standardised estimates produced by the model with post-group session pedometer readings, reported in Table 10.1, showed that perceived control over external factors is a significant predictor of neither intention, $\beta = .13, p = .23$, nor post-group session pedometer readings, $\beta = -.14, p = .27$. In addition, intention was not found to be a significant predictor of post-group session pedometer readings, $\beta = .19, p = .13$, although self-efficacy was found to be a significant predictor of intention, $\beta = .49, p < .001$, corroborating the findings from the mediational analyses reported in chapter 9. However, for the model with total physical activity days, although perceived control over external factors was not found to be a significant predictor of intention, $\beta = .13, p = .23$, it did significantly predict total physical activity days, $\beta = .27, p = .02$. Corroborating the findings of the model with post-group session pedometer readings, intention was not found to predict total physical activity days, $\beta = .03, p = .79$. In addition, the squared multiple correlations for total physical activity days was .081, indicating that perceived control over
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external factors explained 8.1% of the variance found in total physical activity days.

Table 10.1

*Standardised Estimates and Squared Multiple Correlations of Variables in Model 2*

<table>
<thead>
<tr>
<th>Item</th>
<th>Standardised Estimates</th>
<th>Estimates</th>
<th>S.E. of Estimates</th>
<th>Squared Multiple Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived control predicting total physical activity days</td>
<td>.27*</td>
<td>.43</td>
<td>.19</td>
<td>.081</td>
</tr>
<tr>
<td>Perceived control predicting post-group session pedometer readings</td>
<td>-.14</td>
<td>-.324.37</td>
<td>296.11</td>
<td></td>
</tr>
<tr>
<td>Perceived control predicting intention</td>
<td>.13</td>
<td>.11</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy predicting intention</td>
<td>.49**</td>
<td>.35</td>
<td>.08</td>
<td>.33</td>
</tr>
<tr>
<td>Intention predicting total physical activity days</td>
<td>.03</td>
<td>.07</td>
<td>.24</td>
<td></td>
</tr>
<tr>
<td>Intention predicting post-group session pedometer readings</td>
<td>.13</td>
<td>.11</td>
<td>.09</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Perceived control = perceived control over external factors; * p < .05; ** p < .01*

In order to investigate if perceived control over external factors would still be a significant proximal predictor of total physical activity days controlling for baseline physical activity, another set of path analyses which included baseline physical activity was conducted, as illustrated by Model 3 in Figure 10.5 and Figure 10.6.
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Inspection of the fit indices for Model 3 revealed that $\chi^2 (5, n = 76) = 58.51$, $p < .001$, CFI was .49 and SRMR was .20 for the model with pedometer readings, and $\chi^2 (5, n = 76) = 22.88$, $p < .001$, CFI was .76 and SRMR was .13 for the model with total physical activity days, suggesting that the model was not a satisfactory fit for the data. Inspection of the modification indices suggests that including the relationship of baseline physical activity predicting physical activity at 8-week follow-up might improve model fit. There are also theoretical grounds to include this relationship as past physical activity has been found to be a predictor of current
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physical activity (Crozier, Gierc, Locke, & Brawley, 2015). The model was thus revised to incorporate the autoregressive relationship between baseline physical activity measures and physical activity measures at follow-up, as illustrated by Model 4 in Figure 10.7 and Figure 10.8.

![Figure 10.7](image1)  
*Figure 10.7. Model 4 investigating path analysis of perceived control over external factors and baseline pedometer readings predicting post group session pedometer readings. *$p < .05$; **$p < .01$*

![Figure 10.8](image2)  
*Figure 10.8. Model 4 investigating path analysis of perceived control over external factors and baseline total physical activity days predicting post eight-week total physical activity days. *$p < .05$; **$p < .01$*

Inspection of the fit indices suggested that Model 4 was a better fit for the data compared to Model 3. For the model with pedometer readings, $\chi^2 (4, n = 76) = 5.27$, $p = .26$, CFI was .99 and SRMR was .086. Although the SRMR value was slightly greater than .08, it was much closer to .08 than the corresponding SRMR value of .20.
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for Model 3, and thus satisfied the criteria of SRMR value of close to .08 suggested

by Hu and Bentler (1999). For the model with total physical activity days, $\chi^2 (4, n = 76) = 5.11, p = .28$, CFI was .99 and SRMR was .06.

Inspection of the standardised estimates produced by Model 4, as reported in

Table 10.2, revealed that when baseline physical activity was included in the model, it

became the strongest predictor of physical activity at 8-week follow-up. For the

model with pedometer readings, both baseline pedometer readings and perceived

control over external factors were significant proximal predictors of post-group

session pedometer readings, $\beta = .71, p < .001$, and $\beta = -.18, p = .036$ respectively.

However, it should be noted that the relationship between perceived control and post

group session pedometer readings was not in the direction hypothesized. Perceived

control was not a significant predictor of intention, $\beta = .13, p = .23$ and neither was

intention a proximal predictor of pedometer readings, $\beta = .08, p = .36$. The squared

multiple correlations for post-group session pedometer readings was .53, indicating

that baseline pedometer readings and perceived control together explained 53% of the

variance found in post-group session pedometer readings. For the model with total

physical activity days, baseline total physical activity days was the only significant

proximal predictor of total physical activity days, $\beta = .46, p < .001$. Neither perceived
Improving attitudes to ageing to increase physical activity control nor intention were proximal predictors of total physical activity days, $\beta = .16$, $p = .14$ and $\beta = .12$, $p = .28$ respectively. The squared multiple correlations for total physical activity days was .26, indicating that baseline total physical activity days explained 26% of the variance found in total physical activity days. The increase in variance explained for both post-group session pedometer readings and total physical activity days also provided empirical support for the decision to include baseline physical activity in the model.

Table 10.2

<table>
<thead>
<tr>
<th>Standardised Estimates and Squared Multiple Correlations of Variables in Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Baseline physical activity days predicting total physical activity days</td>
</tr>
<tr>
<td>Baseline pedometer readings predicting post-group session pedometer readings</td>
</tr>
<tr>
<td>Perceived control predicting total physical activity days</td>
</tr>
<tr>
<td>Perceived control predicting post-group session pedometer readings</td>
</tr>
<tr>
<td>Perceived control predicting intention</td>
</tr>
<tr>
<td>Self-efficacy predicting intention</td>
</tr>
<tr>
<td>Intention predicting total physical activity days</td>
</tr>
<tr>
<td>Intention predicting post-group session pedometer readings</td>
</tr>
</tbody>
</table>

*Note. Perceived control = perceived control over external factors; * $p < .05$; ** $p < .01$"Baseline pedometer readings and perceived control over external factors together predicted 53% of the variance in post-group session pedometer readings.*

Taken together, these results provide only partial support for Hypothesis 3.1, as perceived control over external factors was found to be a proximal predictor of total physical activity days, but became non-significant when baseline total physical
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activity days was included in the model.

**Aim 3: Physical activity level as a predictor of subsequent perceived control over external factors and self-efficacy**

The third broad aim of the study also included the investigation of whether physical activity level would predict subsequent levels of perceived control over external factors and self-efficacy.

**Hypothesis 3.2**

Hypothesis 3.2 was that post-group session physical activity level would predict post 8-week perceived control over external factors, as well as post eight-week perceived self-efficacy. In Model 5, extended from Model 4, physical activity level is hypothesized to predict the manifest variables of post eight-week perceived control over external factors (the mean of the two items measuring this construct) and post eight-week self-efficacy (the mean of the two items measuring this construct). In addition, the residual terms for post eight-week perceived control over external factors and post eight-week self-efficacy were hypothesized to be positively correlated.

Model 5 is illustrated by Figure 10.9 and Figure 10.10. Path analyses were conducted for Model 5, first with post-group session pedometer readings, followed by total physical activity days.
Inspection of the fit indices indicated that Model 5 was not a good fit for the data. For the model with pedometer readings, $\chi^2 (12, n = 76) = 38.37, p < .001$, SRMR was .18 and CFI was .83. For the model with total physical activity days, $\chi^2 (12, n =$
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76) = 36.57, \( p < .001 \), SRMR was .16 and CFI was .80. Inspection of the modification indices of Model 5 with post-group session pedometer readings indicated that model fit might be improved by including the relationships of perceived control over external factors predicting post 8-week perceived control over external factors, and self-efficacy predicting post 8-week self-efficacy. There are also theoretical grounds to include these two relationships as Armitage (2005) had found that perceived behavioural control at baseline significantly predicted the same variable at 12-week follow-up. A revision to Model 5 was thus made in order to incorporate these two additional relationships. Path analyses were then conducted on the revised model, Model 6, illustrated by Figure 10.11 and Figure 10.12.

![Figure 10.11: Model 6 for pedometer readings. *p < .05, **p < .01](image)
The fit indices indicated that Model 6 was a better fit of the data compared to Model 5. For the model with pedometer readings, $\chi^2 (10, n = 76) = 11.64, p = .31$, SRMR was .08 and CFI was .99. For the model with total physical activity days, $\chi^2 (10, n = 76) = 10.17, p = .43$, SRMR was .06 and CFI was .999. As Model 6 demonstrated satisfactory fit of the model to the data, for both pedometer readings and total physical activity days, this model was retained.

Inspection of the output for Model 6, reported in Table 10.3, revealed some evidence that, while physical activity level did not predict subsequent perceived control over external factors, it did predict subsequent self-efficacy. For the model with post-group session pedometer readings, post-group session pedometer readings
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was a significant predictor of neither post eight-week perceived self-efficacy, $\beta = .13, p = .23$, nor post eight-week perceived control over external factors, $\beta = .06, p = .55$.

However, for the model with total physical activity days, it was found that total physical activity days significantly predicted post eight-week self-efficacy, $\beta = .26, p = .02$, although it was also not found to predict post eight-week perceived control over external factors, $\beta = -.04, p = .74$. Hence, there was partial support for Hypothesis 3.2, as physical activity level measured by total physical activity days was a significant predictor of post eight-week self-efficacy. In addition, it was also found that perceived control over external factors was a significant predictor of post eight-week perceived control over external factors, $\beta = .49, p < .001$, and that self-efficacy was a significant predictor of post eight-week self-efficacy, $\beta = .30, p = .002$. The squared multiple correlations for post eight-week self-efficacy revealed that the total amount of variance in post eight-week self-efficacy that was explained by total physical activity days and self-efficacy was 17.9%.
## Table 10.3

*Standardised Estimates and Squared Multiple Correlations of Variables in Model 6*

<table>
<thead>
<tr>
<th>Item</th>
<th>Standardised Estimates</th>
<th>Estimates S.E. of Estimates</th>
<th>Squared Multiple Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline physical activity days predicting total physical activity</td>
<td>.46**</td>
<td>.42</td>
<td>.09</td>
</tr>
<tr>
<td>days predicting total physical activity days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline pedometer readings predicting post-group session pedometer</td>
<td>.71**</td>
<td>.69</td>
<td>.08</td>
</tr>
<tr>
<td>readings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived control predicting total physical activity days</td>
<td>.14</td>
<td>.25</td>
<td>.17</td>
</tr>
<tr>
<td>Perceived control predicting post-group session pedometer readings</td>
<td>-.18*</td>
<td>-435.16</td>
<td>207.64</td>
</tr>
<tr>
<td>Perceived control predicting intention</td>
<td>.13</td>
<td>.11</td>
<td>.09</td>
</tr>
<tr>
<td>Self-efficacy predicting intention</td>
<td>.49**</td>
<td>.35</td>
<td>.08</td>
</tr>
<tr>
<td>Intention predicting total physical activity days</td>
<td>.12</td>
<td>.23</td>
<td>.21</td>
</tr>
<tr>
<td>Intention predicting post-group session pedometer readings</td>
<td>.08</td>
<td>242.95</td>
<td>263.22</td>
</tr>
<tr>
<td>Total physical activity days predicting post eight-week self-</td>
<td>.26*</td>
<td>.23</td>
<td>.09</td>
</tr>
<tr>
<td>efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-group session pedometer readings predicting post eight-week</td>
<td>.13</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total physical activity days predicting post eight-week perceived</td>
<td>-.04</td>
<td>-.03</td>
<td>.08</td>
</tr>
<tr>
<td>control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-group session pedometer readings predicting post eight-week</td>
<td>.06</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>perceived control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy predicting post eight-week self-efficacy</td>
<td>.30**</td>
<td>.45</td>
<td>.13</td>
</tr>
<tr>
<td>Perceived control predicting post eight-week perceived control</td>
<td>.49**</td>
<td>.57</td>
<td>.12</td>
</tr>
</tbody>
</table>

*Note.* Perceived control = perceived control over external factors; *p < .05; **p < .01. ^Baseline pedometer readings and perceived control over external factors together predicted 53% of the variance in post-group session pedometer readings. ^Total physical activity days and self-efficacy together predicted 17.9% of the variance in post eight-week self-efficacy.
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**Conclusion**

In this chapter, the role of perceived control over external factors in predicting physical activity level was investigated. It was found that, although perceived control over external factors was not a distal predictor of physical activity level via the mediator of intention, it was a significant proximal predictor of physical activity level measured by total physical activity days. However, after considering the role of baseline physical activity as a predictor, perceived control was no longer a proximal predictor of total physical activity days, but became a proximal predictor of post group session pedometer readings. Physical activity level was also investigated as a predictor of subsequent perceived control over external factors and subsequent self-efficacy. Although physical activity level was not found to predict subsequent perceived control over external factors, physical activity level measured by total physical activity days was found to predict subsequent self-efficacy.

In the next chapter, the role of subjective norms as a distal predictor of physical activity level via the mediator of intention will be investigated, together with the role of cultural identification as a possible moderator of the relationship between subjective norms and physical activity level via intention.
Chapter 11: Subjective norms as a predictor of physical activity level, and cultural identification as a factor that influences the strength of the relationship between subjective norms and physical activity level

Overview

In the previous chapter, results regarding whether perceived control over external factors was a proximal predictor of physical activity level, as well as a distal predictor via the mediator of intention, were presented. Although perceived control over external factors was not found to be a distal factor of either post-group session pedometer readings or total physical activity days, it was a significant proximal predictor of total physical activity days. In addition, physical activity level was investigated as a predictor of subsequent perceived self-efficacy and perceived control over external factors. It was found that although neither pedometer readings nor total physical activity days predicted perceived control over external factors at eight-week follow-up, total physical activity days predicted self-efficacy at eight-week follow-up.

In this chapter, in order to gain a more comprehensive understanding of factors influencing physical activity level within the framework of the Theory of Planned Behavior, subjective norms will be investigated as a distal predictor of physical activity level via the mediator of intention. In addition, cultural identification will be
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investigated as a moderator of the mediating relationship between subjective norms and physical activity level via intention. The aims and hypotheses were described in detail in Chapter 5.

Aim 4: Subjective norms as a distal predictor of physical activity level via the mediator of intention and cultural identification as a moderator of this mediating relationship

The fourth broad aim of the study was to investigate whether subjective norms would be a distal predictor of physical activity level via the mediator of intention, and if cultural identification was a moderator of this mediating relationship. In order to investigate the hypotheses for the fourth broad aim of the study, mediation analyses were run via bootstrapping using the PROCESS script (Hayes, 2013). In addition to the strengths of PROCESS mentioned in Chapter 9, this approach to mediation was chosen to investigate the hypotheses in this chapter as it does not assume normal distribution of variables, and thus was able to accommodate the negative skewness of intention.

For the first set of analyses, post-group session subjective norms was assigned as the predictor variable, post-group session intention was assigned as the mediator variable, and post eight-week pedometer readings was assigned as the outcome variable, as illustrated in Figure 11.1. The analysis was then repeated with total
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physical activity days assigned as the outcome variable. For this analysis, post-group
session perceived control over external factors was assigned as a covariate as it was
found to significantly predict total physical activity days.

For the second set of analyses, moderated mediation (Hayes, 2013) was
conducted. Post-group session subjective norms was assigned as the predictor
variable, post-group session intention was assigned as the mediator variable, cultural
identification was assigned as the moderator variable and post eight-week pedometer
readings was assigned as the outcome variable. Model 8, illustrated by Figure 11.2,
where the moderator is proposed to have an effect on both the direct effect of the
predictor variable on the outcome variable, as well as the relationship between the

Figure 11.1. Proposed mediating relationship of subjective norms on physical activity
via intention. *p < .05. **p < .01. Only coefficients of significant pathways are
included in the figure.
Improving attitudes to ageing to increase physical activity predictor and mediator variables, was chosen. The analysis was then repeated with total physical activity days as the outcome variable, where perceived control over external factors was included as a covariate. A significant index of moderated mediation, with a corresponding bootstrap confidence interval that does not include zero, indicates moderated mediation (Hayes, 2015), and implies that the difference between the conditional indirect effects at the two values of the moderator (with 0 representing Australian culture and 1 representing Chinese culture) is statistically different (Williams, Dev, Hankey, & Blitch, 2017).

![Diagram of moderated mediation]

*Figure 11.2. Proposed moderated mediating relationship of subjective norms on physical activity via intention. Cultural identification is proposed to moderate the direct effect of subjective norms on physical activity, and the effect of subjective norms on the mediator, intention. *p < .05. **p < .01. Only coefficients of significant pathways are included in the figure.*
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**Hypothesis 4.1**

Hypothesis 4.1 was that subjective norms would predict physical activity level via the mediator of intention. However, the results indicated that independent of intention, subjective norms was not a significant predictor of post eight-week pedometer readings, $b = -384.19$, $t = -1.24$, $p = .22$. Similarly, subjective norms did not predict total physical activity days, $b = -.15$, $t = -.73$, $p = .47$. As explained in Chapter 8, PROCESS adopts the approach of estimating mediation effects by comparing effect sizes, using confidence intervals as a guideline (Cumming, 2013; Field, 2013). Thus, there are theoretical grounds to report the indirect effects of subjective norms via intention, and the effects of the predictor variable of subjective norms on the mediator variable of intention, even though it was found that subjective norms did not predict the outcome variables of pedometer readings and total physical activity days.

Contrary to the hypothesis, subjective norms were not found to be a distal predictor, via intention, of physical activity levels measured by pedometer readings and total physical activity days. There was no significant indirect effect on pedometer readings via intention, for subjective norms, $b = 130.97$, 95% CI [-45.60, 401.24]. Similarly, there was no significant indirect effect on total physical activity days via
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intention, for subjective norms, \( b = .09, 95\% \text{ CI} [-.006, .27] \). However, it was found that subjective norms significantly predicted intention, \( b = .24, t = 2.42, p = .02 \).

**Hypothesis 4.2**

Hypothesis 4.2 was that cultural identification would moderate the indirect effect that subjective norms had on physical activity level via the mediator of intention, such that subjective norms would have a stronger indirect effect on physical activity level for participants who identified with Chinese culture, compared to Australian culture.

Contrary to the hypothesis, cultural identification was not a significant moderator of the indirect effect of subjective norms on physical activity level via intention. The index of moderated mediation was found to be significant neither for the analysis of pedometer readings, Index = 176.97, Boot SE = 209.41, CI [-56.57, 847.65], nor the analysis of total physical activity days, Index = .07, Boot SE = .10, CI [-.07, .33]. The conditional indirect effects of subjective norms on pedometer readings via intention were found to be neither significant for participants identifying with Australian culture, \( b = 33.01, 95\% \text{ CI} [-64.34, 499.37] \), nor Chinese culture, \( b = 209.98, 95\% \text{ CI} [-166.19, 624.43] \). Similarly, the conditional indirect effects of
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subjective norms on total physical activity days via intention were found to be neither significant for participants identifying with Australian culture, \( b = .02, 95\% \text{ CI} [-.04, .23] \), nor Chinese culture, \( b = .09, 95\% \text{ CI} [-.09, .36] \). In addition, the cross-product term between subjective norms and cultural identification was only marginally significant for the analysis of pedometer readings, \( b = .31, t = 1.77, p = .08 \), and was not significant for the analysis of total physical activity days, \( b = .24, t = 1.41, p = .16 \), indicating that cultural identification did not moderate the effect of the predictor variable of subjective norms on the mediator variable of intention.

Moreover, the conditional direct effects of subjective norms on pedometer readings were found to be neither significant for participants identifying with Australian culture, \( b = -115.16, 95\% \text{ CI} [-1035.84, 805.52] \), nor Chinese culture, \( b = -714.87, 95\% \text{ CI} [-1669.43, 239.69] \). Similarly, the conditional direct effects of subjective norms on total physical activity days were found to be neither significant for participants identifying with Australian culture, \( b = -.21, 95\% \text{ CI} [-.78, .37] \), nor Chinese culture, \( b = -.19, 95\% \text{ CI} [-.79, .41] \), indicating that cultural identification was also not a moderator of the direct effect of subjective norms on physical activity level. Although the overall model for total physical activity days was significant, \( F (5, 65) = 2.45, p = .04 \), the only significant predictor of total physical activity days
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was the covariate perceived control over external factors, \( b = .49, t = 2.42, \ p = .02, \)
corroborating the findings in Chapter 10. Please refer to Table 11.1 for a summary of the
parameters for the respective conditional indirect and direct effects for the moderated
mediation analyses.

Table 11.1

<table>
<thead>
<tr>
<th>Conditional indirect effects</th>
<th>( b )</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective norms on pedometer readings via intention (for Australian CI)</td>
<td>33.01</td>
<td>-64.34, 499.37</td>
</tr>
<tr>
<td>Subjective norms on pedometer readings via intention (for Chinese CI)</td>
<td>209.98</td>
<td>-166.19, 624.43</td>
</tr>
<tr>
<td>Subjective norms on total PA days via intention (for Australian CI)</td>
<td>.02</td>
<td>-.04, .23</td>
</tr>
<tr>
<td>Subjective norms on total PA days via intention (for Chinese CI)</td>
<td>.09</td>
<td>-.09, .36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional direct effects</th>
<th>( b )</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective norms on pedometer readings (for Australian CI)</td>
<td>-115.16</td>
<td>-1035.84, 805.52</td>
</tr>
<tr>
<td>Subjective norms on pedometer readings (for Chinese CI)</td>
<td>-714.87</td>
<td>-1669.43, 239.69</td>
</tr>
<tr>
<td>Subjective norms on total PA days (for Australian CI)</td>
<td>-.21</td>
<td>-.78, .37</td>
</tr>
<tr>
<td>Subjective norms on total PA days (for Chinese CI)</td>
<td>-.19</td>
<td>-.79, .41</td>
</tr>
</tbody>
</table>

**Conclusion**

In this chapter, subjective norms were investigated as a distal predictor of physical
activity level via the mediator of intention, and it was found that the indirect effect of
subjective norms on both pedometer readings and total physical activity days were not
significant, although the predictor variable of subjective norms significantly predicted the
mediator variable of intention. In addition, cultural identification was not found to be a
moderator of the proposed mediating relationship of subjective norms on physical activity
level via intention. In the next chapter, the findings from Chapters 8 to 11 will be discussed
together, in order to have a comprehensive understanding of the factors within the Theory of
Planned Behavior that are particularly significant in influencing physical activity levels for
the specific population of midlife women.
Chapter 12: Discussion

Overview

In this chapter, the findings reported in Chapters 8 to 11 will be interpreted in relation to the corresponding aims of the study. The findings will also be discussed in relation to how they collectively contribute to a holistic and culturally sensitive understanding of factors that influence physical activity levels of midlife women. In addition, the practical implications of this study’s findings, as well as the strengths and limitations of this study will be discussed, together with suggestions for future directions in research.

The overall aim of this study was to investigate whether an intervention designed to improve attitudes to ageing would lead to an increase in physical activity among midlife women. The design allowed for the investigation of groups of women who broadly identified with two different cultures. All participants attended a one-to-one physiotherapist session, during which they set physical activity goals and provided a range of baseline measures, including attitudes to ageing. Participants then attended discussion group sessions on the topic of healthy ageing and positive attitudes towards ageing (the intervention condition) or on the topic of healthy diet (the control condition). At the group sessions, participants submitted records of
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baseline physical activity levels, operationalised as daily average pedometer readings
and days per week of physical activity recorded on a physical activity diary, which
were measured from the day after the physiotherapist session to the day before the
group session. Following the group session, participants provided measures of
attitudes to ageing, intention to increase physical activity in the following two months,
self-efficacy, perceived control over external factors and subjective norms.

Participants continued to record their physical activity levels during an eight-week
follow-up period. At the end of the follow-up period, participants again provided
measures of their attitudes to ageing, as well as intention, self-efficacy, perceived
control over external factors and subjective norms.

Among the 100 participants recruited for the current study, 97 were
considered eligible to continue with the study following the physiotherapist session,
and 96 of these provided baseline data. These 96 participants had a mean age of 53.89
years, and included 53 Caucasian and 43 Chinese women. The majority of the
participants had a partner, were employed and had a university education. In addition,
the majority of the participants were of a higher socioeconomic status. Hence, the
generalisability of the findings from the current study might be applicable only among
midlife women with similar demographic characteristics.
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In summary, the findings from the current study indicated that there was a very small short-term effect of the intervention in improving attitudes to ageing in the psychological growth domain, though intervention efficacy was not found for attitudes in the physical change and psychosocial loss domains. The intervention was also not effective at increasing physical activity levels. Intention and self-efficacy were not found to mediate the relationship between attitudes to ageing and physical activity, and subjective norms were also not found to exert a distal effect on physical activity levels. Perceived control over external factors was found to be a proximal predictor of total physical activity days. However, after controlling for baseline physical activity, perceived control became a non-significant predictor of total physical activity days, while baseline physical activity was found to be the strongest predictor of physical activity at eight-week follow-up. Each of these results is discussed in detail over the following pages.

**Efficacy of intervention on attitudes to ageing**

The first broad aim of the study was to investigate if a culturally relevant intervention with a component designed to improve attitudes to ageing would improve attitudes to ageing and increase physical activity levels among culturally diverse
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midlife women. The first aim of the study also included the investigation of cultural
identification as a moderator of intervention efficacy. The significant interaction
effect of condition by time in the psychological growth domain lent partial support to
the hypothesis that intervention condition participants would experience more
improvement in attitudes to ageing post-intervention. However, there were no
significant condition by time interaction effects for the physical change and
psychosocial loss domains, indicating a lack of support for the hypothesis pertaining
to the physical change and psychosocial loss domains.

Baseline differences in attitudes to ageing as a function of cultural
identification were also investigated as a precursor to demonstrating that cultural
identification was a moderator of intervention efficacy. Although there was a
significant main effect of cultural identification in the physical change domain,
further investigation revealed that there were no significant baseline differences
between participants of Australian, compared to Chinese, cultural identification in the
physical change domain. There were no significant main effects of cultural
identification in the psychosocial loss and psychological growth domains. There were
no significant interaction effects of condition by time by cultural identification for any
of the three domains. The hypothesis that cultural identification would moderate
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intervention efficacy such that intervention participants with Australian, compared to Chinese, cultural identification would experience significantly greater improvement in attitudes to ageing post-intervention was thus not supported.

In addition to the findings that relate to the hypotheses, a significant main effect of socioeconomic status was found for the psychological growth domain, indicating that participants who had higher, compared to lower, socioeconomic status had more positive baseline attitudes to ageing in the psychological growth domain.

To investigate intervention efficacy for increasing physical activity levels, three sets of linear mixed models were conducted for the respective physical activity measures of pedometer readings, total physical activity days, and group physical activity days. Significant condition by time interaction effects were not found for pedometer readings or total physical activity days, while a significant condition by time interaction effect was found for group physical activity days, indicating that control condition participants, compared to intervention condition participants, had greater increases in group physical activity levels post-intervention. Thus, the hypothesis that intervention condition participants, compared to control condition participants, would experience greater increases in physical activity levels post intervention was not supported for any of the three physical activity measures. In
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addition, there were no significant interaction effects of condition by time by cultural identification for pedometer readings and total physical activity days, while the significant interaction effects of condition by time by cultural identification for group physical activity days indicated that control condition participants who identified most with Chinese culture, compared to Australian culture, experienced greater increases in group physical activity days. Thus, the hypothesis that intervention condition participants who identified most with Australian, compared to Chinese culture, would experience greater increases in physical activity levels was not supported for any of the three measures of physical activity.

Possible explanations for partial intervention efficacy on attitudes to ageing

The partial support for the hypothesis that intervention condition participants, compared to control condition participants, would experience greater improvement in attitudes to ageing, indicated that the intervention was effective in improving attitudes to ageing in the psychological growth domain immediately after the group session, though the improvement was not maintained at eight-week follow-up. This finding demonstrated that an intervention with culturally relevant role models of ageing was successful in the short-term in increasing expectations of continuing growth,
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development and pleasant aspects of life during the ageing process among.midlife
women who broadly identified with two different cultures. The efficacy of the
intervention in the psychological growth domain extended the findings of Wolff et al.
(2014) and Bardach et al. (2010) by demonstrating that single session intervention
sessions can be efficacious in improving views on one’s own ageing experiences not
only among older adults, but also among midlife women. However, this finding that
the current study’s intervention was effective in improving attitudes in the
psychological growth domain in the short term should be interpreted with caution
given the following two reasons. Firstly, intervention condition participants’ scores
were significantly lower than control condition participants’ scores at baseline,
giving rise to the possibility that control condition participants might not have
experienced an increase in AAQ scores post-group session because of ceiling effects.
Secondly, the effect size for the intervention’s effect on improving AAQ scores in the
psychological growth domain immediately after the group session was very small,
suggesting that even if there was a statistically significant effect of the intervention on
changing AAQ scores between baseline and post-group session, the difference in
change between intervention and control groups would be very small (Pallant, 2007).

In the current study, it is possible that improvement in attitudes pertaining to
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the psychological growth domain was achieved via two pathways. Firstly, similar to Wolff et al.’s study (2014), in the current study, the provision of evidence-based information on how physical activity contributes to the maintenance of health and well-being during the ageing process improved midlife women’s attitudes in the psychological growth domain so that they were less inclined to perceive ageing as synonymous with physical decline and would be more likely to perceive ageing as a process that includes pleasant experiences to look forward to. Indeed, although a significant improvement in attitudes pertaining to the physical change domain was not found, post-group session attitudes in the physical change domain were positively correlated with post-group session attitudes in the psychological growth domain.

Secondly, similar to Bardach et al.’s study (2010), in this current study, the older women featured in the video clips were role models whose positive outlook in life midlife women were able to emulate, thereby improving post-group session attitudes in the psychological growth domain.

A possible reason for the lack of maintenance of this improvement in attitudes at eight-week follow-up could be due to relatively short-lived priming effects. In addition to acting as role models, the women featured in the intervention video clips might also have acted as primes to bring into salience positive age stereotypes (Levy,
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1996) that had been internalised by midlife women. These salient positive age stereotypes might have in turn influenced scores for the AAQ psychological growth domain right after the intervention session. However, given that the intervention was a single session, negative age stereotypes prevalent in everyday life (Lockenhoff et al., 2009; Luo et al., 2013) that participants came into contact with during the eight-week follow-up period would have provided constant priming of negative age stereotypes, explaining the lack of maintenance at eight-week follow-up for the improvement in attitudes in the psychological growth domain. Indeed, challenges in maintaining improvement in attitude change have been found in other intervention studies. For example, a study conducted by Ragan and Bowen (2001) to investigate the efficacy of an intervention to improve ageist attitudes among college students, found that, although improvement in attitudes towards older adults were found in all 99 participants who attended a 30-minute information session regarding older adults, maintenance in this improvement in attitudes at four-week follow-up were only found for those participants who attended a second session to reinforce the information they had received during the first session. Although single session interventions might be effective in improving attitudes, follow-up sessions that provide positive reinforcement for participants might be needed to maintain the improvement in
Improving attitudes to ageing to increase physical activity attitudes over longer periods of time (Ragan & Bowen, 2001). The findings of Ragan and Bowen (2001) and this current study thus collectively suggest that although single session interventions might be effective for attitude change, these effects tend to be relatively short-term, and interventions with more sessions to provide positive reinforcement for the improvement in attitudes might be necessary for sustaining attitude change.

Despite the effect of the intervention on psychological growth, there was no evidence for an effect of the intervention in the physical change and psychosocial loss domains. There are a number of possible explanations for this. One potential explanation could be the resistance of existing attitudes to ageing to change. In a study investigating the relationship between age stereotypes and stressful life events in late adulthood, Levy, Slade, Chung and Gill (2015) found that age stereotypes measured at baseline among older adults predicted age stereotypes measured at 10 year follow-up, and did not change as a function of hospitalisations of the participants and bereavements of their family members or friends during the ten-year follow-up period. Participants who held positive age stereotypes at baseline continued to hold positive age stereotypes at ten-year follow-up, and those who held negative age stereotypes at baseline continued to hold negative age stereotypes at ten-year follow
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up. Extending the finding of Levy et al. (2015) that age stereotypes are resistant to change in late adulthood, this thesis’s finding of a lack of intervention efficacy on attitudes in two domains suggests that internalised age stereotypes might already be resistant to change as early as during midlife, and that, although attitudes to one’s own ageing only become relevant from midlife (Brown et al., 2015), interventions aiming to improve attitudes to ageing that are shaped by internalised age stereotypes might achieve greater efficacy if they are implemented at earlier life stages of the intervention’s recipients.

Research has found that negative age stereotypes are internalised and shape ageist attitudes in children as young as five years of age (McGuire, 1993), and such ageist attitudes might already be resistant to change by adolescence (Burke, 1981; Klein, Council, & McGuire, 2005). In their study investigating the efficacy of an intervention programme to improve attitudes toward ageing among high school students, Klein et al. (2005) found that a one-day intervention programme was not efficacious in improving attitudes among a sample of 194 9th graders, of whom 91 were in the intervention condition. Given the lack of efficacy of a one-day intervention in changing adolescents’ attitudes toward older adults, Klein et al. (2005) suggested introducing education on ageing into the curriculum from as early as
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elementary school (Klein et al., 2005; Couper & Pratt, 1999). Despite this current
study’s efficacy in improving short term attitudes in the psychological growth domain,
as well as the efficacy of interventions such as Wolff et al. (2014), that collectively
suggest that attitudes to ageing might still be amenable to change in midlife and
beyond, findings from other studies that highlight the resistance of age stereotypes to
change from as early as adolescence suggest that the earlier interventions are
carried out, the more effective they will be. Future studies could thus consider
carrying out interventions to improve attitudes to ageing or age stereotypes at earlier
life stages.

Another possible reason for the current study’s lack of intervention efficacy on
attitudes in two domains could be that the intervention was too brief. Brief
interventions, such as the current study’s intervention and the intervention conducted
by Bardach et al. (2010), which increased participants’ expectations regarding ageing
but was not effective in increasing participants’ future possible selves, might have
limited effect in improving attitudes to ageing. Thus, future studies could improve
intervention design to feature interventions that are conducted over multiple sessions
and longer time periods, such as the intervention conducted by Sarkisian et al. (2007)
which featured four weekly sessions, so that information about healthy ageing and
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positive age stereotypes can be provided for participants on a consistent basis, much
like the negative age stereotypes that individuals encounter in their daily lives over
long periods of time.

A third potential explanation for the lack of efficacy in two domains of
attitudes to ageing might be the presence of ceiling effects. Compared to the sample
of midlife Australian women in Brown et al.’s study (2015), this study’s intervention
condition participants, who were also midlife women, had more positive attitudes in
the psychosocial loss domain. The mean baseline psychosocial loss domain score for
this study’s intervention condition participants was 15.92, which was lower than the
former’s mean score of 18.74. Note that lower scores in the psychosocial loss domain
are indicative of more positive attitudes to ageing in this domain, with a lowest
possible score of 0 and a highest possible score of 40. Ceiling effects for the
intervention condition participants were not found in the psychological growth
domain, for which higher scores indicated more positive attitudes. The mean baseline
score for this current study’s intervention condition participants was 26.79 in this
domain, which was lower than the mean score of 30.18 reported by Brown et al.’s
participants. In addition, this study’s intervention condition participants had more
positive attitudes to ageing in the physical change and psychosocial loss domains, but
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not the psychological growth domain, compared to the older adults who participated in Laidlaw et al.’s study (2010), who had mean AAQ scores of 16.00, 25.22 and 26.30 for these respective domains. The positive baseline attitudes to ageing of this current study’s participants in the two domains of physical change and psychosocial loss might not be surprising as this study had been advertised as an opportunity to increase physical activity levels, and participants were also informed that this study included a group activity. Thus, it is possible that women who chose to participate in the study might already view their ageing experiences more positively in these two domains at baseline, and think that it would be worthwhile to invest time and effort in increasing their physical activity despite their busy schedules, compared to women who did not respond to the recruitment drive or who did not choose to participate eventually due to reasons such as time commitment issues.

This issue of self-selection of participants has also been highlighted in a pilot study conducted by Chee et al. (2016), on the practical challenges of participant recruitment for a web-based intervention designed to increase physical activity among Chinese American and Korean American midlife women. Chee et al. (2016) suggested that compared to those who chose to participate in the pilot study, Asian American midlife women who had more negative attitudes to ageing might not
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subjectively perceive themselves being in midlife, and thus might not choose to participate in the study as they might be resistant to the idea of being in a study for midlife women. Chee et al.’s suggestion (2016) corroborated previous research that found that adopting a subjective age that is younger than one’s chronological age is a self-enhancing strategy within a global consumerist culture that views ageing, especially of women, in a negative light (Barak, 2009; Barrett, 2005), and suggest that another reason that might make study participation unattractive, other than time commitment to study participation, could be the association to an ageing identity one gains through participation in a study on healthy ageing. Extending the findings of Chee et al. (2016), the current study’s finding of positive attitudes at baseline suggest that self-selection biases for participation in studies on healthy ageing exist not only among Chinese and Korean women, but also among women who identify with Australian culture.

A final reason for the lack of intervention efficacy could be related to challenges faced in designing a culturally relevant intervention, and the selection of role models who would resonate with all the participants. Even among the Chinese-speaking participants, there was considerable heterogeneity in their linguistic and cultural backgrounds. For example, there were Mandarin-speaking participants from
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China and Taiwan, as well as participants from Hong Kong, Vietnam, Malaysia and Singapore, who were more comfortable communicating in Cantonese or English. As the video for the psychosocial loss domain featured Mandarin-speaking Chinese women, it is possible that the intervention condition participants might have differing levels of identification with the Chinese role models who might have spoken in a language that did not resonate with them. Another area of diversity among the Chinese participants was the number of years they have been living in Australia, which ranged from one to 40 years, and the extent to which they identified with Chinese culture and Chinese role models. Although the majority of the Chinese participants indicated that they most belonged to Chinese culture, they might also have been influenced by Australian culture over the years they have been living in Australia, and might not have been able to fully identify with either the Chinese or Caucasian role models featured in the intervention group session. Among the Caucasian participants, there was also heterogeneity in their cultural background, as there were three participants who indicated their cultural identification to a non-British European culture, such as Italian culture. Thus, the Caucasian participants might have differing levels of identification with the Caucasian role models featured in the intervention. As similarity of role models to intervention participants increases
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their level of relatability as role models (Bandura, 1994; Bardach et al., 2010), the

lack of intervention efficacy for two out of the three domains thus highlights the need

for a more nuanced selection of culturally relevant role models.

**Influence of demographic factors on attitudes to ageing**

One final point to note regarding attitudes is the influence of demographic factors, such as socioeconomic status, on shaping attitudes to ageing. Besides contributing to a more nuanced understanding of culturally relevant interventions, this study also extends previous findings on socioeconomic status as a predictor of attitudes to ageing (Bryant et al., 2012; Moser, Spagnoli, & Santos-Eggimann, 2011).

Being of higher socioeconomic status, indicated in this study as having financial resources that are sufficient or more than sufficient to meet needs, predicted more positive baseline attitudes in the psychological growth domain. This finding suggests that perceived financial security could facilitate midlife women’s focus on the positive aspects of ageing, such as continual growth and development, when they have fewer worries about financial security during the ageing process. Previous studies have found that having more financial resources predicted more positive attitudes to ageing in the physical change and psychosocial loss domains among
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Australian adults aged 60 and above (Bryant et al., 2012), and that low income was associated with negative self-perception of ageing among Swiss adults aged 65 to 70 years (Moser et al., 2011). The current study extends these findings by demonstrating that a higher level of financial resource was a significant predictor of more positive attitudes to ageing not only among older adults, but also among midlife women.

Cultural identification as a moderator of intervention efficacy

Before investigating cultural identification as a moderator of intervention efficacy, baseline differences in attitudes as a function of cultural identification were examined. The lack of baseline differences as a function of cultural identification, in attitudes to ageing for all three domains, could be explained by the Stereotype Embodiment Theory. One interpretation for the lack of baseline differences is that Chinese participants might have assimilated Australian age stereotypes along with Chinese age stereotypes during the years that they have been living in Australia. Among the 37 Chinese participants who provided information about the number of years they have been living in Australia, the mean number of years lived in Australia was 18.16 years ($SD = 10.83$), which was close to two decades. This interpretation fits with the argument derived from the Stereotype Embodiment Theory (Levy, 2009).
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that age stereotypes are internalised over the lifespan to shape one’s attitudes to ageing. In a study conducted by Zou, Morris and Benet-Martínez (2008), number of years lived in the United States was found to be positively correlated with American cultural identification among first generation American Chinese. The lack of a significant difference by cultural identification in baseline attitudes in the psychosocial loss and psychological growth domains also provides a possible explanation for the lack of a significant moderation effect of cultural identification for these two domains.

It was found that, regardless of intervention or control condition, participants with Australian, compared to Chinese, cultural identification demonstrated a significantly greater improvement in attitudes in the physical change domain immediately after the group session. A possible interpretation of this finding is that signing up to participate in the current study, which was advertised as an opportunity for midlife women to increase their physical activity level, might have primed participants to be more aware of, and be receptive towards, positive role models who exercise as a means of health maintenance during the ageing process, whom participants might encounter in their daily lives. This increased receptiveness towards positive age stereotypes in the physical change domain could have contributed to
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participants internalising more positive age stereotypes in the physical change domain, explaining the improvement in attitudes in the physical change domain during the period from baseline to the group session, which was approximately one week.

Participants with Australian cultural identification might be more receptive to these positive age stereotypes, hence experiencing a greater improvement in attitudes in the physical change domain during the period between baseline and after the group session. Individualistic cultures tend to emphasise self-expression over integration into group standards (Hofstede, 1980). Thus, there might be greater acceptance of heterogeneous standards of beauty within individualistic cultures. Australian culture, which is a relatively individualistic culture (McCormick & Shi, 1999), might be more accepting of heterogeneity in age stereotypes. Midlife women in the current study who identified with Australian, compared to Chinese, culture might have a greater tendency to question negative cookie-cutter images of ageing (Levy, 2008), and be more receptive towards the positive age stereotypes pertaining to the physical change domain that they might have encountered during the period from baseline to the group session, facilitating greater improvement in attitudes in the physical change domain.

The lack of intervention efficacy in improving attitudes and greater improvement in attitudes among participants with Australian cultural identification collectively
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suggest that while one-session intervention sessions might be limited in their
effectiveness in improving attitudes to ageing, more could be done over longer
periods of time to increase receptiveness towards positive age stereotypes.

**Intervention efficacy on physical activity levels and cultural identification as a moderator**

The intervention was not found to be efficacious in increasing physical
activity levels, and cultural identification was also not found to be a moderator. The
lack of intervention efficacy on increasing physical activity levels could be due to the
limited efficacy of the intervention in improving attitudes to ageing. Unlike Sarkisian
et al.’s intervention (2007) which increased older adults’ expectations regarding their
own physical ability and subsequently their physical activity levels (Sarkisian et al.,
2007), the current study’s intervention did not manage to improve midlife women’s
attitudes in the physical change domain, for which improvement was hypothesized to
lead to increase in physical activity levels. In addition, in this current study,
improvement in attitudes in the psychosocial loss domain for intervention condition
participants that was hypothesized to lead to increase specifically in group physical
activities was also not found. Although there was an improvement in attitudes in the
psychological growth domain for intervention condition participants, this
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improvement did not lead to the hypothesized increase in physical activity level through the mediator of intention.

Another possible explanation for the lack of intervention efficacy on physical activity levels could be the presence of ceiling effects. Despite efforts to recruit women whose exercise levels were below those recommended, physical activity levels in this study’s intervention condition participants were already relatively high at baseline. They were higher, for example, than those reported in a study of 60 Caucasian women with an average age of 42 years, and with ages ranging from 22 to 64 years, who participated in an intervention programme that successfully increased physical activity levels among women residing in rural America (Sherman, Gilliland, Speckman, & Freund, 2008). While the mean pedometer reading at baseline was 9647.15 steps per day for this study’s intervention condition participants, it was only 6337 steps per day for Sherman et al.’s participants. Even among the subsample of 37 women from Sherman et al.’s study (2008) who reported that they were already engaging in physical activity at baseline, their mean baseline pedometer reading was still only 6972 steps per day. Moreover, the baseline pedometer reading of this study’s intervention condition participants was already approaching the recommended 10,000 steps per day (Wilde, Sidman & Corbin, 2001). Therefore, there was less room for the
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intervention to increase the pedometer readings of participants as baseline pedometer readings were already high for intervention condition participants. Given that this study had been advertised as an opportunity for participants to increase their physical activity levels, it is perhaps not surprising that the women who joined the study might tend to prioritise physical activity and were already relatively physically active, compared to women who saw the study’s advertisement but did not choose to participate in the study. This recruitment issue of participants’ self-selection into a study has also been found in other physical activity interventions, such as the Move More for Life Trial, a physical activity intervention for post-treatment breast cancer survivors (Short, James, Girgis, D’Souza, & Plotnikoff, 2015). Although women who are already physically active could still enjoy increases in health benefits by further increasing their physical activity levels (Upchurch et al., 2015), future studies should consider how to recruit sedentary women, to investigate intervention efficacy in the absence of ceiling effects, and more importantly, to bring interventions to sedentary participants who would greatly benefit from these interventions.

Although there was no significant difference between intervention and control condition participants in the increase of total physical activity days, control condition participants had a significantly greater increase in group physical activity days. There
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are a number of possible explanations for this surprising finding. One explanation
could be unintended carry-over effects of self-efficacy for healthy eating in the
control group. In a study conducted among 706 Chinese men and women, aged 18 to
45, Miao, Gan, Gan, & Zhou (2017) found that there were reciprocal carry-over
effects for the specific health behaviours of healthy eating and physical activity
through pathways of self-efficacy, and that an increase in self-efficacy for a healthy
diet predicted an increase in self-efficacy for physical activity via the mediator of
general self-efficacy. Arguably, discussing the adoption of a healthy diet could have
increased self-efficacy for group physical activities, leading to increases in group
physical activity levels (Miao et al., 2017). This explanation is unlikely, however, as
an inspection of the self-efficacy scores for the current study’s control condition
participants at baseline and post-group session revealed that there was actually a
decrease in physical activity self-efficacy following the control group session. Thus, it
is unlikely that the unintended effects of the control group session in this current
study are attributable to the carry-over effects of self-efficacy for healthy eating.

Another possible explanation for the unintended effects of the control group
session increasing group physical activities could be control condition participants
increasing group physical activities in an attempt to reduce sedentary behaviour that
Improving attitudes to ageing to increase physical activity might encourage unhealthy dietary behaviours. After attending the control group session that encouraged the adoption of a healthy diet, control condition participants might have been motivated to adopt more healthy eating behaviours. One strategy that they might adopt to increase healthy eating behaviours might be to increase group physical activities, as sedentary behaviours have been found to be associated with higher fat intake and more unhealthy eating behaviours (Lake, Townshend, Alvanides, Stamp, & Adamson, 2009; Vereecken, Todd, Roberts, Mulvihill, & Maes, 2006).

Lake et al. (2009) found in their study conducted in the United Kingdom among 73 adolescents and young adults, aged 16 to 20, that sedentary behaviours such as television watching and driving or sitting in a car were positively associated with higher levels of fat intake. In addition, Vereecken et al. (2006) found in a study using data collected from 162305 adolescents, aged 11 to 15, from 34 countries, that more time spent watching television was positively associated with increased daily consumption of sugared drinks and sweets. Thus, it is possible that this current study’s control condition participants increased group physical activities to reduce sedentary behaviours such as television watching that might encourage unhealthy eating behaviours. Group physical activities might have been favoured over solitary physical activities as a means of reducing sedentary behaviour, as lack of
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companionship has been found to be a barrier to physical activity for midlife women (Hendry et al., 2010).

There was also an unexpected moderation effect of cultural identification, such that control condition participants who identified with Chinese culture, compared to Australian culture, had a greater increase in group physical activities. Greater increases in group physical activity levels among control condition participants who identified with Chinese culture, compared to Australian culture, could be a reflection of the emphasis on cooperation and social harmony within Chinese society. In their study investigating the relationships among motives for and barriers to physical activity, motivational styles for physical activity and level of physical activity, Sit et al. (2008) found that their participants who were Chinese women aged 30 to 59 tended to have motivational styles that emphasise cooperation over personal gains, and concern for others over competition, and suggested that Chinese women within this age range might view participation in physical activity as a form of cooperation as they are influenced by their Confucian cultural background to prioritise social harmony. It was also found that those who had motivational styles which prioritised concern for others rated social motives, such as the opportunity to meet new people, as more important motives for physical activity (Sit et al., 2008).
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The control condition participants who identified with Chinese culture in the current study might have a greater increase in group physical activities as they might have viewed engagement in group physical activity as a form of cooperation when invited by peers to join in group physical activities. It is also possible that they might view an increased engagement in physical activity as a form of cooperation in their role as participants of a study advertised as an opportunity to increase physical activity, and might have favoured group physical activities that provided them opportunities for social interaction.

**Intention and self-efficacy as mediators of the relationship between attitudes to ageing and physical activity levels**

The second aim of this thesis was to investigate if intention and perceived self-efficacy would mediate the relationship between more positive attitudes to ageing and increase in physical activity levels, and if perceived self-efficacy contributes to strengthening intention. The hypothesis that intention would mediate the relationship between attitudes to ageing, in all three domains, and physical activity levels was not supported as the indirect effects of attitudes to ageing on the respective measures of pedometer readings, total physical activity days and group physical activity days via
Improving attitudes to ageing to increase physical activity intention was not significant. In addition, the hypothesis that perceived self-efficacy would mediate the relationship between attitudes to ageing, in the physical change and psychosocial loss domains, and physical activity levels was not supported, as the indirect effects of attitudes to ageing on physical activity levels via self-efficacy were not significant. However, the hypothesis that self-efficacy would be a proximal predictor of intention to increase physical activity was supported, as there was a significant effect of self-efficacy on intention. It was also found that attitudes to ageing in the physical change and psychosocial loss domains significantly predicted self-efficacy, and that attitudes to ageing in the physical change and psychological growth domains significantly predicted intention to increase physical activity, although independent of intention and self-efficacy, attitudes to ageing in the three domains did not predict physical activity levels.

Although attitudes to ageing significantly predicted self-efficacy, the lack of significant indirect effects of attitudes to ageing on physical activity levels via self-efficacy suggests that self-efficacy was not a proximal predictor of physical activity levels in the current sample of midlife women. Unlike Aparicio-Ting et al.’s study (2015), which found that self-efficacy was a significant predictor of physical activity maintenance at one-year follow-up of an exercise intervention programme conducted
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for sedentary women aged 50 to 74, the current study conducted among women aged
45 to 60 did not find evidence supporting self-efficacy as a proximal predictor of
physical activity level. Given that Aparicio-Ting et al.’s participants were more
sedentary and older than the current study’s participants, the non-significance of self
efficacy as a proximal predictor of physical activity in the current study suggests that
self-efficacy might be a predictor of physical activity that is more relevant to older
women, as well as more sedentary women, compared to midlife women and relatively
more active women. Compared to those at midlife, or who are already more active,
individuals who are older or more sedentary might perceive physical activity to be a
relatively non-volitional behaviour which might not be achievable even if they want
to perform the behaviour, and thus for older and more sedentary women, self-efficacy
might be more relevant as a predictor of physical activity (Aparicio-Ting et al., 2015;
Peeters et al., 2015).

Control condition participants' baseline self-efficacy was found to be significantly
higher than intervention condition participants', suggesting there may have been ceiling
effects for increase in self-efficacy for control condition participants after the group session. However, the intervention was not efficacious in improving attitudes in the physical change
and psychosocial loss domains, which were hypothesised to be positively associated with an
increase in self-efficacy. Moreover, self-efficacy was found to be neither a proximal nor
distal predictor of physical activity levels at eight-week follow-up. Thus baseline differences
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in self-efficacy might not have implications for interpreting intervention efficacy on physical activity levels. Nevertheless, interpretation of the slight increase in intervention condition participants' post-group session self-efficacy and decrease in control condition participants' post-group session self-efficacy should take into consideration baseline differences and possible ceiling effects demonstrated by control condition participants with regards to self-efficacy.

Moreover, although the current study demonstrated that self-efficacy was a predictor of intention, evidence for intention as a proximal predictor of physical activity level was not found. This lack of evidence for intention as a proximal predictor of physical activity contradicts the findings of other studies such as White et al. (2012) and Fortier et al. (2009). For example, Fortier et al. (2009) found that among women aged 39 to 68, intention at baseline was a predictor of self-reported physical activity levels at six-month follow-up. As the phrasing for Fortier et al.'s measure of intention (“I intend to increase my physical activity level over the next six months.”) is similar to the current study’s measure of intention (“I intend to increase time spent on physical activity over the next two months.”), it is unlikely that the discrepancy between Fortier et al.’s findings and this study’s findings could be due to differences in measurement of physical activity intention. Given that there is a significant, but only modest association between intention and physical activity
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behaviour in Fortier et al.’s study, it is possible that the wider age range of Fortier et al.’s participants, which includes older adults up to the age of 68, could contribute to the significance of intention as a predictor of physical activity. Thus, the findings of Fortier et al. and this current study with regards to intention being a predictor of physical activity behaviour collectively suggest that intention might be a more relevant predictor of physical activity behaviour for older adults, compared to midlife women who might face time constraints in engaging in physical activity. However, given that one of the limitations of the current study is the lack of a direct measure of midlife women’s actual level of family and work commitments, it is acknowledged that this point regarding intention being less relevant as a predictor of physical activity for midlife women is somewhat speculative.

The finding that intention was not a proximal predictor of physical activity levels in this study might be explained by the so called ‘intention-behaviour gap’ (Sheeran, 2002). This ‘intention-behaviour gap’ might be a possible reason for the lack of increase in physical activity despite improvement in attitudes in the psychological growth domain. Sheeran (2002) argued that there are several factors that can contribute to discrepancies between intention to perform a behaviour and actual performance of the behaviour, termed the “intention-behaviour gap”. Among these factors are the types of behaviour and intention that are being investigated. In
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general, behaviours that are operationalised as specific actions, such as attending the
gym once a week or jogging three times a week are more likely to be performed when
the corresponding intention to perform the behaviour is strong, compared to
behaviours that are operationalised as goals, such as increasing time spent on physical
activity. In comparison to specific actions, goals are more difficult to achieve as the
achievement of a goal is dependent on the achievement of specific actions. More
importantly, the achievement of a goal is dependent on whether behavioural
performance of specific actions lead to goal achievement (Sheeran, 2002). For
example, even if participants in this study had indicated higher levels of intention to
increase time spent on physical activity, they might not have been able to achieve the
behaviour of actually increasing time spent on physical activity if they had frequently
received calls to attend to family matters while they were in the gym or jogging, and
had terminated their physical activity sessions after just five or ten minutes. Therefore,
the intention-behaviour gap demonstrated by the current study’s midlife women might
be attributable to the somewhat broad operationalisation of the behaviour under
investigation as a goal, which in turn makes behavioural achievement more
challenging.

Besides type of behaviour, the type of intention that is being investigated can
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also have an influence on the magnitude of the intention-behaviour gap. Intentions that have been phrased to include specific contexts for behavioural performance, termed implementation intentions (Gollwitzer, 1999), might be more effective proximal predictors of behavioural performance, such as exercise (Milne, Orbell, & Sheeran, 2002), compared to behavioural intentions such as those measured by Armitage (2005) and Fortier et al. (2009). For example, instead of phrasing the intention to increase physical activity as “I intend to increase time spent on physical activity over the next two months”, it could be phrased as “To increase time spent on physical activity over the next two months, I intend to jog for 30 minutes twice a week in the park after dinner”. Adding a specific context to the intention being measured provides participants with contextual cues of time and place, such as after dinner, that reminds them of performing the behaviour when they encounter these contextual cues (Gollwitzer, 1999). Implementation intentions which include contextual cues of behavioural performance have been found to be predictors of behavioural performance over longer periods of up to eight weeks (Silverman & Sheeran, 1999). Although the measure for behavioural intention in this current study included the context of “over the next two months” in relation to performing the behaviour of “increasing time spent on physical activity”, this context might not be
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sufficient to remind participants of the specific physical activities for increasing physical activity to be done on a regular basis which they had discussed with the physiotherapist during their physiotherapist session. As suggestions for physical activities were customised to participants’ respective health conditions and preferences, an improvement to this study’s design for future replications could be to rephrase the measure for intention as “To increase time spent on physical activity over the next two months, I intend to _______” and ask participants to fill in the blank with the specific physical activities and frequency of activities they have discussed during their physiotherapist session before asking them to rate this statement on a Likert scale to quantify their behavioural intention.

Although the intervention demonstrated efficacy in improving attitudes to ageing in the psychological growth domain, and post-group session attitudes in the psychological growth domain significantly predicted post-group session intention to increase physical activity levels, intention was not found to significantly predict post 8-week physical activity levels. Hence, while the intervention might have been effective in improving midlife women’s view that there are still pleasant aspects of ageing that make investing time and effort on health behaviours such as physical activity worthwhile, and this future-orientation might have translated to intention to
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increase time spent on physical activity, intention did not translate to actual behaviour.

Similarly, while the one-session intervention might not have improved attitudes to ageing in the physical change and psychosocial loss domains, attitudes in these two domains did predict self-efficacy to increase physical activity level, corroborating Sarkisian et al.’s (2007) suggestion that positive expectations of one’s physical ability during the ageing process could predict self-efficacy for physical activity. However, the lack of evidence from the current study for self-efficacy as a proximal predictor of physical activity level was contrary to Sarkisian et al.’s suggestion of self-efficacy as a mediator of the relationship between attitudes to ageing and physical activity levels. Given the lack of effect of intention and self-efficacy on physical activity behaviour, it is possible that for the specific population of midlife women, other predictors within the TPB framework might be particularly important predictors of physical activity behaviour. These will be discussed next.

**Perceived control over external factors as a predictor of physical activity levels**

The third aim of the study was to investigate if perceived control over external factors was a proximal predictor, as well as a distal predictor via intention, of physical
Improving attitudes to ageing to increase physical activity levels. The third aim also included investigating if there was a bi-directional relationship between physical activity level and self-efficacy, as well as between physical activity level and perceived control over external factors. The hypothesis that perceived control over external factors would predict physical activity levels was only partially supported, as perceived control over external factors was found to be a proximal predictor of total physical activity days, but not post-group session pedometer readings. Moreover, when baseline physical activity was controlled for, perceived control no longer predicted total physical activity days, and though it predicted pedometer readings, this was not in the hypothesized direction. In addition, perceived control over external factors was not found to be a predictor of intention, and thus not a distal predictor of physical activity levels. The hypothesis that post group session physical activity level would predict self-efficacy and perceived control over external factors at eight weeks post intervention was also only partially supported, as physical activity level measured by total physical activity days was found to predict post eight-week self-efficacy, but not post eight-week perceived control over external factors. In addition, neither post-group session pedometer readings nor total physical activity days was found to predict post eight-week perceived control over external factors. These findings thus collectively suggest that
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while a sense of control over external factors that facilitate physical activity is
important in encouraging higher levels of deliberate physical activity, past physical
activity behaviour is still the strongest predictor of current physical activity behaviour.

The finding that perceived control over external factors was a significant
proximal predictor of total physical activity days extends the existing literature on
physical activity among the specific population of midlife women, by providing
quantitative data that demonstrated that perceived control over external factors was an
independent and proximal predictor of physical activity level, separate and
distinguishable from self-efficacy. Past studies have already found that lack of time is
an important barrier to physical activity among midlife women (King et al., 2000;
McGuire et al., 2016; Osuji et al., 2006). However, these studies have not investigated
the role of perceived ability to overcome external barriers, such as lack of time, in
influencing physical activity levels of midlife women. Other studies that have
investigated the role of perceived control over external resources in directly predicting
physical activity level have not included (Wang & Zhang, 2016) or focused on
(Armitage, 2005) the specific population of midlife women. In addition, these studies
have either not distinguished between perceived control over internal resources such
as physical ability, or external resources such as time (Armitage, 2005), or did not
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find evidence for perceived control over external factors as a proximal predictor of physical activity (Wang & Zhang, 2016). In investigating and demonstrating affirmative evidence for the proximal relationship between perceived control over external resources, such as time, and physical activity levels among midlife women, the findings of this thesis thus highlight the importance of the perception of control over external resources in achieving the behaviour of physical activity, among the specific population of midlife women.

The finding that perceived control over external factors is a proximal predictor of total physical activity days, but not post-group session pedometer readings, reaffirms the importance of a sense of control over one’s schedule in influencing level of deliberate physical activity at midlife (Osuji et al., 2006). Unlike pedometer readings, which is a measure of accumulated deliberate and incidental physical activity over the day, such as walking from the office to the bathroom, total physical activity days in the current study is a specific measure of deliberate physical activity as it measured only days per week when participants engaged in physical activities of at least 30 minutes in duration per session. Total physical activity days might also be a more accurate reflection of deliberate and sustained physical activity as it also measured deliberate physical activity that would not have been measured by the
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pedometer, such as swimming. Studies have demonstrated the protective benefits of midlife physical activity of at least 30 minutes in duration per session on physical and cognitive functioning in late adulthood (Tartibian et al., 2011; Tolppanen et al., 2015), as well as on more immediate health benefits such as sleep quality at midlife (Mansikkamäki et al., 2012). Although midlife women often face work and family commitments that seem to take time away from physical activity (King et al., 2000; McGuire et al., 2016; Osuji et al., 2006; Sit et al., 2008), some women are still able to enjoy higher levels of physical activity, compared to other women facing similar constraints of scheduling time for physical activity. Differences in perceived level of control over external resources for physical activity, such as time, could thus be a possible explanation for differing levels of deliberate physical activity that could contribute to differing levels of health and well-being at midlife and beyond.

The finding that baseline physical activity became the strongest predictor of physical activity at eight-week follow up after it was included as a predictor of physical activity suggests that rather than level of perceived control over external factors, the deciding factor for differing levels of physical activity among midlife women could be whether they had already developed the habit of physical activity. Kwan et al. (2009) found that past physical activity behaviour was the only significant
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predictor of current physical activity behaviour, while intention and perceived

behavioural control were not significant predictors of physical activity, among first

year Canadian university students. This current study’s finding that baseline physical

activity is the strongest predictor of post-group session pedometer readings and the

only significant predictor of total physical activity days extends the findings of Kwan

et al. by suggesting that past physical activity behaviour might also be the most

important predictor of current physical activity among midlife women. One

explanation for this is that, similar to first-year university students who might have

indicated high levels of perceived behavioural control but underestimated the barriers
to physical activity during the transition to university (Kwan et al., 2009), this current

study’s participants might also have overestimated their level of control over external

factors, such as various work and family demands usually associated with midlife,

and reverted back to past physical activity habits when they prioritised dealing with

unexpected work and family demands over increasing physical activity during the

eight-week follow-up period. The relative importance of past physical activity

behaviour over TPB variables in predicting current physical activity behaviour at

midlife has important implications, both for health policies and research, which will

be discussed in greater detail below.
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The surprising finding that higher levels of perceived control over external factors predicted lower levels of post-group session pedometer readings might be due to participants’ attempt to reduce incidental physical activity to conserve energy for physical activity of longer durations. Previous studies (Goran & Poelhman, 1992; Stubbs et al., 2004) have found that individuals who participated in exercise intervention programs compensated for the increase in energy expenditure by reducing their level of energy expenditure for non-exercise related activities. In the current study, participants might have chosen to take the lift over climbing the stairs as they might already have planned to engage in deliberate physical activity later during the day. However, unexpected work and family demands might eventually prevent participants from completing the physical activity session that they had planned to engage in.

The finding that perceived control over external factors did not predict intention to increase physical activity in this study suggests that perceived control over external resources might work through pathways eschewing long-term planning to influence physical activity among midlife women. Contrary to Wang and Zhang’s study (2016) on determinants of physical activity levels among Chinese adolescents, which found that perceived control over external factors was a significant predictor of
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intention for physical activity in the following week, perceived control over external factors was not found to be a significant predictor of intention to increase physical activity level over a two-month period in this current study. Among this current study’s sample of midlife women, perceived control over external factors had an effect directly on physical activity level, rather than influencing physical activity level through the mediator of intention. The lack of a significant effect of perceived control over external factors on intention could suggest that the qualitative meaning of perceived control over external resources such as time for midlife women might refer to confidence in one’s ability to adapt to changes in one’s daily schedule so that time could still be squeezed to include pockets of physical activity of at least 30 minutes in duration, instead of confidence in planning out and executing a two month schedule for physical activity that is fixed in timing regardless of unexpected external challenges that might occur in the future. Further studies that are qualitative in nature would be needed to investigate this suggested interpretation of what perceived control over external resources might mean to midlife women in the context of physical activity, and if women with a higher level of adaptability would have higher levels of perceived control over time.
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**Physical activity level as a predictor of subsequent self-efficacy and perceived control**

The finding that total physical activity days, but not pedometer readings, predicted subsequent self-efficacy suggests that successful performance of deliberate and sustained physical activity increases midlife women’s self-confidence in their physical ability to perform physical activities, corroborating and extending the findings of Armitage (2005) and Aparicio-Ting et al. (2015). Armitage demonstrated that physical activity level at 12-week follow-up predicted subsequent perceived behavioural control. However, Armitage did not provide direct evidence for physical activity level predicting subsequent self-efficacy as the construct of perceived behavioural control measured was not further differentiated into self-efficacy and perceived control over external factors. The current study extends Armitage’s finding by demonstrating that physical activity level was predictive of subsequent level of the specific construct of self-efficacy, which was measured separately from perceived control over external factors. Aparicio-Ting et al.’s findings (2015) suggest a bi-directional relationship between self-efficacy and physical activity levels among midlife and older women. Extending the findings of Aparicio-Ting et al. (2015), the current study’s finding suggests that while the bi-directional relationship between
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self-efficacy and physical activity might be stronger among older women, for the specific population of midlife women, successful performance of deliberate physical activity might predict subsequent self-efficacy, but self-efficacy might not be sufficient to predict further increases in physical activity levels measured by the performance of deliberate physical activities over longer time periods.

The finding that total physical activity days predicted subsequent self-efficacy also extends the findings of Klusmann, Evers, Schwarzer, and Heuser (2012) on the effects of exercise on increasing direct approach orientation and improving views on ageing. Approach orientation is the focus on achieving positive emotions through goal attainment (Higgins, 1997). In a randomised controlled trial conducted among 247 German-speaking women above 70 years of age, Klusmann et al. found that participants who were assigned to an exercise intervention programme had significantly higher levels of direct approach orientation and lower levels of ageing dissatisfaction at six-month follow-up, compared to those who were assigned to one of two control conditions. It was also found that direct approach orientation mediated the positive association between exercise and positive views on ageing, operationalised as lower levels of ageing dissatisfaction. In the study conducted by Klusmann et al., the exercise intervention programme consisted of group exercise
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activities three times a week for six months, the active control condition consisted of a computer course of equal frequency and duration, and the passive control condition did not require participants to attend any activities. Klusmann et al.’s findings thus suggest that among older women, successful engagement in physical activities provides immediate feedback of physical performance, which contributes to a sense of enjoyment and achievement that orientates one towards direct approach (Klusmann et al., 2012), which is a type of approach orientation that is associated with increased self-esteem (Mees & Schmitt, 2008).

Positive emotions such as enjoyment of physical activities and the sense of achievement gained through successful performance of physical activities in turn contribute to lower levels of ageing dissatisfaction, defined as a general feeling that life becomes worse as one ages, feelings of uselessness and disengagement from social connections (Klusmann et al., 2012). The current study extends the findings of Klusmann et al. (2012), who conducted their study among a sample of sedentary older women, by demonstrating that even among relatively active midlife women, physical activity engagement was also able to further increase their level of self-efficacy. This highlights the importance of experiencing physical activity-related achievement.

Extrapolating from Klusmann et al., such increases in self-efficacy could also co
Improving attitudes to ageing to increase physical activity occur with increases in well-being brought by enjoyment from physical activities, and provides further endorsement for the benefits of physical activity during midlife.

The finding that post-group session physical activity levels did not predict subsequent perceived control over external factors extends the literature by providing further evidence for the discriminant validity between the concepts of self-efficacy and perceived control over external factors. Although successful performance of physical activities was hypothesized to increase midlife women’s level of control over external resources that facilitate physical activities, similar to the sense of mastery gained through successful behavioural performance underlying the bi-directional relationship between perceived behavioural control and physical activity (Armitage, 2005), the current study did not find evidence to support a bi-directional relationship between perceived control over external resources and physical activity. Previous studies have provided evidence of discriminant validity between self-efficacy and perceived control over external factors as separate predictors of physical activity (Rhodes & Courneya, 2003; Wang & Zhang, 2016). However, as these studies (Rhodes & Courneya, 2003; Wang & Zhang, 2016) did not investigate how physical activity level predicts subsequent levels of self-efficacy and perceived control over external factors, the finding of the current study that total physical activity days
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predicted subsequent self-efficacy but not subsequent perceived control over external
factors extends the literature by providing evidence of discriminant validity between
these two constructs as outcome measures.

**Subjective norms as distal predictor of physical activity levels and
cultural identification as a moderator**

The fourth aim of this thesis was to investigate if subjective norms would
predict physical activity levels among midlife women via the mediator of intention,
and if cultural identification of midlife women would moderate this proposed
mediating relationship via intention, such that subjective norms would have a stronger
distal influence on physical activity levels of participants who identified with Chinese
culture, compared to Australian culture. Although subjective norms were found to be
a significant predictor of intention, they were not found to have a distal effect on
physical activity levels, measured either by pedometer readings or total physical
activity days, via intention. Moreover, independent of intention, subjective norms
were not found to have an effect on either pedometer readings or total physical
activity days. Thus, the hypothesis that subjective norms would have a distal
influence on physical activity levels via the mediator of intention was not supported.

In addition, the conditional indirect effects of subjective norms on pedometer readings,
Improving attitudes to ageing to increase physical activity as well as total physical activity days, via intention were found to be significant for neither participants who identified with Australian culture nor Chinese culture. Thus, the hypothesis that cultural identification would moderate the hypothesized mediating relationship of subjective norms on physical activity level via intention was also not supported.

The significant proximal effect of subjective norms on intention found in this thesis is consistent with previous findings on the importance of perceived societal pressure in influencing intention to perform the behaviour under investigation.

Corroborating previous findings that subjective norms are a significant predictor of intention for physical activity among diverse sample populations including older adults (White et al., 2012), university students (Kwan et al., 2009), as well as midlife women (Fortier et al., 2009), this study further extends the findings of Fortier et al. (2009) by providing empirical evidence of the importance of subjective norms as a predictor of intention to increase physical activity among midlife women who identify with different cultures, suggesting that perceived societal pressure to engage in physical activity can be an important influence on behavioural intention within both individualistic and collectivistic cultural contexts.

The lack of a significant distal effect of subjective norms on physical activity
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level regardless of cultural identification indicates that perceived societal pressure might not be sufficient to influence actual physical activity levels among the specific population of midlife women. Consistent with Armitage’s study (2005), which found that subjective norms were not a distal predictor of physical activity levels over a 12 week follow-up period among men and women over a wide age range of 18 to 65, the current study also found that subjective norms did not have a significant distal influence on physical activity levels over an eight-week follow-up period among the specific population of midlife women. Given that subjective norms were found to be a proximal predictor of intention in this study, the lack of a distal effect of subjective norms on physical activity levels via the mediator of intention might be explained by the intention-behaviour gap. With a mean post-group session score of close to 5 (out of a maximum possible score of 7) for subjective norms, this sample of midlife participants perceived high levels of societal pressure to increase their physical activity levels, which in turn influenced their intention to increase physical activity levels, unlike Hendry et al.’s (2010) midlife participants who perceived societal pressure not to engage in physical activities lest these activities took time away from familial responsibilities. Nevertheless, the intention-behaviour gap found among this thesis’s sample of midlife women suggests that given the work and family
Improving attitudes to ageing to increase physical activity commitments that are characteristic of challenges faced by midlife women, having the intention to increase physical activity might be insufficient to have an effect on physical activity behaviour. Another possible explanation for the inability of subjective norms to exert a distal influence on midlife women’s physical activity levels could be the relative inefficiency of introjected regulation in influencing physical activity levels (Frederick-Rescacino, 2002; Ryan & Deci, 2002; Segar et al., 2007). Extending previous findings that socio-cultural norms exert social pressure to engage in physical activity, that is partially internalised (Segar et al., 2007) as introjected behavioural regulation, (Ryan & Deci, 2002) and that introjected regulation has been found to lead to lower levels of adherence to physical activity (Frederick-Rescacino, 2002), this current study further provides empirical evidence for the lack of influence of social pressure on physical activity behaviour among women of both individualistic and collectivistic cultures.

**Predictors of physical activity for non-sedentary midlife women**

Overall, this thesis’s findings suggest that, among the specific population of midlife women, past physical activity behaviour and perceived control over external factors may be particularly important predictors of long-term physical activity level.
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While the intervention designed to improve attitudes to ageing was found to be efficacious in improving attitudes in the psychological growth domain, which was in turn a predictor of intention to increase physical activity levels, intention was not found to be a predictor of time spent on physical activity behaviour, which might be explained by the intention-behaviour gap. Moreover, self-efficacy was found to be neither a proximal nor distal predictor of physical activity level. While subjective norms were found to predict intention, they did not exert a distal influence on physical activity levels due to the intention-behaviour gap. However, unlike the hypothesized predictors of attitudes to ageing, intention, self-efficacy and subjective norms, perceived control over external factors was found to be a proximal predictor of days per week for which midlife women engaged in at least 30 minutes of physical activity. The caveat to this finding, however, is that perceived control was no longer a significant predictor of total physical activity days when baseline physical activity was also investigated as a predictor. Thus, the findings of this thesis collectively suggest that, while positive attitudes to ageing, intention, self-efficacy and subjective norms are theoretically important factors for increasing midlife women’s physical activity levels, for non-sedentary midlife women facing time constraints, confidence in managing their schedules to include regular physical activities might be more
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relevant as a predictor of deliberate physical activity levels. More importantly, past physical activity behaviour was found to be the most relevant predictor of engagement in regular physical activities over longer periods of time.

**Practical implications of study findings**

The findings reported in this thesis extend the findings of previous studies on factors predicting midlife women’s physical activity behaviour by highlighting that midlife women are a heterogeneous group of individuals for whom perceived control over external factors might be a relevant predictor for those who are more active, while self-efficacy might be a more relevant predictor for those who are more sedentary. Thus, a multi-pronged approach might be necessary to encourage regular physical activity that meets recommended standards of at least 150 minutes of moderate physical activity per week (World Health Organization, 2010). While previous findings that included midlife women (Peeters et al., 2015) found that self-efficacy was a significant predictor of physical activity level for low-active middle-aged individuals, this current study did not find self-efficacy to have an effect on physical activity levels of midlife women who were non-sedentary at baseline. This discrepancy in findings suggests that programmes that aim to improve different
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psychosocial factors might be needed to tailor to different groups of midlife women in
order to successfully increase physical activity levels. For midlife women who are
sedentary or who are experiencing chronic health conditions such as diabetes and
arthritis, exercise programmes with professional guidance to increase duration and
intensity of physical activity level gradually and in a structured manner, such as the
intervention featured in Tartibian et al.’s study (2011), might be most appropriate to
facilitate the development of self-efficacy via mastery of progressively challenging
physical activity levels. On the other hand, for midlife women who are already
engaging in physical activities and would like to increase physical activity level to
reap more health benefits, programmes that prioritise increasing perceived control
over external factors might be more appropriate. Such programmes could feature
professional advice, similar to advice given during this current study’s physiotherapist
session, which provides information on different types of physical activities that
midlife women could incorporate into their daily routines, or information on
convenient exercise facilities that provide midlife women with a wider range of
physical activities to enjoy. The finding that past physical activity behaviour is the
strongest predictor of current physical activity behaviour among the current study’s
participants also suggests that interventions that aim to increase physical activity
Improving attitudes to ageing to increase physical activity might achieve greater efficacy if they are conducted as early as possible, perhaps even before midlife, to help women cultivate the habit of engaging in regular physical activity.

The findings of this current study highlight the challenge in improving attitudes to ageing within the span of a single intervention session lasting only 90 minutes, and suggest that interventions that consistently provide positive age stereotypes over longer periods of time might be more effective in counterbalancing negative age stereotypes that have been internalised over many decades. As ageist images encountered in the media and everyday conversation reinforce internalised negative age stereotypes, intervention programmes that include more sessions conducted at regular intervals and that feature viewing movies, dramas or documentaries with positive age stereotypes might be more effective in reinforcing positive age stereotypes by repeatedly bringing into salience positive age stereotypes.

**Theoretical implications of the study**

On a theoretical level, this thesis’s findings extend the TPB by providing empirical support for the substitution of attitudes towards physical activity with attitudes to ageing when the Extended TPB is adopted as a theoretical framework to understand factors influencing physical activity levels among the specific population of midlife women. Although neither intention nor perceived self-efficacy were found to be proximal predictors
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doing of physical activity at eight-week follow-up among this study’s sample, attitudes to ageing were positively associated with self-efficacy and intention. Specifically, post-group session attitudes in the physical change and psychosocial loss domains were positively associated with self-efficacy measured at the same time point, and post-group session attitudes in the physical change and psychological growth domains were positively associated with intention measured at the same time point. The positive association between attitudes in the physical change and psychosocial loss domains with self-efficacy demonstrated empirical evidence for the Stereotype Embodiment Theory’s explanation (Levy, 2009) that attitudes to one’s own ageing influence self-efficacy for health behaviours, such as physical activity which could be done either alone or within a social context, thus providing support for including attitudes to ageing within the Extended TPB framework. Future studies could consider investigating factors influencing physical activity among midlife women who are not as physically active as this study’s participants, to provide evidence for the role of self-efficacy as a predictor of midlife women’s physical activity.

Moreover, the lack of differences in baseline attitudes to ageing in all three domains as a function of cultural identification suggests that the Stereotype Embodiment Theory (Levy, 2009) might be further enhanced by future studies that adopt more nuanced frameworks to investigate the role of culture in shaping age stereotypes that are in turn internalised. That is, contrary to the Stereotype Embodiment Theory’s tenet that views on one’s own ageing are likely to differ from culture to culture as age stereotypes that shape views on ageing differ as a function of culture, this study did not find significant differences in baseline attitudes between participants who self-reported belonging most to Australian, compared to Chinese, culture. The migrant backgrounds of this study’s Chinese participants suggests that they might have assimilated Australian age stereotypes, together with Chinese age stereotypes, and that age stereotypes from both cultures might have influenced their
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attitudes to ageing. Given current trends in cross-cultural migration in countries such as Australia (Australian Bureau of Statistics, 2017), future studies investigating the role of culture on shaping attitudes to ageing could consider moving away from dichotomous frameworks adopted in previous studies (e.g. Levy & Langer, 1994) and adopting a more nuanced framework for multicultural individuals (Wan & Chew, 2013) to extend the Stereotype Embodiment Theory’s application in an increasingly globalised world.

Strengths and limitations of the study

This study is one of the first to investigate the influence of attitudes to ageing on physical activity levels of midlife individuals within the framework of an established behaviour change theory, the Theory of Planned Behaviour. Although past studies have investigated the influence of views on ageing (Wolff et al., 2014) and expectations regarding ageing (Sarkisian et al., 2007) on physical activity levels of older adults, these studies have not investigated how attitudes or views on one’s own ageing experiences exert their influence alongside other established psychosocial factors that influence physical activity. By incorporating attitudes to ageing into an Extended Theory of Planned Behaviour framework, the current study thus allows for a more comprehensive investigation of factors influencing physical activity levels of midlife women, for whom attitudes to ageing have been found to be personally relevant (Brown et al., 2015), and TPB variables (Aparicio-Ting et al., 2015; Fortier
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et al., 2009) have also been found to predict physical activity levels.

Another important contribution of the current study is its investigation of a culturally relevant intervention for improving attitudes to ageing among women of different cultural identifications. Previous intervention studies that aimed to improve attitudes to ageing among older adults (Wolff et al., 2014; Sarkisian et al., 2007), middle-aged adults and college students (Bardach et al., 2010) did not feature interventions that were designed to take into consideration possible differences in cultural identification of participants. The current study demonstrated that an intervention designed to be culturally relevant to women of different cultural identifications was efficacious in improving attitudes to ageing in the psychological growth domain for participants of different cultural identifications. Given the trend of cross-cultural migration in countries such as Australia and the United States (Australia Bureau of Statistics, 2017; Migration Policy Institute, 2017) that increases the prevalence of culturally diverse communities, and the trend of population ageing in these countries (Australian Institute of Health & Welfare, 2016; Ortman et al., 2014), developing interventions that are relevant to individuals of different cultural identifications is of practical importance. Attitudes to ageing are shaped by internalised age stereotypes that exist within the culture that one feels that one belongs to. Thus, positive age stereotypes introduced during interventions can only gain relevance among recipients of interventions if these positive age stereotypes are culturally and linguistically similar (Bandura, 1994). The implementation of interventions that are cross-culturally relevant thus has the potential to facilitate culturally
Improving attitudes to ageing to increase physical activity inclusive efforts towards healthy ageing.

One of the strengths of the current study was the one-to-one physiotherapist sessions that were provided for all participants. Given that the primary goal of the study was to increase physical activity levels among midlife women, the provision of the physiotherapist session allowed for screening of participants who were ineligible to continue in the study due to health reasons, or lack of intention to increase physical activity levels. The physiotherapist session also allowed participants to receive professional advice from a physiotherapist, which was tailored according to any specific health conditions they were experiencing, so that participants could increase physical activity levels in a safe and suitable manner. In the current study, there were significant increases in total physical activity days and group physical activity days for all participants at eight-week follow-up. Goal setting during the physiotherapist session might have contributed to this increase in physical activity levels, similar to the effects of goal-setting on increase in physical activity demonstrated in Jindo et al.’s study (2016).

Despite its strengths, the current study also has some limitations. Firstly, the measure of cultural identification for the current study might be insufficient to reflect nuances in participants’ cultural identification. Many of the participants, including
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both Chinese and Caucasian participants, might identify with more than one culture, similar to the first generation American Chinese biculturals investigated in Zou et al.’s study (2008). While the item measuring cultural identification had the advantage of asking for the culture participants most identified with in a succinct and easily comprehensible manner, hence reducing the time commitment in completing the questionnaire, it did not reflect the possibility of more than one culture influencing the attitudes to ageing and subjective norms of participants, and is a possible explanation for the lack of baseline cultural differences in attitudes to ageing in the psychosocial loss and psychological growth domains, as well as a possible explanation for the lack of hypothesized moderating effects. Indeed, there were a few participants who indicated that they most belong to two cultures. Even among the participants who indicated one culture they most belong to, it is possible that they could also be influenced by other cultures, due to factors such as some Chinese participants having lived in more than Australia for many years (as much as 40 years, in one case). Cell sizes of participants with Australian or Chinese cultural identification within the respective conditions (intervention and control) were also relatively small, which means that the number of cases to the predictors of condition and cultural identification could have been small. Future studies should aim to recruit a larger number of participants.

Another limitation of the current study is the recruitment of participants who
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already had relatively positive attitudes to ageing and were non-sedentary at baseline.

Given the time commitment and effort required for participating in the current study,

it is understandable that midlife women who consented to participation in a study

advertised as an opportunity to increase physical activity levels might tend to be those

who already endorsed healthy ageing and physical activity as a means of health

maintenance. However, the possibility of self-selection bias for participating in this

intervention study (Lavrakas, 2008) contributes to likely ceiling effects for attitudes to

ageing and physical activity levels, and might not allow for the findings to be

representative of predictors of physical activity that are relevant to a wider spectrum

of midlife women. For example, for non-participants who might be relatively

sedentary, self-efficacy might be a significant predictor of physical activity levels.

More importantly, the issue of self-selection bias for participants highlights the need

to consider strategies to encourage sedentary midlife women with less positive

attitudes to ageing to participate in future intervention studies, either through having

more resources to conduct intervention sessions with more venue and time options, or

possibly through developing online version of interventions to increase the reach of

interventions to more midlife women and reduce time opportunity costs for study

participation.
Improving attitudes to ageing to increase physical activity

A third limitation pertains to the measurement of baseline physical activity levels. In the current study, due to scheduling issues, not all participants were able to provide a full week of data for baseline physical activity levels. As weekday physical activity patterns might differ from weekend patterns (Eduardo Rossi et al., 2017), findings on changes in physical activity levels from baseline to follow-up should be interpreted taking this limitation in baseline physical activity measurement into consideration.

Another limitation of this study is the lack of a direct measure of participants’ level of family and work commitments. One of the reasons posited for the Extended TPB as a suitable framework to study factors influencing midlife women’s physical activity levels is that midlife is a period that is usually characterised by numerous work and family commitments (Lachman et al., 1994). Although perceived control over external factors, such as one’s schedule, was measured in the current study, a measure of level of family and work commitments could have further elucidated how actual family and work commitments influence perceptions of control over external resources such as time for physical activity, which could in turn influence physical activity levels.

The lack of a measure of self-reported health status was also a limitation of the current study. Although age was controlled for in the linear mixed model analyses reported in Chapters 8 and 9, self-reported health status was not controlled for. Moreover, age and self-reported health status were not controlled for in the mediation and path analyses reported in Chapters 9, 10 and 11. Controlling for age and self-reported health status could further elucidate the level of importance of attitudes to ageing and the respective factors within the
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Extended TPB framework in predicting physical activity levels of midlife women.

A final limitation is the lack of feedback from participants on the acceptability of the intervention, as well as how much participants remembered the content of the intervention immediately after, as well as eight weeks after the group session, and how culturally relevant the role models shown in the video clips were perceived to be by the intervention condition participants of Australian or Chinese cultural identification. Although participants who had completed the study were contacted six months after study completion for their feedback on the study, this information has not been included as part of this thesis due to time constraints. Participants’ feedback on intervention acceptability might be able to provide information on aspects of the intervention which were particularly useful from the participants’ perspective (Lara et al., 2016), and this feedback could be used by future studies to design improved interventions that aim to increase physical activity among midlife women.

**Directions for future research**

Future intervention studies that aim to improve attitudes to ageing could consider the following suggestions. Firstly, for studies that investigate the role of culture in interventions for attitudes to ageing, there is a need to move away from dichotomous or discrete frameworks, and towards more nuanced frameworks that recognise the possibility of influences from more than one culture on individuals’ attitudes to ageing. In the age of globalisation, more nuanced frameworks might be
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especially needed in the investigation of the role of culture in interventions, as individuals become increasingly exposed to age stereotypes in different cultures that are introduced to them via the media, and via opportunities to travel, work and live in different countries for various periods of time. Future intervention studies could also consider involving user groups in a pilot study to gather feedback on the degree of relatability of the role models to be featured in interventions, as well as include manipulation checks after the intervention to ascertain the acceptability of the role models and intervention for participants, and how much of the intervention the participants remembered. Secondly, future intervention studies should consider recruiting more participants with low baseline AAQ scores to investigate intervention efficacy without the presence of a possible ceiling effect.

Further suggestions for future interventions that aim to increase physical activity among midlife women include the following. Firstly, to eliminate possible confounds of unintended control session effects, future studies could improve on the intervention design by selecting another topic that is not related to health behaviours for the control session. Selecting a control session topic that is unrelated to health behaviours could minimise the possibility of any unintended carry-over effects attributable to factors such as the correlation between health behaviours, or the relationship between a general sense of self-efficacy and self-efficacy for specific
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health behaviours. Secondly, future studies could tailor interventions for different
groups of midlife women taking into account their type of regulatory focus (Higgins, 1997). For midlife women with a promotion focus, and for whom the enjoyment and sense of achievement that could be attained from successful performance of physical activities might motivate them to engage in more physical activities (Higgins, 1997), interventions could arrange for participants to try out different exercise classes, such as Zumba and yoga, so that participants can find a type of exercise that they personally enjoy. Enjoyment of the physical activities could then motivate them to increase physical activity behaviour on a regular basis. Such an intervention method would be similar to the product testing approach adopted by Dugan et al. (2016), who recruited 29 midlife American women to sample physical activities, either community-based or home-based, and rank those physical activities that were enjoyable and sustainable for at least two weeks. For midlife women with a prevention focus, and for whom the absence of negative outcomes, such as age related diseases, would motivate them to increase physical activities (Higgins, 1997), interventions like the current study’s or Wolff et al.’s (2014), that highlight the health benefits of physical activity, might be more suitable in motivating them to increase physical activity behaviour. Future intervention studies that take into consideration
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type of regulatory focus could have a two by two condition design to investigate if a match in intervention method with type of regulatory focus could produce the highest level of intervention efficacy.

Thirdly, given the current study’s findings of the significance of perceived control over external factors as a proximal predictor of physical activity levels among midlife women, future intervention studies could increase the importance of components that specifically aim to increase midlife women’s level of control over barriers to physical activity such as lack of time or lack of resources. Although interventions such as ‘Step into Motion’ (Marcus et al., 2007), as well as the current study’s physiotherapist session, provided information regarding exercise facilities, the aim of these studies was not to increase perceived control over external factors. Future studies that seek to increase physical activity in sporadically active midlife women could design interventions that specifically aim to increase perceived control over external factors, by providing information on convenient physical activities that could be incorporated into women’s schedules or providing counselling, similar to the component of telephone counselling in the ADAPT study (Plotnikoff et al., 2010) to facilitate increase in participants’ level of control and confidence in overcoming external barriers to physical activity. Moreover, future studies that aim to increase perceived
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control over external factors in participants could also investigate if the external factors perceived by midlife participants include the experience of ageing, and if there is a positive association between positive attitudes to ageing and higher levels of perceived control over external factors. Future studies could also measure level of social support received by participants, and investigate if level of social support is positively associated with level of perceived control over external factors.

**Conclusion**

This thesis investigated the efficacy of a culturally relevant intervention to improve attitudes to ageing and increase physical activity levels among midlife women from different cultural identifications. The influence of intention, self-efficacy, perceived control over external factors and subjective norms on midlife women’s physical activity levels was also investigated under an Extended Theory of Planned Behaviour framework. Although intervention efficacy was demonstrated in the short term for attitudes in the psychological growth domain, there was a lack of intervention efficacy for attitudes in the physical change and psychosocial loss domains. Moreover, the intervention was not efficacious in increasing physical activity levels. Intention, self-efficacy and subjective norms were also not found to have a significant influence on physical activity levels. Although perceived control over external factors was found to have a significant proximal effect on days per week
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when midlife women engaged in physical activity, past physical activity behaviour

was still the strongest predictor of current physical activity behaviour. The findings of

this thesis thus indicate that for some midlife women, perceived control over external

factors is more relevant as a predictor of physical activity compared to attitudes to

ageing and other TPB variables. Moreover, given the influence of past physical

activity behaviour on current physical activity, it might be advisable for women to

cultivate the habit of engaging in regular physical activity as early as possible, to

enjoy the many health benefits that regular physical activity brings, and increase their

chances of successful ageing.
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Appendices
Appendix A

30 May 2016

A/Prof C.A. Bryant
Melbourne School of Psychological Sciences
The University of Melbourne

Dear A/Prof Bryant

Project title: Attitudes to ageing and physical activity in older, healthy, sedentary women.
Researchers: Ms S Neha, Dr I Rio, Dr L Brown, A/Prof C A Bryant, S Seah, Prof M Hickey, Dr M J Sherburn
Ethics ID: 1442049

I am pleased to advise that the amendment to this Project 1442049.5, dated 26/05/2016, has been approved by the Behavioural and Social Sciences Human Ethics Sub-Committee on 14/06/2016.

Please note it is your responsibility to ensure that all people associated with the Project are made aware of the amendment.

Yours sincerely

Mr Tony Callahan
Secretary, Behavioural and Social Sciences HESC
Phone: 8344 2067, Email: t.callahan@unimelb.edu.au
THE ROYAL WOMEN'S HOSPITAL

RESEARCH AND HUMAN RESEARCH ETHICS COMMITTEES

PROJECT APPROVAL

PROJECT NO: 16/02
PROJECT TITLE: Physical activity in health midlife women: a pilot study trialling an intervention to increase physical activity
INVESTIGATOR (S): C Bryant, M Hickey, I Rio, M Sherburn, N Suryanarayan, L Brown, SJ Seah
DATE OF APPROVAL: 30 March 2016
DURATION: Twenty two (22) months

SIGNED
Secretary, Research & Human Research Ethics Committees

DATE

30.3.2016

CONDITIONS OF APPROVAL

The Principal Investigator is reminded of the following:-

1. Prior to commencement of the project, you must contact the relevant RWH Divisional Directors / Department Heads to confirm your actual commencement date. Failure to inform these RWH personnel may jeopardise their approval and support for your project.

2. A Project may commence once the Principal Investigator has received written confirmation that the Human Research Ethics Committee has approved the Project.

3. Substantial changes in protocols must be submitted to the Research/Human Research Ethics Committees for approval.

4. Progress reports must be submitted annually. A request will be forwarded to the Principal Investigator. If no report is supplied, permission to continue the project may lapse.

5. The Research/Human Research Ethics Committees must be notified IMMEDIATELY of any untoward or unexpected complications or side effects arising during the project or of any ethical or medico-legal problems that may arise.

6. Consent forms must be available for audit and retained on file for five (5) years.

7. Raw data and details of analysis must be retained by the Principal Investigator for five (5) years.

8. Principal Investigator MUST upon leaving the Institution, inform the Human Research Ethics Committee as to the nominated person to replace him/her.

PLEASE QUOTE PROJECT NO. AND TITLE FOR ALL CORRESPONDENCE
Appendix B

PLAIN LANGUAGE STATEMENT

Principal Researcher: Associate Professor Christina Bryant
Faculty of Medicine, Dentistry and Health Sciences
Melbourne School of Psychological Sciences
03 8345 3906
Cbryant@unimelb.edu.au

Co-researchers: Dr Margaret Sherburn, Prof. Martha Hickey, Dr
Ines Rio, Dr Laura Brown, Neha Suryanarayan, Siang Joo Seah

Project: Physical Activity in Healthy Women

Introduction

You have asked for more information about this project after seeing an
advertisement about it, or getting information from your GP.

We would like to invite you to take part in our research project. We want to see
if we can help women to increase their physical activity and feel better in
themselves. This project has been given the go ahead by the Human Research
Ethics Committee of the University of Melbourne, and has the support of your
health centre. The project has funding from the Royal Women’s Hospital
Foundation.

What will I be asked to do?

If you agree to take part, this is what you would need to do:

1. We will allocate you randomly to one of two groups.

2. If you are in the first group, you will meet with a physiotherapist to
   plan physical activities that you would like to do. The physiotherapist will help
   you to work out what you are going to do. We will give you a pedometer
   (which counts the steps you take), and a diary for you to keep notes about
   what you do during this stage of the project (8 weeks). The session with the
   physiotherapist will take about 40 minutes. If you would like to, you can bring
   a family member for support.
3. At the end of the physiotherapist session, we will ask you to fill in a written questionnaire. The questions are about symptoms of depression (if any), ageing and your attitudes towards physical activity and culture. We will also ask you about some health behaviours (e.g. how much physical activity you do at the moment), and some things about yourself (e.g. your age, whether you are married and how long you went to school). The questionnaire will take about 30 minutes to fill in and we will give you an envelope with a stamp on it to return it to us if you are unable to complete it right after the physiotherapist session. We would also like you to record your physical activity during the time between the physiotherapist session and the talk.

4. About a week after the physiotherapist session, there will be a talk from a psychologist about healthy ageing, then a chance for you to share your own thoughts about ageing and physical activity. This will be in a group of about 5 to 11 other women aged from 45-60 years. This will take around 1.5 hours. You will then be asked to complete the same questionnaire. We would like you to record your physical activities with the pedometer and diary for 8 weeks following the talk, and will phone you once a week to see how you are going with your physical activities. This phone call should take no more than 5 minutes. At the end of 8 weeks, we will ask you to fill in the questionnaire again. This should take around 30 minutes. We will give you an envelope with a stamp on it to return it to us.

5. If you are in the second group, you will do everything listed in points 2 and 3, and 4, except that the talk you attend and sharing of your views will be on the topic of healthy diet, instead of healthy ageing.

Is my personal information safe?

We do many things to make sure that your answers and information about you (“data”) are kept safe. All information is kept in a computer and only available to the researchers. Only the researchers can link you to your responses, which we may need to do to phone you. If we write any reports we will write only about what we found in general. The data will be kept securely in the Faculty of Medicine, Dentistry and Health Sciences for five years, before being destroyed.

Can I find out about the research when it is finished?

Once we have written any reports about this project, we can send you a summary of what we found. When you sign the consent form, you can tell us if you would like us to send you this. It is also possible that the results will be presented at academic conferences.
Do I have to take part?
It is completely up to you to decide if you want to take part in this project. If you want to pull out at any time or ask us not to use your data, you can tell us at any time. Whether you choose to take part in the study or not will not affect the care from your health centre or GP in any way.

Where can I get further information?
If you want any more information, or have any questions, please contact Christina Bryant on the number given above. Should you have any worries about how the project is being run, contact the Executive Officer, Human Research Ethics, The University of Melbourne, on phone: 8344 2073, or fax: 9347 6759.

How do I agree to take part?
If you would like to take part, please sign the consent form. The researchers will then arrange for you to take part in the study.
首席研究员: Associate Professor Christina Bryant
Faculty of Medicine, Dentistry and Health Sciences
Melbourne School of Psychological Sciences
03 8345 3906
Cbyrant@unimelb.edu.au

其他的研究员: Dr Margaret Sherburn, Prof. Martha Hickey, Dr Ines Rio, Dr Laura Brown, Neha Suryanarayan, Siang Joo Seah

研究项目: 健康女性的运动

简介

通过我们的传单或您的家庭医生的介绍，您想进一步了解我们的研究项目。

我们邀请您参加我们的研究项目。这项研究希望帮助女性提高运动量，并对自己有更好的感觉。墨尔本大学人类研究伦理审查委员会(Human Research Ethics Committee of the University of Melbourne)已经批准我们进行这项研究。这项研究也获得了您的社区健康中心的支持。这项研究的经费来自皇家妇女医院基金会(Royal Women’s Hospital Foundation)。

我需要做什么？

如果您答应参加这项研究，我们需要您做的是:

1. 我们将随机安排您参加两组的其中一组。

2. 如果您在第一组，您将和一位物理治疗师见面，并一起计划您接下来要做的运动。物理治疗师将给您一些建议，看看有哪些适合您接下来做的运动。我们将给您一个计数器（计算您的步数的仪器）以及一个活动日记让您记下您在研究的这个阶段（8周）所做的运动。您和物理治疗师的谈话时间约40分钟。如果您想让一位家人陪您见物理治疗师，我们欢迎您这么做。
3. 见了物理治疗师之后，我们将请您完成一份问卷。问卷内容是关于抑郁症状（我们想了解您有没有这些症状），乐龄化，以及您对运动及文化的看法。我们也想问您关于健康行为的问题（例如您目前做多少运动）以及您的个人资料（例如年纪，婚姻状况，教育程度）。填写问卷所需时间约 30 分钟。如果您不能在完物理治疗师时完成问卷，我们将给您一个贴好邮票的信封，让您在完成问卷后把它寄回给我们。在见了物理治疗师后和座谈会开始前的这段时间，我们将请您记录您所作的运动。

4. 见了物理治疗师后大约一周，您将出席一个由心理学家主讲，关于健康乐龄化的座谈会。在座谈会上，您将有机会分享您对于年龄增长以及运动的看法。您将和他 5 位 45 岁至 60 岁的女性一起参加这个座谈会。座谈会时间约为一个半小时。在座谈会上之后，我们将请您完成同一份问卷，并且在接下来的 8 周里使用计步器以及活动日记得记录您所做的运动。我们会每周给您打一通电话（约 5 分钟），了解您运动的情况。在 8 周后，我们将请您完成同一份问卷（完成问卷时间约 30 分钟）。我们将给您一个贴好邮票的信封，让您在完成问卷后把它寄回给我们。

5. **如果您在第二组**，您所需做的如同以上第 2,3,4 点，不同之处是您参加的座谈会主题是健康饮食，以及在座谈会上分享的是关于健康饮的的看法。

我的个人资料安全吗？

我们将有诸多措施，安全保管您的答案和个人资料（"研究资料"）。所有的资料将被存放在电脑里。只有这项研究的研究员能接触这些资料，并知道哪些答案是您提供的，以便我们在有需要时联络您。关于这项研究所写的任何报告，我们将只发表总体上的研究发现。我们将把研究资料安全地存放在医学牙医学及健康科学系（Faculty of Medicine, Dentistry and Health Sciences），并在 5 年之后销毁这些研究资料。

我可以知道研究完成后的成果吗？

关于这项研究所写的任何报告，我们可以将研究发现的概要寄给您。您在答同意书时就知道您是否希望我们把研究发现的概要寄给您。我们也可能在学术会议上发表这项研究的研究发现。

我必须参加这项研究吗？
关于参加这项研究与否，完全由您来决定。如果您在任何时间决定停止参加这项研究，或要求我们不要使用您提供的研究资料，您随时都能通知我们。无论您参加这项研究与否，都不会在任何方面影响您的健康社区中心或家庭医生给予您的照顾。

我可以从哪里得到更多资料？

如果您想得到更多资料，或有任何疑问，请拨以上号码联络 Christina Bryant。如果您对我们如何进行这项研究有任何疑虑，请致电：8344 2073 或传真：9347 6739 联络墨尔本大学人类研究伦理主管人员(Executive Officer, Human Research Ethics, The University of Melbourne)。

我如何同意参加这项研究？

如果您愿意参加这项研究，请在同意书上签名。签名之后，研究员将安排您参加这项研究。
Melbourne School of Psychological Sciences

Consent form for persons participating in a research project

PROJECT TITLE: Attitudes to Ageing and Physical Activity in Healthy, Sedentary, Older Women

Name of participant:

Name of investigator(s): Dr Christina Bryant, Dr Margaret Sherburn, Prof. Martha Hickey, Dr Ines Rio, Dr Laura Brown, Neha Suryanarayan, Siang Joo Seah

1. I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written plain language statement to keep.

2. I understand that after I sign and return this consent form it will be kept by the researcher.

3. I understand that my participation will involve a consultation with a physiotherapist, and will include participation in a discussion group. I agree that the researcher may use the data as described in the plain language statement.

4. I acknowledge that:

   (a) the possible effects of participating in the consultation with the physiotherapist and group have been explained to my satisfaction;

   (b) I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;

   (c) the project is for the purpose of research;

   (d) I have been informed that the confidentiality of the information I provide will be safeguarded by being stored at a secure location subject to any legal requirements. Only the researchers will have access to this information. Data will be stored at University of Melbourne and will be destroyed after five years;

   (e) Only group data will be reported in any publications arising from the research

   (f) I have been informed that a copy of the research findings will be forwarded to me at my request.

I wish to receive a copy of the summary project report on research findings □ yes □ no

(please tick)

Participant signature: Date:

HREC HREC number 1442049.1. PLS V1 18.10.2014
Melbourne School of Psychological Sciences

研究项目参与者同意书

研究题目：久坐不动的健康年长女性面对年龄增长时的态度及她们的运动

参加者姓名:

研究员（们）姓名：Dr Christina Bryant, Dr Margaret Sherburn, Prof. Martha Hickey, Dr Ines Rio, Dr Laura Brown, Neha Suryanarayan, Siang Joo Seah

1. 我同意参加这项研究项目。研究员已向我解释清楚研究项目的细节，并给了我一张书面研究说明。

2. 我了解在我读了这份同意书并把它交给研究员后，它将被研究员保管。

3. 我知道参加这项研究项目包括和物理治疗师的谈话，以及参加一个座谈会。我同意研究员根据研究说明所描述的方法使用我提供的研究资料。

4. 我同意：

(a) 和物理治疗师的谈话以及参加这项研究项目的群组活动所可能带来的影响，研究员已向我解释清楚，而我也满意这份解释。

(b) 我已被通知我能随时退出这项研究，不需要解释原因也不会因为我退出而须承受偏见。

(c) 这个项目的研究目的。

(d) 我已被通知我所提供的资料将会存放在一个安全的地方，以确保资料是保密的。除非我们收到公开资料的法律通知，否则只有研究员能接触这些资料。研究资料将被存储在墨尔本大学，并在五年后被销毁。

(e) 任何关于这项研究所发表的文章，只报告关于群组的研究发现。

(f) 我已被通知，如果我表示愿意，研究员将给我一份研究发现概要报告。

我想收到一份研究发现概要报告。 □ 想 □ 不想

(请勾选)

参加者签名：

日期：

HREC HREC number 1442049.1. PLS V1 18.10.2014
PARTICIPANT INFORMATION AND CONSENT FORM (PICF)

**Project Title:** Physical activity in healthy, midlife women: a pilot study trialing an intervention to increase physical activity.

**Principal Researcher:** Associate Professor Christina Bryant  
Royal Women’s Hospital  
03 8345 3906

**Co-researchers:** Dr Margaret Sherburn, Prof. Martha Hickey, Dr Ines Rio, Dr Laura Brown, Neha Suryanarayan, Siang Joo Seah.

1. **Introduction**

We would like to invite you to participate in our research project. This is because you are a female staff member at the Royal Women’s Hospital. This research project aims to help women aged between 45-60 years of age to increase physical activity levels. You are eligible to join the study if your current exercise level is less than 5 times per week of at least 30 minutes duration at moderate intensity. The results of this research project will be used by the student researcher, Siang Joo Seah, for the purpose of obtaining a Doctor of Philosophy (PhD) degree.

This Participant Information Sheet/Consent Form tells you about the research project. It explains the process involved if you choose to participate. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don’t understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or your local doctor.

Participation in this research is voluntary. If you don’t wish to take part, you don’t have to. If you choose not to participate, your employment at the hospital will not be affected in any way.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research project
- Consent to the use of your information as described.

You will be given a copy of this Participant Information and Consent form to keep.
2. What is the purpose of this project?

The purpose of this study is to see whether working with a physiotherapist to plan physical activities and taking part in a group discussion about healthy ageing or healthy diet help women to increase their physical activity and well-being. This project has been approved by the Royal Women’s Hospital Ethics committee.

3. What will I be asked to do?

If you agree to take part, this is what you would need to do:

1. We will allocate you randomly to one of two groups.

2. If you are in the first group, you will meet with a physiotherapist to plan physical activities that you would like to do. The physiotherapist will help you to work out safely what you are going to do. We will give you a pedometer (which counts the steps you take), and a diary for you to keep notes about what you do during this stage of the project (8 weeks). The session with the physiotherapist will take about 30 minutes. If you would like to, you can bring a family member for support.

3. At the end of the physiotherapist session, we will ask you to fill in a written questionnaire. The questions are about symptoms of depression (if any), ageing and your attitudes towards physical activity and culture. We will also ask you about some health behaviours (e.g. how much physical activity you do at the moment), and some things about yourself (e.g. your age, whether you are married and how long you went to school). The questionnaire will take about 20 minutes to fill in and we will give you an envelope with a stamp on it to return it to us if you are unable to complete it right after the physiotherapist session. We would also like you to record your physical activity during the time between the physiotherapist session and the talk.

4. About a week after the physiotherapist session, there will be a talk from a psychologist about healthy ageing, then a chance for you to share your own thoughts about ageing and physical activity. This will be in a group of about 5 to 11 other women aged from 45-60 years. This will take around 1.5 hours and be held at the hospital. You will then be asked to complete the same questionnaire you completed initially. We would like you to record your physical activities with the pedometer and diary for 8 weeks following the talk, and will phone you once a week to see how you are going with your physical activities. This phone call should take no more than 5 minutes. At the end of 8 weeks, we will ask you to fill in the questionnaire again. This should take around 20 minutes. We will give you an envelope with a stamp on it to return it to us. Six months after you complete this questionnaire, we will contact you again with a brief questionnaire asking you about your current physical activity level and beliefs about exercise.

5. If you are in the second group, you will do everything listed in points 2 and 3, and 4, except that the talk you attend and sharing of your views will be on the topic of healthy diet, instead of healthy ageing.
4. What are the possible benefits of taking part?

We cannot guarantee or promise that you will receive any benefits from this research; however, possible benefits may include increased sense of well-being from engaging in regular exercise. Participants may also benefit from the session with a physiotherapist aimed at setting realistic goals for increasing activity levels.

5. What are the possible risks of taking part?

We do not foresee any significant risks from participating in this project. It is possible that participants may experience minor discomfort associated from increasing activity levels. However, we aim to minimise this risk by having every participant develop a plan for increasing activity levels with a physiotherapist. If in any way you feel that the study has raised questions or concerns for you, the research team will be happy to speak to you or to organise additional information or counselling to address your questions.

6. How will my confidentiality be protected?

We do many things to make sure that your answers and information about you are kept secure. All information is kept in a separate, password-protected computer and only available to the researchers. We also separate your name and other information that may identify you from your answers. Only the researchers can link to your responses which they may need to do to contact you for a follow-up phone call to see how you are progressing during and after the study period. In any report, you will not be able to be identified, instead your data will be combined with the rest of the study participants. We will remove any references to personal information that might allow someone to guess your identity. The data will be kept securely for seven years from the date of publication, before being destroyed. You should be aware that as participation in this project involves taking part in a face-face group discussion, you may be with colleagues whom you recognize. At the start of the group, the facilitators will ask you to keep confidential anything that is shared by group members.

7. How will I receive feedback?

Once publication of journal articles arising from this research have been completed, a brief summary of the findings will be made available by the researchers. When you sign the consent form, you can tell us if you would like to receive this. It is also possible that the results will be presented at academic conferences.

8. Do I have to take part in this research project?

Your participation in this study is completely voluntary. If you don’t want to take part, you do not have to. If you decide to take part and you change your mind later, you can leave the project without having to explain why.

If you decide to leave the project, the researchers would like to keep the information about you that has been collected. This would allow us to know if those who complete the project are similar to those who don’t. Your information would remain confidential at all times. If you don’t want us to do this, you can tell us before you leave the project.
Whether you choose to take part in the study or not will not affect your employment at the hospital in any way.

Where can I get further information?

Should you require any further information, or have any concerns, please do not hesitate to contact either of the researchers on the numbers given below.

- If you need more information about the project, or any concerns about how it has affected you please contact Associate Professor Christina Bryant on 8345 3906.
- If you have any concerns or complaints about the project or the way it is being conducted and would like to speak to someone independent of the project, please contact The Royal Women's Hospital Consumer Advocate, ph: 8345 2290, or email: advocate@thewomens.org.au.

9. How do I agree to participate?

If you would like to participate, please indicate that you have read and understood this information by signing the accompanying consent form and returning it in the envelope provided. The researchers will then contact you to arrange your participation in the study.

Thank you for your interest in the study.
Consent

I, ____________________________________________
Voluntarily consent to taking part in this research project, which has been explained
to me by a member of the research team.
I have received an information sheet to keep and I fully understand the purpose,
extent and possible effects of my consent.

I understand that if I refuse to consent, or, if I withdraw my consent at any time
without explanation, it will not affect my relationship with the Women's now or at any
time in the future.
I understand I will be given a copy of this consent form

SIGNATURE ________________________________________

DATE ____________________

RESEARCHER'S SIGNATURE ________________________________________

DATE ____________________

I would like to receive a one-page summary of the project results YES / NO (please
circle)

Email address
(preferred) ________________________________________

Contact Number
______________________________________________
Appendix E  
Screen form  
PA and Ageing study

### PA SCREENING FORM

Date of Screening: ___/___/____  
Screened by: __________

Name: _______________________________  
D.O.B.: ___/___/____

Street: _______________________________

Suburb/Town: _________________________  
Post Code: ______

Daytime phone: _________________________  
(home / work / mobile)

Email: _______________________________  
@ _______________________

How did you find out about study: _______________________

#### Suitability Criteria  (Bold = pass)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you 45-60 years of age?</td>
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<tr>
<td>Are you able to commit to the study for 8 weeks?</td>
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<td>Are you willing for us to contact you again in 6 months to see how things are going?</td>
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<tr>
<td>Are you willing to wear a pedometer, &amp; complete an exercise diary?</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Home exercises 5 days each week (30 mins each)</td>
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#### Current physical activity

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>How often have you been physically active in the last week?</td>
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<td>Is this most days (5-7 days/week) or less than this?</td>
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<tr>
<td>(Have a list of typical physical activities to show participant so they understand what PA means for them).</td>
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<td>Was this a typical week?</td>
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<td>If No, how much activity would you normally do?</td>
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<tr>
<td>Are you seriously thinking of increasing the number of days that you are physically active?</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>At present, how much do you want to increase the number of days that you are physically active?</td>
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<td>[ ] Not at all</td>
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<td>[ ] A little</td>
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<td>[ ] Some</td>
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<td>[ ] Very much</td>
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<tr>
<td>If you wanted to increase the number of days that you are physically active, how sure are you that you would be able to do it?</td>
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<td>[ ] Not at all sure</td>
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<td>[ ] A little sure</td>
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<td>[ ] Somewhat sure</td>
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<td>[ ] Very sure</td>
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<tr>
<td>What type of PA you are most comfortable/ familiar doing?</td>
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HREC No.: 1544340.1  
Page 1  
Version date: 14/8/15
## Precautions / Exclusion factors

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Do you have any heart problems? If Yes, does it limit your ability to exercise?</td>
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<tr>
<td>Details:</td>
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<td>Have you had any surgery in the past 6 months? If Yes, does it limit your ability to exercise?</td>
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<td>If yes, need to wait until exercise tolerance is back to normal and screen again.</td>
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<tr>
<td>Details:</td>
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<tr>
<td>Are you on the waiting list for any leg or back or other surgery?</td>
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<td>Have you taken any corticosteroids or had any joint injections in the last 6 months? (such as intra-articular steroid or Synvisc® injection). If yes, need to wait until 6 mths post and screen again.</td>
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<tr>
<td>Details:</td>
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<tr>
<td>Do you have pain in any joints or muscles? (if unilateral indicate Right &amp; Left)</td>
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<td>If pain in many areas, which is the most painful area at the moment?</td>
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<td>How often have you had joint/muscle pain in the last month?</td>
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<td>• Is this most days (5-7 days/week or 20-30 days/month)?</td>
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<td>Please rate your average level of pain out of 10 for the past week, where 0 = no pain and 10 = worst pain possible?</td>
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<td>• Is this 4 out of 10 or greater?</td>
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<tr>
<td>Was this a typical week?</td>
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<tr>
<td>If No, what would you normally rate your joint/muscle pain?</td>
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<tr>
<td>Is this 4 out of 10 or greater?</td>
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## Is the participant eligible?

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
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Readiness for change:

Smart Goals:
<table>
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<tr>
<th>Explained and given Exercise Diary and Pedometer</th>
<th>YES</th>
<th>NO</th>
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### Activity diary

<table>
<thead>
<tr>
<th>Activity name</th>
<th>Monday Time in minutes</th>
<th>Tuesday Time in minutes</th>
<th>Wednesday Time in minutes</th>
<th>Thursday Time in minutes</th>
<th>Friday Time in minutes</th>
<th>Saturday Time in minutes</th>
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<td>日期</td>
<td>星期一时间（分钟计算）</td>
<td>星期二时间（分钟计算）</td>
<td>星期三时间（分钟计算）</td>
<td>星期四时间（分钟计算）</td>
<td>星期五时间（分钟计算）</td>
<td>星期六时间（分钟计算）</td>
<td>星期日时间（分钟计算）</td>
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Appendix G

GENERAL INFORMATION

First, we would like to ask some questions about yourself. Please tick ✓ the appropriate box:

1. Your date of birth (dd/mm/yy) __________ / __________

2. What is the highest level of education that you have completed?
   - □ Primary school (or less)
   - □ High school
   - □ TAFE or trade training
   - □ University or higher

3. Current employment status (please tick the option that applies most of the time)
   - □ Employed ( □ full-time □ part-time □ casual)
     What is your current occupation? ____________________
   - □ Unemployed since __________
   - □ Retired since __________
   - □ Home duties
   - □ Receiving an allowance from the government
   - □ Other (please specify) ________________

4. Marital status
   - □ Married
   - □ Living with partner
   - □ Divorced/separated
   - □ Widowed
   - □ Single

5. Financial status:
   - □ Insufficient to meet needs
   - □ Adequate or just enough to meet needs
   - □ Sufficient to meet needs
   - □ More than enough to meet needs
6. Thinking about the last month, on how many days in a week have you been physically active for at least 30 minutes?

   □ 0-1 day       □ 2-3 days       □ 4-5 days       □ 6-7 days

7. Where were you born?_____________________________________
   If you were not born in Australia, how many years have you lived in Australia?
   ______________________________________

8. What culture do you most belong to?  
   □ Australian  
   □ Chinese  
   □ Other (please specify) ________________

Next, we would like to ask about your views on culture.

Please circle the number that most accurately describes how you feel towards each item, ranging from “strongly disagree” to “strongly agree”.

• If you indicated that you most belong to Australian culture, please answer questions 1 to 3.

• If you indicated that you most belong to Chinese culture, please answer questions 4 to 6.

• If you indicated that you most belong to “Other” culture, please leave questions 1 to 6 blank.

1a) Most Australians think that it is important to take exercise at any age.

1  2  3  4  5  6  7

Strongly disagree Strongly agree

1b) I think that it is important to take exercise at any age.

1  2  3  4  5  6  7

Strongly disagree Strongly agree
2a) Most Australians think that older Australian adults do not feel involved in society (for example do not take part in social activities, volunteer work etc.) as they get older.

3a) Most Australians think that wisdom comes with age.

3b) I think that wisdom comes with age.

4a) Most Chinese think that it is important to take exercise at any age.

4b) I think that it is important to take exercise at any age.
5a) Most Chinese think that older Chinese adults do not feel involved in society (for example do not take part in social activities, volunteer work etc.) as they get older.

1 2 3 4 5 6 7
Strongly disagree Strongly agree

5b) I think that older Chinese adults do not feel involved in society (for example do not take part in social activities, volunteer work etc.) as they get older.

1 2 3 4 5 6 7
Strongly disagree Strongly agree

6a) Most Chinese think that wisdom comes with age.

1 2 3 4 5 6 7
Strongly disagree Strongly agree

6b) I think that wisdom comes with age.

1 2 3 4 5 6 7
Strongly disagree Strongly agree
This section asks you about your own views on ageing.

1. If you could choose, what age would you like to be? __________ years old

Or ☐ My current age

This questionnaire asks you how you feel about growing older.
Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.
Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in general.

For example, thinking how you feel in general, a question might ask:

I dislike growing older

<table>
<thead>
<tr>
<th>Not at all true</th>
<th>Slightly true</th>
<th>Moderately true</th>
<th>Very true</th>
<th>Extremely true</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

You should circle the number that best fits how true the statements are for you. So you would circle the number 4 if you dislike growing older "Very much", or circle number 1 if you are "Not at all" concerned about growing older. Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.
The following questions ask **how much you agree** with the following statements. If you agree with the statements an extreme amount circle the number next to "strongly agree". If you do not agree with the statements at all, circle the number next to "Strongly disagree". You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between "Strongly disagree" and "Strongly agree".

1. As people get older they are better able to cope with life.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

2. It is a privilege to grow old.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

3. Old age is a time of loneliness.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

4. Wisdom comes with age.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

5. There are many pleasant things about growing older.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

6. Old age is a depressing time of life.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5

7. It is important to take exercise at any age.
   - Strongly disagree | Disagree | Uncertain | Agree | Strongly agree
   - 1 | 2 | 3 | 4 | 5
The following questions ask **how true** the following statements are for you. If the statement is "Extremely" true for you, circle the number next to "Extremely true". If the statements are not true for you at all, circle the number next to "Not at all true". You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between "Not at all true" and "Extremely true".

8. Growing older has been easier than I thought.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1               | 2             | 3              | 4         | 5             |

9. I find it more difficult to talk about my feelings as I get older.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1               | 2             | 3              | 4         | 5             |

10. I am more accepting of myself as I have grown older.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

11. I don't feel old.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

12. I see old age mainly as a time of loss.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

13. My identity is not defined by my age.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

14. I have more energy now than I expected for my age.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

15. I am losing my physical independence as I get older.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |

16. Problems with my physical health do not hold me back from doing what I want to.
    | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
    | 1               | 2             | 3              | 4         | 5             |
17. As I get older, I find it more difficult to make new friends.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

18. It is very important to pass on the benefits of my experiences to younger people.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

19. I believe my life has made a difference.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

20. I don't feel involved in society now that I am older.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

21. I want to give a good example to younger people.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

22. I feel excluded from things because of my age.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

23. My health is better than I expected for my age.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |

24. I keep myself as fit and active as possible by exercising.
   | Not at all true | Slightly true | Moderately true | Very true | Extremely true |
   | 1             | 2             | 3               | 4        | 5             |
The following questions are regarding physical activity.

Please circle the number that most accurately describes how you feel towards each item.

1. How confident are you that you will be able to increase the time you spend on physical activity in the next two months?

   1  2  3  4  5  6  7  
   Not very confident  Very confident

2. Do you believe that you have the ability to increase the time you spend on physical activity in the next two months?

   1  2  3  4  5  6  7  
   Definitely do not believe  Definitely do believe

Please circle the number that most accurately describes how you feel towards each item.

1. Do you agree that whether or not you increase the time you spend on physical activity in the next two months is entirely up to you?

   1  2  3  4  5  6  7  
   Strongly disagree  Strongly agree

2. How much do you feel that whether you increase the time you spend on physical activity in the next two months is beyond your control (due to factors such as bad weather, being busy with work etc.)?

   1  2  3  4  5  6  7  
   Very little control  Complete control
Please circle the number that most accurately describes how you feel towards each item.

1. I **intend** to increase the time I spend on physical activity over the next two months.

![Rating Scale]

-3  -2  -1  0  1  2  3

Definitely do not  Definitely do

2. I **plan** to increase the time I spend on physical activity over the next two months.

![Rating Scale]

-3  -2  -1  0  1  2  3

Definitely do not  Definitely do

3. I **want** to increase the time I spend on physical activity over the next two months.

![Rating Scale]

-3  -2  -1  0  1  2  3

Definitely do not  Definitely do

4. If you do not intend, plan or want to increase the time you spend on physical activity in the next two months, what would make you change your mind?
Please circle the number that most accurately describes how you feel towards each item.

1. People who are important to me think I …

2. People who are important to me would …

3. People who are important to me want me to increase the time I spend on physical activity.

4. I feel under social pressure to increase the time I spend on physical activity.
Please circle the number that most accurately describes how you feel towards each item.

1a) My family think I ...

1 2 3 4 5 6 7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

1b) With regard to increasing the time you spend on physical activity, how much do you want to do what your family think you should?

1 2 3 4 5 6 7

Not at all

Very much

2a) My friends think I ...

1 2 3 4 5 6 7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

2b) With regard to increasing the time you spend on physical activity, how much do you want to do what your friends think you should?

1 2 3 4 5 6 7

Not at all

Very much
3a) The media think I...

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

3b) With regard to increasing the time you spend on physical activity, how much do you want to do what the media think you should?

1  2  3  4  5  6  7

Not at all

Very much

4a) Health experts (e.g. doctors) think I...

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

4b) With regard to increasing the time you spend on physical activity, how much do you want to do what health experts think you should?

1  2  3  4  5  6  7

Not at all

Very much
The following questions ask you about how you have felt over the last week. Please circle the number of each statement which best describes how often you felt or behaved this way – DURING THE PAST WEEK.

<table>
<thead>
<tr>
<th>DURING THE PAST WEEK:</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 a moderate amount of the time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 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>2. 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>3. I felt that I could not shake off the blues even with help from my family or friends</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I felt that I was just as good as other people</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. 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>6. I felt depressed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. 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>8. I felt hopeful about the future</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. I thought my life had been a failure</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. I felt fearful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. My sleep was restless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. I was happy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. I talked less than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. I felt lonely</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. People were unfriendly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. I enjoyed life</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. I had crying spells</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. I felt sad</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. I felt that people disliked me</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. I could not get “going”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</table>

Thank you very much for taking the time to answer the questions.
个人资料

首先，请您提供一些基本的个人资料。请在代表您答案的格子里打勾。

1. 出生年月（日期／月份／年份） ____________

2. 您的最高教育程度：
   □ 小学或以下
   □ 初／高中
   □ 大专／
      接受过专业技能培训
   □ 大学及以上

3. 就业状况（请勾选您大部分时间的就业状况。）
   □ 在职（□全职 □兼职
       □临时性工作）
       您现在的职业是：______________
   □ 失业（从________开始）
   □ 退休（从________开始）
   □ 全职家庭主妇
   □ 领取政府的补贴金
   □ 其他（请说明）_______

4. 婚姻状况
   □ 已婚
   □ 同居
   □ 离婚／分居
   □ 配偶逝世
   □ 单身

5. 经济状况
   □ 收入不足以应付开支
   □ 收入足以应付开支，但有点吃力
   □ 收入足以应付开支
   □ 充裕
6. 在过去的一个月里，请问您每周有多少天运动至少 30 分钟？

<table>
<thead>
<tr>
<th></th>
<th>0至1天</th>
<th>2至3天</th>
<th>4至5天</th>
<th>6至7天</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

7. 您在哪里出生？
如果您的出生地不是澳洲，请问您在澳洲生活了多少年？

8. 您认为您最熟悉的文化是
   - □ 澳洲人的文化
   - □ 华人的文化
   - □ 其他（请说明）

接下来，我们想了解您对于文化的想法。

请选择最能代表您的观点的号码，并把它圈起来。

- 如果您答了您最熟悉的文化是澳洲人的文化，请回答第 1 至 3 题。
- 如果您答了您最熟悉的文化是华人的文化，请回答第 4 至 6 题。
- 如果您答了您最熟悉的文化是其他的文化，请不要回答第 1 至 6 题。

1a) 大多数的澳洲人认为在任何年龄运动都是很重要的。

1b) 我认为在任何年龄运动都是很重要的。
2a) 大多数的澳洲人认为年长的澳洲人觉得自己没有社会参与感（如不参与社区活动，义工活动等）。

非常不赞成 | 非常赞成

2b) 我认为年长的澳洲人觉得自己没有社会参与感（如不参与社区活动，义工活动等）。

非常不赞成 | 非常赞成

3a) 大多数的澳洲人认为智慧随年龄而增长。

非常不赞成 | 非常赞成

3b) 我认为智慧随年龄而增长。

非常不赞成 | 非常赞成

4a) 大多数的华人认为在任何年龄运动都是很重要的。

非常不赞成 | 非常赞成

4b) 我认为在任何年龄运动都是很重要的。

非常不赞成 | 非常赞成
5a) 大多数的华人认为年长的华人觉得自己没有社会参与感（如不参与社区活动，义工活动等）。

6a) 大多数的华人认为智慧随年龄而增长。

5b) 我认为年长的华人觉得自己没有社会参与感（如不参与社区活动，义工活动等）。

6b) 我认为智慧随年龄而增长。
接下来，我们想了解您对于年龄增长的看法。

1. 如果能让您选择，您希望您现在几岁？________ 岁
   或 □ 我目前的年龄

指导语：

本问卷是关于您是怎么看待变老的。请回答所有的题目，如果不能确定某个题的答案，请选一个最接近的，往往您的第一反应就是最适合的答案。回答问题时，脑子里始终想着您的标准、希望、快乐和担心是什么。请按您生活中的一般情形予以回答。

例如：考虑在一般情况下，回答这样一个问题：
我不喜欢变老。
完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

您需要把最适合您自己情形的答案圈起来。也就是说，如果您认为“我不喜欢变老”这句话非常正确，您就把 4 圈起来；如果您完全不同意这种说法，就把 1 圈起来。下面，请看每一个句子，并把最适合您的答案所代表的数字圈起来。谢谢您的合作！
第一部分，下面这些问题问您在多大程度上同意这些陈述。如果您“完全同意”，请把它下面的5圈起来，如果“完全不同意”，就把它下面的1圈起来。每个题目都请在完全同意和完全不同意之间做出一个选择，并把相应的数字圈起来。

1. 当人们年纪越来越老，他们更有能力处理生活中的问题。

<table>
<thead>
<tr>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
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<tbody>
<tr>
<td>1</td>
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2. 年老是一种优势。

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</table>

3. 老年时光是孤独的。

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4. 智慧随年龄而增长。

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5. 变老也有许多令人愉快的事。

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<th>赞成</th>
<th>非常赞成</th>
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6. 老年是生命中令人沮丧的时期。

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<th>赞成</th>
<th>非常赞成</th>
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</table>

7. 在任何年龄进行锻炼都是很重要的。

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<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
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<td>4</td>
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</table>
第二部分，下面这些问题是在多大程度上认为这些陈述是正确的。如果您认为“完全正确”，请把它下面的5圈起来，如果认为“完全不正确”，就把它下面的1圈起来。每个题目都请在完全正确和完全不正确之间做出一个选择，并把相应的数字圈起来。

8. 变老比我想象的要轻松。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

9. 上年纪后，我发现越来越难谈论自己的感受。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

10. 老了之后，我更加接受自己了。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

11. 我不觉得自己老。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

12. 在我看来，老年意味着丧失。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

13. 年龄并不代表我的身份。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

14. 我现在的精力比我预计自己这个年龄时候的要好。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5

15. 上年纪之后，我渐渐丧失了身体的独立能力。

完全不正确  |  有点正确  |  相当正确  |  非常正确  |  完全正确
1               |  2           |  3           |  4           |  5
16. 身体健康问题并不妨碍我做自己想做的事。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

17. 老了以后，我发现更难交到新朋友了。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

18. 把我的经验传授给年轻人是非常重要的。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

19. 我认为我的人生是有价值的。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

20. 由于我是个老人，所以我觉得自己没有社会参与感。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

21. 我想为年轻人树立一个好榜样。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

22. 因为我的年龄，我感到我被排斥在一边。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

23. 我的健康比我预计这个年龄时候的要好。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5

24. 通过锻炼我尽可能使自己保持强壮和有活力。

完全不正确  | 有点正确  | 相当正确  | 非常正确  | 完全正确
---|---|---|---|---
1  | 2  | 3  | 4  | 5
以下的问题是关于运动。

请选择最能代表您观点的号码，并把它圈起来。

1. 对接下来两个月里增加自己运动的时间，您有多大的把握？

   1 | 2 | 3 | 4 | 5 | 6 | 7
   没把握 | | | | | | 很有把握

2. 您相信您在接下来的两个月里有能力增加自己运动的时间吗？

   1 | 2 | 3 | 4 | 5 | 6 | 7
   绝对不相信 | | | | | | 绝对相信

请选择最能代表您观点的号码，并把它圈起来。

1. 您认为在接下来的两个月里您能否增加自己运动的时间完全取决于自己吗？

   1 | 2 | 3 | 4 | 5 | 6 | 7
   非常不赞成 | | | | | | 非常赞成

2. 您觉得在接下来的两个月里增加自己运动的时间在多大的程度上是自己无法控制的（例如，如因天气不好，工作太忙等等）？

   1 | 2 | 3 | 4 | 5 | 6 | 7
   很难自己控制 | | | | | | 绝对能自己控制
请选择最能代表您观点的号码，并把它圈起来。

1. 我打算在接下来的两个月里增加运动的时间。

2. 我计划在接下来的两个月里增加运动的时间。

3. 我想在接下来的两个月里增加运动的时间。

4. 如果您不打算，计划或想在接下来的两个月里增加运动的时间，请问有什么会让您改变主意？
请选择最能代表您观点的号码，并把它圈起来。

1. 对我重要的人认为我。。。 

2. 对我重要的人会。。。 

3. 对我重要的人要我增加运动的时间。 

4. 我因为周围的人要我增加自己运动的时间感到有压力。 

非常不赞成 非常赞成
请选择最能代表您观点的号码，并把它圈起来。

1a) 我的家人认为我。。。

1b) 关于增加自己运动的时间，您会想照着家人认为您应该做的去做吗？

2a) 我的朋友认为我。。。

2b) 关于增加自己运动的时间，您会想照着朋友认为您应该做的去做吗？
3a) 媒体认为我。。。

3b) 关于增加自己运动的时间，您会想照着媒体认为您应该做的去做吗？

4a) 健康专家（例如医生）认为我。。。

4b) 关于增加自己运动的时间，您会想照着健康专家认为您应该做的去做吗？
想想上一星期您有几天有下面所描述的感觉。请根据过去一周里您多常有以下的感觉或行为，把最能代表您的答案的号码圈起来。

<table>
<thead>
<tr>
<th>在过去一周里：</th>
<th>很少或完全没有（少于1天）</th>
<th>少部分时间或有时侯（1至2天）</th>
<th>偶尔或相当长时间（3至4天）</th>
<th>大部分或所有时间（5至7天）</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 本来很平常的事，也开始使我烦恼。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. 我不想吃东西：我食欲很差。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. 即使在家人或朋友的帮助下，我也感到无法甩掉忧郁的心境。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. 我觉得自己象大家一样好。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. 我不能集中精力做事情。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. 我感到抑郁。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. 我觉得自己做什么都费劲。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. 我对未来充满希望。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. 我觉得自己的生活很失败。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. 我感到害怕。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. 我失眠。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. 我很快乐。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. 我比平常说话少。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. 我感到孤独。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. 人们对我不友好。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. 我感到生活是享受。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. 我有时哭泣。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. 我感到悲伤。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. 我觉得大家不喜欢我。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. 我无法提起精神。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

谢谢您抽出宝贵的时间回答以上的问卷。
Appendix H

This section asks you about your own views on ageing.

1. If you could choose, what age would you like to be? _______ years old
   Or □ My current age

This questionnaire asks you how you feel about growing older.
Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.
Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in general.

For example, thinking how you feel in general, a question might ask:

I dislike growing older

<table>
<thead>
<tr>
<th>Not at all true</th>
<th>Slightly true</th>
<th>Moderately true</th>
<th>Very true</th>
<th>Extremely true</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

You should circle the number that best fits how true the statements are for you. So you would circle the number 4 if you dislike growing older “Very much”, or circle number 1 if you are “Not at all” concerned about growing older. Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.
The following questions ask **how much you agree** with the following statements. If you agree with the statements an extreme amount circle the number next to “strongly agree”. If you do not agree with the statements at all, circle the number next to “Strongly disagree”. You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between “Strongly disagree” and “Strongly agree”.

1. As people get older they are better able to cope with life.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. It is a privilege to grow old.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3. Old age is a time of loneliness.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

4. Wisdom comes with age.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

5. There are many pleasant things about growing older.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

6. Old age is a depressing time of life.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

7. It is important to take exercise at any age.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Uncertain</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
The following questions ask **how true** the following statements are for you. If the statement is "Extremely" true for you, circle the number next to "Extremely true". If the statements are not true for you at all, circle the number next to "Not at all true". You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between "Not at all true" and "Extremely true".

8. Growing older has been easier than I thought.  
   Not at all true | Slightly true | Moderately true | Very true | Extremely true  
   1 | 2 | 3 | 4 | 5  

9. I find it more difficult to talk about my feelings as I get older.  
   Not at all true | Slightly true | Moderately true | Very true | Extremely true  
   1 | 2 | 3 | 4 | 5  

10. I am more accepting of myself as I have grown older.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

11. I don’t feel old.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

12. I see old age mainly as a time of loss.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

13. My identity is not defined by my age.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

14. I have more energy now than I expected for my age.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

15. I am losing my physical independence as I get older.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5  

16. Problems with my physical health do not hold me back from doing what I want to.  
    Not at all true | Slightly true | Moderately true | Very true | Extremely true  
    1 | 2 | 3 | 4 | 5
17. As I get older, I find it more difficult to make new friends.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

18. It is very important to pass on the benefits of my experiences to younger people.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

19. I believe my life has made a difference.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

20. I don't feel involved in society now that I am older.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

21. I want to give a good example to younger people.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

22. I feel excluded from things because of my age.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

23. My health is better than I expected for my age.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5

24. I keep myself as fit and active as possible by exercising.
Not at all true | Slightly true | Moderately true | Very true | Extremely true
---|---|---|---|---
1 | 2 | 3 | 4 | 5
The following questions are regarding physical activity.

Please circle the number that most accurately describes how you feel towards each item.

1. How confident are you that you will be able to increase the time you spend on physical activity in the next two months?

   Not very confident   Very confident

2. Do you believe that you have the ability to increase the time you spend on physical activity in the next two months?

   Definitely do not believe   Definitely do believe

Please circle the number that most accurately describes how you feel towards each item.

1. Do you agree that whether or not you increase the time you spend on physical activity in the next two months is entirely up to you?

   Strongly disagree   Strongly agree

2. How much do you feel that whether you increase the time you spend on physical activity in the next two months is beyond your control (due to factors such as bad weather, being busy with work etc.)?

   Very little control   Complete control
Please circle the number that most accurately describes how you feel towards each item.

1. I **intend** to increase the time I spend on physical activity over the next two months.

   -3 | -2 | -1 | 0 | 1 | 2 | 3
   Definitely do not | | | | | | Definitely do

2. I **plan** to increase the time I spend on physical activity over the next two months.

   -3 | -2 | -1 | 0 | 1 | 2 | 3
   Definitely do not | | | | | | Definitely do

3. I **want** to increase the time I spend on physical activity over the next two months.

   -3 | -2 | -1 | 0 | 1 | 2 | 3
   Definitely do not | | | | | | Definitely do

4. If you do not intend, plan or want to increase the time you spend on physical activity in the next two months, what would make you change your mind?

   ______________________________
Please circle the number that most accurately describes how you feel towards each item.

1. People who are important to me think I ... 

2. People who are important to me would ... 

3. People who are important to me want me to increase the time I spend on physical activity.

4. I feel under social pressure to increase the time I spend on physical activity.
Please circle the number that most accurately describes how you feel towards each item.

1a) My family think I ...

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

1b) With regard to increasing the time you spend on physical activity, how much do you want to do what your family think you should?

1  2  3  4  5  6  7

Not at all

Very much

2a) My friends think I ...

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

2b) With regard to increasing the time you spend on physical activity, how much do you want to do what your friends think you should?

1  2  3  4  5  6  7

Not at all

Very much
3a) The media think I…

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

3b) With regard to increasing the time you spend on physical activity, how much do you want to do what the media think you should?

1  2  3  4  5  6  7

Not at all

Very much

4a) Health experts (e.g. doctors) think I…

1  2  3  4  5  6  7

Should not increase the time I spend on physical activity

Should increase the time I spend on physical activity

4b) With regard to increasing the time you spend on physical activity, how much do you want to do what health experts think you should?

1  2  3  4  5  6  7

Not at all

Very much
The following questions ask you about how you have felt over the last week. Please circle the number of each statement which best describes how often you felt or behaved this way – DURING THE PAST WEEK.

<table>
<thead>
<tr>
<th>DURING THE PAST WEEK:</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 a moderate amount of the time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 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>2. 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>3. I felt that I could not shake off the blues even with help from my family or friends</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I felt that I was just as good as other people</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. 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>6. I felt depressed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. 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>8. I felt hopeful about the future</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. I thought my life had been a failure</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. I felt fearful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. My sleep was restless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. I was happy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. I talked less than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. I felt lonely</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. People were unfriendly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. I enjoyed life</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. I had crying spells</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. I felt sad</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. I felt that people disliked me</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. I could not get &quot;going&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Thank you very much for taking the time to answer the questions.
接下来，我们想了解您对年龄增长的看法。

1. 如果能让您选择，您希望您现在几岁？________岁
   或□我目前的年龄

指导语：

本问卷是关于您是怎么看待变老的。请回答所有的题目，如果您不能确定某个题的答案，请选一个最接近的，往往您的第一反应就是最适合的答案。回答问题时，脑子里始终想着您的标准、希望、快乐和担心是什么。请按您生活中的一般情形予以回答。

例如：考虑在一般情况下，回答这样一个问题：
我不喜欢变老。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

您需要把最适合您自己情形的答案圈起来。也就是说，如果您认为“我不喜欢变老”这句话非常正确，您就把4圈起来；如果您完全不同意这种说法，就把1圈起来。下面，请看每一个句子，并把最适合您的答案所代表的数字圈起来。谢谢您的合作！
第一部分，下面这些问题是在您在多大程度上同意这些陈述。如果您“完全同意”，请把下面的5圈起来，如果“完全不同意”，就把它下面的1圈起来。每个题目都请在完全同意和完全不同意之间做出一个选择，并把相应的数字圈起来。

1. 当人们年纪越来越老，他们更有能力处理生活中的问题。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. 年老是一种优势。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3. 老年时光是孤独的。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
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<tr>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

4. 智慧随年龄而增长。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

5. 变老也有许多令人愉快的事。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

6. 老年是生命中令人沮丧的时期。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

7. 在任何年龄进行锻炼都是很重要的。

<table>
<thead>
<tr>
<th>非常不赞成</th>
<th>不赞成</th>
<th>不确定</th>
<th>赞成</th>
<th>非常赞成</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
第二部分，下面这些问题是你在多大程度上认为这些陈述是正确的。如果您认为“完全正确”，请把它下面的5圈起来，如果您认为“完全不正确”，就把它下面的1圈起来。每个题目都请在完全正确和完全不正确之间做出一个选择，并把相应的数字圈起来。

8. 变老比我想象的要轻松。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

9. 上年纪后，我发现越来越难谈论自己的感受。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

10. 老了之后，我更加接受自己了。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

11. 我不觉得自己老。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

12. 在我看来，老年意味着丧失。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

13. 年龄并不代表我的身份。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

14. 我现在的精力比我预计自己这个年龄时候的要好。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5

15. 上年纪之后，我渐渐丧失了身体的独立能力。

完全不正确 | 有点正确 | 相当正确 | 非常正确 | 完全正确
1 | 2 | 3 | 4 | 5
16. 身体健康问题并不妨碍我做自己想做的事。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

17. 老了以后，我发觉更难交到新朋友了。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

18. 把我的经验传授给年轻人是非常重要的。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

19. 我认为我的人生是有价值的。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

20. 由于我是个老人，所以我觉得自己没有社会参与感。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

21. 我想为年轻人树立一个好榜样。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

22. 因为我的年龄，我感到我被排斥在一边。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

23. 我的健康比我预期这个年龄时候的要好。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

24. 通过锻炼我尽可能使自己保持强壮和有活力。

<table>
<thead>
<tr>
<th>完全不正确</th>
<th>有点正确</th>
<th>相当正确</th>
<th>非常正确</th>
<th>完全正确</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
以下的问题是关于运动。

请选择最能代表您观点的号码，并把它圈起来。

1. 对接下来两个月里增加自己运动的时间，您有多大的把握？

   1  2  3  4  5  6  7

   没把握                       很有把握

2. 您相信您在接下来的两个月里有能力增加自己运动的时间吗？

   1  2  3  4  5  6  7

   绝对不相信                    绝对相信

请选择最能代表您观点的号码，并把它圈起来。

1. 您认为在接下来的两个月里您能否增加自己运动的时间完全取决于自己吗？

   1  2  3  4  5  6  7

   非常不赞成                    非常赞成

2. 您觉得在接下来的两个月里增加自己运动的时间在多大的程度上是自己无法控制的（例如因天气不好，工作太忙等等）？

   1  2  3  4  5  6  7

   很难自己控制                  绝对能自己控制
请选择最能代表您观点的号码，并把它圈起来。

1. 我打算在接下来的两个月里增加我运动的时间。

2. 我计划在接下来的两个月里增加我运动的时间。

3. 我想在接下来的两个月里增加我运动的时间。

4. 如果您不打算、计划或想在接下来的两个月里增加您运动的时间，请问有什么会让您改变主意？
请选择最能代表您的观点的号码，并把它圈起来。

1. 对我重要的人认为我。。。

不应该增加
运动的时间

不应该增加
运动的时间

2. 对我重要的人会。。。

反对我增加
运动的时间

反对我增加
运动的时间

3. 对我重要的人要我增加运动的时间。

非常不赞成

非常不赞成

4. 我因为周围的人要我增加自己运动的时间感到有压力。

非常不赞成

非常不赞成
请选择最能代表您观点的号码，并把它圈起来。

1a) 我的家人认为我。。。

1b) 关于增加自己运动的时间，您会想照着家人认为您应该做的去做吗？

2a) 我的朋友认为我。。。

2b) 关于增加自己运动的时间，您会想照着朋友认为您应该做的去做吗？
3a) 媒体认为我。。。

不应该增加运动的时间

不应该增加运动的时间

3b) 关于增加自己运动的时间，您会想照着媒体认为您应该做的去做吗？

完全不想

应该增加运动的时间

应该增加运动的时间

4a) 健康专家（例如医生）认为我。。。

不应该增加运动的时间

不应该增加运动的时间

4b) 关于增加自己运动的时间，您会想照着健康专家认为您应该做的去做吗？

完全不想

应该增加运动的时间

应该增加运动的时间
想想上一星期您有几天有下面所描述的感觉，请根据过去一星期您多常有以下的感觉或行为，
把最能代表您的答案的号码圈起来。

<table>
<thead>
<tr>
<th>在过去一周里：</th>
<th>很少或完全没有（少于1天）</th>
<th>少部分时间或有时候（1至2天）</th>
<th>偶尔或相当长时间（3至4天）</th>
<th>大部分或所有时间（5至7天）</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 本来很平常的事，也使我烦恼。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. 我不想吃东西；我食欲很差。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. 即使在家人的帮助下，我也感到无法甩掉忧郁的心境。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. 我觉得自己象大家一样好。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. 我不能集中精力做事情。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. 我感到抑郁。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. 我觉得自己做什么都很费劲。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. 我对未来充满希望。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. 我觉得自己生活很失败。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. 我感到害怕。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. 我失眠。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. 我很快乐。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. 我比平常说话少。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. 我感到孤独。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. 人们不友好。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. 我感到生活是享受。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. 我有时哭泣。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. 我感到悲伤。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. 我觉得大家不喜欢我。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. 我无法提起精神。</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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Author/s:  
Seah, Siang Joo

Title:  
Does improving women’s attitudes to ageing facilitate increase in physical activity?  
Evaluation of an intervention across sociocultural contexts

Date:  
2017

Persistent Link:  
http://hdl.handle.net/11343/198257

File Description:  
Final thesis

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