The effects of education, self-regulation, social support and cultural participation on physical activity variety in the Baby Boomer Generation

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ABSTRACT

If there is one principle for well-being, it is that recreational physical activities, such as walking and sports, have wide-ranging health benefits. However, most people are not active enough to realise the benefits, such as the baby boomer generation. A major public health issue is how to develop better ways to encourage the ‘boomers’ to live physically active lives.

Research has identified a tendency for the boomers to participate in variety, such as a range of recreational activities (Alderson, Junisbai, & Heacock, 2007). In addition, adult education level is connected to more variety (e.g. van Eijck, 1999). If the boomers have an appetite for variety, it may be a focus for physical activity promotion. However, the potential effects of education on activity variety of this generation is unclear, and it has not been directly investigated whether forms of self-agency such as self-regulation, and seeking social support, intervene education and physical activity variety.

By drawing on social-cultural psychology to integrate insights from health psychology, public health, and sociology, the current thesis investigated the potential role of formal education and self-agency in current participation in physical activity variety by the boomer generation. The aim was to establish whether education is a determinant of physical activity variety, and in particular, as a potential precursor to day-to-day agency (e.g. seeking social support to be active).
A model of the effects of education on physical activity variety was developed, and investigated through a field study of boomer adults (n = 217) in the general community of Melbourne, Australia. The Model proposed that education leads to activity variety via self-regulation, seeking social support and cultural participation (e.g. visiting museums and cultural festivals). Research participants completed a detailed survey of social and life background, lifestyle patterns, and health, and a measure of cognitive ability – a potentially important capacity for self-regulation and active living. Before the main field study, the survey was developed through two pilot studies (n₁ = 218, and n₂ = 106), and the ability measure evaluated in the latter pilot.

As anticipated, education was found to effect physical activity variety, positively and indirectly, and primarily via: (1) self-regulation and attaining social support, and (2) cultural participation. The strongest direct effect on activity variety was via social support elicitation, and the multiple indirect effects of education on variety took place via this form of adult self-agency. Cognitive ability had a negative effect on self-regulation, and a positive direct effect on social support elicitation. Women were more engaged in cultural participation than men, and less engaged in physical activity variety.

The findings of this thesis suggest that physical activity promotion strategies that are focused on increasing multiple types of activity may be a promising public health approach, and may be particularly effective for boomers with higher education. Furthermore, forms of self-agency that are not normally the ‘target’ of public health, such as cultural participation, may foster more health-enhancing physical activity. The baby boomers gravitate to variety in life, and efforts to support this proclivity in the generation may confer additional benefits to their well-being.
DECLARATION

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

Signature: [Signature]

Date: 6/3/14
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Chapter 1: Introduction

Meandering around the Lyceum with his disciples, Aristotle mused on exercise as a virtue. For Aristotle, everyday practices of exercising one’s mind and body, such as philosophising with colleagues and friends, while walking, were the makings of “the good life”, and well-being (Warne, 2006). In the 21st century, ‘exercise’ is thought of as recreational physical activity (US Department of Health and Human Services, US DHHS, 1996, 2008; World Health Organization, WHO, 2008). Benefits include prevention and management of chronic illnesses such as cardiovascular disease, diabetes, and some cancers; management of depression; stemming the tide of obesity; promoting physical and mental health, and quality of life; coping with stress; reducing the onset of dementia; sustaining the ageing workforce; containing health care costs; and ecologically sustainable living (for literature review, see Appendix 1).

The practical problem of maintaining physical activity

In general, the range of benefits just canvassed derive from regular physical activity that is sustained over the medium and long-term. However, ‘modern’ environments tend to be geared against physical activity (Mirowsky, 2011). As a result, people are generally not active enough to gain the health benefits (Australian Institute of Health and Welfare, AIHW, 2011; USDHHS, 2008), especially the largest sub-population, those born between 1945 and 1972 – the ‘baby boomers’ (Mirowsky, 2011) – hereafter called the ‘boomers’ or ‘boomer generation’. Increases in physical activity are marginal (Knuth & Hallal, 2009; Troost et al., 2012; Victorian Department of
Human Services, 2008) and physical activity programs have limited success at conferring prolonged activity (Conn et al., 2011; Fjeldsoe et al., 2011; van der Bij et al., 2002).

A significant problem therefore, is that large sub-populations such as the ‘boomers’, do not sustain a physically active lifestyle, resulting in poorer health and well-being.

There is much research on physical activity, spanning health psychology, public health, clinical sports and exercise sciences, medical anthropology, ergonomics, economics and urban planning. Mostly, these inquiries are concerned with understanding and fostering agency to increase physical activity, such as factors amenable to change, as a basis for intervention. For instance, health psychology focuses on self-agency – self-directed capacities, processes and practices as precursors to activity. Psychological research on physical activity is considerable, including over 31 models and frameworks, and over 80 constructs (see Appendix 2 for list of literature). While psychological models demonstrate validity by statistically predicting physical activity, and translate into modestly effective programs, helping people sustain physical activity prevails as a major issue (Kohl et al., 2012; van der Bij et al., 2002). To improve the efficacy of physical activity promotion there needs to be models with real world validity, by paying more attention to context, such as the ‘everydayness’ of agency, the multi-dimensionality of practices, and the social-cultural habitat of the relevant population (Ioannou, 2005; Karoly, 1998; Pasick et al., 2009). What is meant by ‘everydayness’ are the largely informal activities and events of day-to-day living.
The research problem, and the research gaps

When it comes to the boomers and context, a significant research problem lies in the fact that there has been no research on the relationship between formal education, current engagement in physical activity variety, and agency (psychological constructs and everyday practices). There are six research gaps.

First, physical activity variety may promote overall physical activity and health (Bond et al., 2012; Sherwood & Jeffery, 2000), but is overlooked in basic research. Physical activity variety is the range of activity types engaged in during recreation, including ‘mild’, ‘moderate’ and ‘vigorous’ forms (e.g. fishing, walking, aerobics, respectively). A public health message is to “be active every day in as many ways as you can” (Australian Department of Health and Aged Care, 1999, italics added). Yet, so far, research directly on ‘naturally occurring’ physical activity variety is rare (for exceptions, see Dafna et al., 2012; Lefévre & Ohl, 2012). A study focused on the physical activity variety of the boomer generation is greatly needed.

Second, there is little empirical research on everyday skills and strategies that adults may apply in keeping active, including the precursors to physical activity variety. For instance, although self-regulation and social support are major themes in physical activity research and promotion (Cerin & Leslie, 2008; Dorough et al., in press), the informal and ‘naturalistic’ initiatives by boomers to self-regulate and elicit social support for physical activity, deserves attention – namely, what may help sustain routines of physical activity.
Third, while formal education, such as years of schooling and level of tertiary training (e.g. vocational and university), is associated with physical activity (Droomers, Schrijvers, & Mackenbach, 2001; Murakami et al., 2011), it is unclear what the role of education is in proximal self-agency for activity (e.g. self-regulation). Furthermore, promotion of activity is premised on education and learning (Cavill & Bauman, 2004), yet the potential role of education from early life experiences on current self-agency in physical activity variety is neglected in research.

Fourth, it is unknown whether cultural participation is a mediator of education and physical activity variety. Cultural research has established that since World War II (WWII; i.e. the era of the boomer generation), individual lifestyles and tastes have broadened, including an increase in cultural participation (e.g. visiting museums, going to movies; Alderson et al., 2007; Bennett et al., 2009). Furthermore, education is positively associated with level of variety in recreational participation (van Eijck, 1999). Taking part in a variety of physical activities may be a manifestation of a more general increase in variety; hence cultural participation could be a determinant of physical activity variety, and education a precursor to cultural participation.

Fifth, it needs to be established what the role of cognitive ability is within the nexus of education, self-agency and physical activity variety. Cognitive ability has been shown to predict lifestyles and health (Batty et al., 2007); education is correlated with cognitive ability (Ceci & Williams, 1997), and may ‘mask’ the effects of cognitive abilities on lifestyles and health (Gottfredson, 2004); and, education could promote self-agency via cognitive ability (Deary et al., 2010).
Sixth, it is yet to be determined if education effects self-agency and physical activity variety independently of age and gender. The role of age and gender in conjunction with education is warranted as they correspond to differences in physical activity, and general variety in recreation (e.g. Bennett, Emmison, & Frow, 1999; Christin, 2012).

If ‘boomer’ adults do gravitate towards physical activity variety, physical activity promotion that is designed to focus on this dimension of physical activity, in conjunction with factors that may bolster it, may provide a new avenue for promoting and sustaining active living. But, to ascertain the value of such an applied approach, basic research is first needed to address the following research questions (RQs):

- **RQ1**: Does education determine physical activity variety?
- **RQ2**: Is any effect of education mediated by proximal agency? These include (a) self-regulation of physical activity, (b) social support elicitation, and (c) cultural participation.
- **RQ3**: Does cognitive ability play a role in proximal agency, and physical activity variety?
- **RQ4**: What is the role of age and gender in adult agency and physical activity variety?

There is no theoretical rationale available to guide research on the set of RQs above as they cut across multiple literatures and levels of analysis. However a useful starting point for developing an integrated model is by drawing upon the Framework of Mutual Constitution provided by Markus and colleagues in social-cultural psychology.
(e.g. Markus & Kitayama, 2010; Plaut, Markus, & Lachman, 2002), as it encompasses the psychology of people in their social-cultural environment, and also enables inter-disciplinary research.

**Aims of the thesis**

The aim of the current thesis is to address the research questions above by investigating the effects of formal education (duration and level of schooling and tertiary training) on current physical activity variety of the boomer generation through a field study in Melbourne, Australia. Specifically, the purpose is to establish whether:

(a) education determines physical activity variety,

(b) education effects physical activity variety via self-regulation and social support elicitation,

(c) cultural participation mediates the effect of education on activity variety, and whether,

(d) cognitive ability plays a role in self-agency and physical activity variety.

**Structure of the thesis**

The next sections provide an outline of the main account and accompanying model of physical activity variety, as well as an overview of how Chapter 1 will progressively present arguments for the model. Then an overview of the three key literatures for informing an understanding of ‘boomer’ agency for physical activity will be provided (namely: health psychology, public health and sociology), as well as how
each of these fields has approached the key concepts. After this, the inspiration for the basis of the current integration of research – the Framework of Mutual Constitution (see Markus & Kitayama, 2010) – will be introduced. Hereafter, for brevity, the integrated model of physical activity variety will be referred to as the “PAV model”, and the Framework of Mutual Constitution will be described as “the FMC”. The final section of Chapter 1 presents the PAV model in detail.

As the scope and breadth of literature is enormous, hypotheses are introduced at various junctures. The list of hypotheses for the model is presented at the end of Chapter 1 (p. 77). Then, in Chapter 2 the methodology of all three field studies is presented (Study 1, pilot 1; Study 2, pilot 2; Study 3, main study). Although the studies differed in some respects, they are presented together for the purpose of brevity. In Chapter 3, the results are presented – first, evaluation of measures and other preliminary analyses; second, evaluation of the PAV model, including comparison to some alternative models, and third, a summary of findings. Chapter 4 provides a discussion and directions for further research.

**Outline of model on physical activity variety**

The main claim in this thesis is that education determines physical activity variety in a positive and indirect manner – and primarily via self-regulation, attaining social support, and cultural participation. The proposed dynamic of a connection between education and physical activity variety, and intervening processes of agency, is presented as the PAV model, in Figure 1. The PAV model delineates the nature and process of relations between education and physical activity variety that take place
within a larger system of mutual constitution. As an integration, the pathways in Figure 1 between education and physical activity variety are a succession of forms of agency which unite ecological and individual-level accounts of psychology and practice.

Based on an integration of literature on the context of the boomer generation (the social-cultural environment after WWII) it will be argued that there were numerous pressures on this generation to embrace both physical activity and variety in everyday practices. In addition, as formal education has the effect of developing an attunement to normativity of a society, education during the boomer era had a double impact of psychological and bodily attunement to (a) shared ideals (e.g. being ‘active’ and ‘productive’), as well as (b) exposure to ambiguities of meeting those ideals (such as through physical activity and a diversification of options on ‘how to be’). Overall, at a broad level, a general relationship was anticipated between education and physical activity variety.

The case is then made for intervening processes between education and physical activity variety (i.e. pathways in the middle of Figure 1), in consideration of both the social-cultural habitat just described (emphasis on activity, variety and mobility), and formation of tendencies in light of this habitat (i.e. ‘habitus’). It will be argued that physical activity variety, as the ‘end-point’ in the model, is an outcome of proximal person dynamics defined by two proclivities that stem from formal education: (1) to self-regulate with respect to physical activity, and seek support to keep active, and (2) an orientation to participate in variety in recreation, as manifested in cultural participation. The former process is the focus of health psychology and public health, while the latter is the focus of the sociology of culture. These tendencies will also be
Figure 1. Model of Physical Activity Variety.
argued to take place separately; there would be *no* influence of cultural participation on self-regulation of physical activity (e.g. in Figure 1, no pathway from cultural participation to self-regulation). Furthermore, cognitive ability is suggested to play a role in boomer agency for physical activity variety, as well as age and gender working alongside education in effecting self-agency and variety.

**Overview of literature that substantiates the PAV model**

Figure 2 presents an overview of the rest of Chapter 1. The remaining sections of Chapter 1 unfold as follows: an overview of the three key literatures to inform boomer agency on physical activity are presented (health psychology, public health, and sociology), including the strengths and limitations of each in addressing the current RQs. The FMC is then proposed as a theoretical basis for synthesis of these literatures, with the integrative concept of ‘habitus’ from sociology, adopted to tailor the FMC perspective to the current research topic.

The literature review then turns to presenting the theoretical rationale for education and physical activity variety as the main end-points of the PAV model. In this, the FMC is applied to map out the social-cultural environment of the boomer generation. Having established a potential link between education and physical activity variety at a broad population level, arguments are then made for each set of structural relationships in the model (as manifested in immediate agency and practice). The key hypothesised pathways by which education ‘translates’ into physical activity variety are discussed – (1) self-regulation and social support elicitation, and (2) cultural participation. Then, the role of cognitive ability in agency for physical activity is reviewed, to address RQ3. As pictured in Figure 2, in finishing
Figure 2. Overview of remainder of Chapter 1.

Mapping of literature: Background to constructs & key fields

Key fields: Health Psychology, Public Health, Sociology
Constructs: physical activity, education, self-regulation, social support elicitation, cultural participation, cognitive ability

Theoretical framework to guide integration
(Framework of Mutual Constitution)

Refinement to theoretical framework
(Habitus as working concept)

New Integration: Physical Activity Variety (PAV) model

Social-cultural environment of the baby boomer generation
Education → Physical Activity Variety

Education & proximal self-agency for physical activity
Education → Self-Regulation → Social Support Elicitation → Variety
Education → Cultural Participation

Role of cognitive ability
Education → Cognitive Ability → Physical Activity Variety

Age and gender
Age → Cognitive Ability, Age → Physical Activity Variety
Gender → Cultural Participation, Gender → Physical Activity Variety

Summary of literature review
(List of Hypotheses)
the review, the two ‘exogenous’ constructs in the PAV model– age, and gender – are discussed, including their anticipated roles (direct and indirect) in effecting physical activity variety. The full list of hypotheses of the PAV model is presented at the end of Chapter 1 (p. 77).

Mapping of key concepts and research literatures

Table 1 presents the key constructs argued to play a role in boomer agency for physical activity variety. Physical activity variety is the number of types (or ‘modes’) of physical activity participated in during recreation time. The current research focuses on recent physical activity variety by the boomers – the breadth of types of physical activity in the last few months.

An understanding of everyday agency for physical activity in the baby boomer generation is significantly impeded by the siloed nature of the academic literature; this is the common denominator to the six RQs canvassed at the start of the introduction. Therefore, each of these constructs is introduced in conjunction with the three key fields that can best inform the current inquiry. Table 2 summarises the forthcoming review in terms of the relative coverage each field gives to the set of constructs.
Table 1. Overview of concepts in the PAV model

<table>
<thead>
<tr>
<th>Theoretical concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical activity</td>
<td>Breadth of physical activity types that take place during recreation time</td>
</tr>
<tr>
<td>variety</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Level and duration of formal schooling and training</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>Use of personal strategies and skills for keeping physically active during recreation</td>
</tr>
<tr>
<td>Social support elicitation</td>
<td>Use of personal strategies and skills, that share in common, seeking social support for recreational physical activity</td>
</tr>
<tr>
<td>Cultural participation</td>
<td>Attendance to a range of cultural events and venues, such as visiting museums and art galleries, and going to the cinema</td>
</tr>
<tr>
<td>Cognitive ability</td>
<td>A general cognitive capacity for reasoning, novel problem solving and learning</td>
</tr>
<tr>
<td>Age</td>
<td>Chronological age of person</td>
</tr>
<tr>
<td>Gender</td>
<td>Distinction of male-female on the basis of cultural, social and biological dimensions</td>
</tr>
</tbody>
</table>
Table 2. Overview of the three key literatures to inform baby boomer agency for physical activity (health psychology, public health, and sociology), and the respective coverage of concepts in the PAV model

<table>
<thead>
<tr>
<th>Concept in PAV model:</th>
<th>Health Psychology</th>
<th>Public Health</th>
<th>Sociology</th>
</tr>
</thead>
</table>
| Physical Activity Variety | Physical activity as ‘health-related behaviour’
Little attention to physical activity variety | Explored as potential promoter of health & physical activity | Physical activity as ‘cultural consumption’, ‘cultural choice’, and ‘cultural capital’ |
| Education | Education neglected as a predictor of physical activity & proximal agency | Major variable in epidemiology, usually as indicator of socio-economic status
Common goal of public health practice: from health campaigns to individualised & local programs | Treated as social-structural variable, or measure of ‘cultural capital’ |
| Self-Regulation | Major construct or process in predictor models of physical activity | The objective of numerous lifestyle change & behaviour management programs (e.g. in primary, secondary prevention) | Considered a “technology of the self” as culture-specific invention |
| Social Support Elicitation | Conceived as a strategy or behavioural technique | Target of physical activity intervention (↑ social support for physical activity & health) | A form of sociality |
| Cultural Participation | Looked at sporadically in terms of quality of life & everyday functioning | Occasionally considered as determinant of health | Major topic of research: differences in participation level by type of social position (including education) |
| Cognitive ability | Investigated as proximal shaper of physical activity & other health-related behaviour | Investigated in population studies of cognitive epidemiology | Described as a form of cultural capital |
| Age | Major variable of analysis, such as age group, or as control variable | Major topic of research
Considers research from gerontology & ageing studies. | Considered as a structure of power & social construct |
| Gender | As indicative of sex differences | Conceptualised as type of stratification of health differences & determinant of physical activity | Approached as a structure of power (esp. patriarchy) & social category or process |
Key research literatures

All three fields are interdisciplinary areas of inquiry, with varying emphasis on individuals and environment in the generation of practices, such as physical activity.

Health psychology

Health psychology has been central to informing policy and research on education and physical activity, through positing diverse frameworks and theories on the nature, structure and process dynamics of health-related behaviour and behaviour change (for reviews see Biddle & Mutrie, 2001; Nigg et al., 2008; Norman, Abraham, & Conner, 2000). Prominent frameworks of health-related behaviour (and behaviour change) include the Theory of Planned Behaviour and Reasoned Action (Ajzen, Albarracín, & Hornik, 2007), the Health Behaviour Model (Rosenstock, 1974), Social Cognitive Theory (Bandura, 1997), the Stages of Change (or Transtheoretical) Model (Prochaska, DiClemente, & Norcross, 1992), and Self-Determination Theory (Deci & Ryan, 2000; Ng et al., 2012). Much recent research is a hybridisation of these models, to bolster an understanding of the motivational dynamics thought to underpin health-related behaviour (e.g. Hagger, Chatzisarantis, & Biddle, 2002). There is also continued evaluation of efficacy of ‘techniques’ derived from these theories, in effecting behaviour change and maintenance (for reviews, see Abraham & Michie, 2008; Lippke & Ziegelmann, 2008; Michie et al., 2009). While diverse, these models share in common a de-compositional approach to agency – that is, pinpointing and measuring constructs and mechanisms thought to determine or inhibit a behaviour of interest. A multitude of proximal capacities and processes are posited to interact in self-regulation of behaviour (e.g. efficacy beliefs; recall Appendix 2).
Theoretical development is needed most in health psychology with respect to understanding how physical activity can be maintained (King, Bauman, & Abrams, 2002; Leventhal & Mora, 2005; Orleans, 2000). The root of this research problem may be a more general neglect of health psychology to everyday practices in the context of everyday life and events in the world (on this, see e.g. Hepworth, 2006; Kagawa-Singer & Emmons, 2009; Kaptein, 2011). Although context and environment is considered in health psychology (e.g. Jung & Brawley, 2010; Karoly, 1998; Maes & Gebhardt, 2000; also see Segar et al., 2007), there is need for a broadened analysis, and further contextualisation, such as the everyday lives and experiences of the boomers. While sub-fields such as critical health psychology are currently seeking to address the neglect of context (Hepworth, 2006; Marks, 2002), the de-compositional and quantitative approaches of ‘mainstream’ health psychology may still be a fruitful avenue to investigate overlooked areas such as self-agency and physical activity variety of the boomers.

Public health

The objectives of public health are to support and improve the general well-being of populations, such as reducing risks to health, treating disease, and health promotion (Baum, 2008). “Encouraging healthy behaviors” is one of the major strategies of public health (Duckett, 2007, p. 186). The two key topics in the PAV model – education and physical activity – are of tremendous interest in public health. Currently there is a major emphasis on the role of the environment, material and social, on health-related behaviours and health (Ding & Gebel, 2012; Sallis, Bauman, & Pratt, 1998), such as application of ecological approaches (e.g. Ding et al., 2012; Glass & McAtee, 2006; WHO, 2008). However, in contextualising health-related behaviour to address problems of individual reductionism,
ecological frameworks of public health, while referring to psychological concepts, in practice have tended to be almost exclusively about the environment (e.g. material features of neighbourhood; e.g. Duncan et al., 2010; Humpel, Owen, & Leslie, 2002), thereby neglecting proximal processes of agency that may be important to physical activity.

**Sociology**

In sociology, and especially the sociology of culture, patterns of everyday practices are not viewed in terms of individual-level differences (such as psychological constructs), but as embodiments of the location of people in social fields (e.g. Bourdieu, 2005 [1979]; Gayo-Cal, Savage, & Warde, 2006). For instance, the many population studies of lifestyle patterns in the sociology of culture, interpret practices in terms of cultural consumption, cultural choice, and cultural capital – and always in light of extra-individual and structural processes, such as stratification (e.g. Bennett et al., 1999; Howell & Ingham, 2001; Koski, 2008; Stempel, 2005). A common empirical finding – particularly in the sociology of culture – is that participation in variety during recreation has become more prevalent in Western societies in the second half of the 20th century, and that these patterns are observed most for people who have had more education (van Eijck, 1999). This finding needs to be investigated with respect to physical activity variety, such as whether education effects variety in conjunction with processes that are more the focus of health psychology and public health (such as self-regulation).
Key concepts

Concepts will be reviewed in the same order as presented in Table 2.

Physical activity variety

The major social issue of concern in this thesis is that keeping physically active to attain the health benefits is difficult for the boomers. Physical activity variety may help sustain a physically active lifestyle (Bond et al., 2012; Sherwood & Jeffery, 2000), and ‘light’, ‘moderate’ activities that may comprise variety, such as walking, are established to contribute to health in many ways (Lee et al., 2001; Morris & Hardman, 1997). Physical activity guidelines for the general public have moved on from prescribing compliance with a single routine of vigorous exercise, to talking about “active living” (e.g. Mendoza, Salmon, & Sallis, 2012, p. 1), such as accumulation of different forms of physical activity each day (Pate et al., 1995), partly reflecting an appreciation that general activity would be more feasible to adopt and sustain. Guidelines on physical activity consistently instruct that people adopt variety in their lifestyles as a way to gain an overall activity level. Appendix 3 illustrates how variety is conveyed in major physical activity guidelines for adults.

There are several reasons that physical activity variety could support sustaining of overall physical activity (Bond et al., 2012; Sherwood & Jeffery, 2000). Engagement in variety can be more interesting and enjoyable (Jansen, Druga, & Sauve, 2011; Sherwood & Jeffery, 2000). Through variety, the risk of injury may be minimised (Sherwood & Jeffery, 2000). Furthermore, physical activity variety may be more inclusive of people’s own perspectives on health, everyday practices, and attentive to the demands of their everyday lives. Concepts of activity and health often diverge and conflict with those of health experts.
and authorities (MacDougall, 2003). Public health needs to consider practices that are most relevant, suitable and valuable to people in terms of their life circumstances and perspectives (Ioannou, 2005). Physical activity variety is promising in this respect, as it encompasses a larger domain of everyday practices.

Sherwood and Jeffery (2000) argued that physical activity variety is an overlooked approach to sustaining a physically active lifestyle, but surprisingly, there continues to be a paucity of research directly on physical activity variety. Research is constrained to indirect analysis of variety in intervention contexts (Glaros & Janelle, 2001; Vara & Epstein, 1993), and some population studies (Dafna et al., 2012; Lefévre & Ohl, 2012). As far as can be ascertained, the PAV model is the first detailed attempt at illuminating the role of agency in physical activity variety (e.g. education, self-regulation).

**Education**

‘Formal education’ is defined here as duration and level of participation in schooling and training from the primary, secondary and tertiary sectors in Australia, or equivalent institutions in other countries. From a functionalist point of view, education represents a major ‘agent’ of socialisation coinciding with, or following, early upbringing in the home (Durkheim, 1938 [1895]; Worsley, 1977). Research indicates that the very early years of life are formative of the person (e.g. McCabe, Cunnington, & Brooks-Gun, 2004). Although there is much variation in theoretical accounts of development and learning, lifecourse research clearly indicates that early life experiences, including upbringing in and outside of formal educational settings, have a range of long-term outcomes (e.g. Melby et al., 2008). Through schooling and tertiary education and training, the person is ‘taught’ about the social rules of
society, whether explicitly (through verbal instruction) or implicitly (through role modelling and imitation) (Bandura, 1977; Vygotsky, 1978). Accordingly, education is viewed as fostering general participation and engagement in the practices of a society (for a review, see Campbell, 2006; also Nussbaum, 2011).

There is consensus that education plays a positive role in people’s lives, by fostering internal and external forms of agency. For instance, Mirowsky and Ross (2003) argue that education develops resources that grow over the lifecourse, such as general skills in the person to flexibly utilise these resources – what they describe as “learned effectiveness” (p. 25). Firstly, education fosters internal agency, by development of capacities, skills and orientations of independence, and critical thinking (Fukuyama, 1992; Mirowsky & Ross, 2003). Education is found to increase agency, as measured in terms of psycho-social constructs (Bandura, 1997; Feinstein et al., 2006; Mirowsky & Ross, 2003), and competencies, knowledge and expertise (Richards & Hatch, 2011). Secondly, education is understood as leading to ‘gateways’, most obviously where credentials lead to access to occupations and corresponding resources, such as income (Mirowsky & Ross, 2003; Ross & Wu, 1996).

Education is consistently correlated with health (Goesling, 2007; Hammond, 2002; Marmot, 2003; Masters, Hummer, & Powers, 2012; Miech et al., 2011; USDHHS, 1996; WHO, 2008), and the role of education in development of agency is proposed to explain this connection. For instance, Mirowsky and Ross (2003) assert that: “Education improves health because it increases effective agency...Education’s beneficial effects are pervasive, cumulative and self-amplifying, growing across the lifecourse.” (p. 206).
Although there is considerable research on the implications of education for agency, and for health, this research is hardly coherent (on this, see esp. Feinstein et al., 2006; Hay, 2006), necessitating a deepened analysis of how education is beneficial, such as a potential role in the dynamics of agency for physical activity variety.

Education is positively associated with recreational physical activity (Droomers, Schrijvers, & Mackenbach, 2001; MacDougall et al., 1997; Ross & Wu, 1995). However, perhaps due to an ideal of health-behaviour research in health psychology to provide abstract, universal or generally applicable models – education, is treated as a co-variante, control or background variable – and as a result is neglected as an explanatory variable, or even as a predictor variable. Also, similar to much research in psychology (see Arnett, 2008), samples on agency of physical activity are often, exclusively with university students (i.e. a band of education with unclear generalisability). As a result, the nature of education for a particular context (e.g. boomers in Australia) is not considered, and the role of education in physical activity variety is not clear, including whether agency may mediate such a relationship (e.g. self-regulation and social support elicitation). Physical activity variety may be another way in which education impacts positively on people’s well-being.

The two most common measures of education in health research are years of education and level of education attained (Galobardes et al., 2006; Mirowsky & Ross, 2003). The current conceptualisation of education takes into account both these operationalisations, as the literature indicates they are both important to agency – with completion of qualifications and duration of time of exposure to formal education as indicative of accumulation of internal agency (e.g. general skills) and external agency (e.g. external resources).
Self-regulation

Self-regulation is a major theme in general psychology (Bandura, 1977; Boekaerts, Pintrich & Zeidner, 2000; Carver & Scheier, 1998; Ford, 1987, 1992; Karoly, 1993; Kuhl, 2000; MacKenzie, Mezo, & Francis, 2012), in self-agency models of physical activity (Edmunds, Ntoumanis, & Duda, 2006; Karoly et al., 2005; Maes & Karoly, 2005; Umstatt et al., 2008), and other health-related behaviours (Bandura, 2005; Cameron & Leventhal, 1995; Maes & Karoly, 2005). The theoretical antecedents of self-regulation are wide, encompassing behavioural theory, control theory, social-cognitive theories, and psychological need theories (Bandura, 1986; Carver & Scheier, 1998; Deci & Ryan, 2000). ‘Self-regulation’ has been defined as a process (Pham, Taylor, & Seeman, 2001; Schwarzer, 1998), system (Hall & Fong, 2007; Karoly, 1993), ability (Marqués et al., 2005), skill (Annesi, 2011), mechanism (Crews, Lochbaum, & Karoly, 2001), technique (Aiduk & Karoly, 1975), strategy (Dombrowski & Luszczynska, 2009; Kitsantas, 2000), behaviour (e.g. Anderson-Bill et al., 2011; Ayotte, Margrett, & Hicks-Patrick, 2010), and trait or disposition (Grossarth-Maticek & Eysenck, 1995; Luszynska et al., 2004). Nonetheless, across theories, self-regulation tends to refer to a nexus of psychological functions and processes that guide human action (Carver & Scheier, 1998; Karoly, 1993).

Self-regulation is a major topic in health psychology and public health. For instance, often a goal of physical activity interventions is to foster self-regulation (e.g. see Dorough et al., in press; Rasinaho et al., 2011). However, there are rarely studies of general ‘natural’ self-regulation (for exceptions see, Williams, Germov, & Young, 2011), in contrast to research on other forms of everyday adaptiveness, such as coping with stress (e.g. Carver, Scheier, & Weintraub, 1989; Folkman & Lazarus, 1985; Folkman et al., 1987).
The current thesis conceptualises self-regulation as the use of skills and strategies where attention is on being physically active. This conceptualisation of self-regulation is found in social-cognitive theory (e.g. see Umbstatt et al., 2008), as well as public health and health promotion approaches to physical activity (e.g. Anderson-Bill et al., 2011; Fleig et al., 2011). Some scholars distinguish between cognitive and behavioural strategies (e.g. Dubbert & Stetson, 1999; Saelens et al., 2000). Annesi (2011), in an evaluation of a weight management program, operationalised self-regulation as frequency of use of self-regulatory skills or strategies (see also Kitsantas, 2000). The current inquiry is similar to Annesi (2011), by focusing on frequency of skill use.

**Social support elicitation**

Social relations and interdependencies have a significant bearing on health and well-being (Berkman & Kawachi, 2000; Cockerham, 2007; Durkheim, 1952 [1897]; Hall & Lamont, 2009; Holt-Lunstad, Smith, & Layton, 2010; Kim, Sherman, & Taylor, 2008; Lewis et al., 2006; Sayer, 2011; Wilkinson & Pickett, 2009). It is acknowledged that physical activity may be engaged in largely for social reasons (Capalb, O’Halloran, & Liamputtong, 2012), and one of the many benefits of physical activity is social connection (Bayly & Bull, 2001; Chau, 2007; Fensham & Gardner, 2005).

Social support and ‘social capital’ are major themes in public health research (Marmot, 2006; McNeill, Kreuter, & Subramanian, 2006; Veenstra, 2000). For instance, ecological frameworks of physical activity refer to social support (see Cerin & Leslie, 2008, p. 2598), or social capital (Lindström, Hanson, & Östergren, 2001). Measures of social support and social capital are found to correlate with recreational physical activity (e.g.
Cotter & Lachman, 2010; Yu et al., 2011). In addition, studies are emerging on the relationships between social inter-dependencies (e.g. network composition) and physical activity (Ball et al., 2010; de la Haye et al., 2011; Shiovitz-Ezra & Litwin, 2012).

In recognising a role of social support as instrumental in physical activity promotion, psychological theories and interventions emphasise processes of building social support resources and networks in lifestyle change (e.g. Anderson-Bill et al., 2011; Ayotte, Margrett, & Hicks-Patrick, 2010; Carr et al., 2013; Edmunds, Ntoumanis, & Duda, 2006; Molloy et al., 2010; Umberson, Crosnoe, & Reczek, 2010). Numerous physical activity programs have increasing levels of social support as a strategy for helping people be more physically active (e.g. Prestwich et al., 2012; for review, see Kahn et al., 2002). Strategies include connecting program participants with physical activity peers, exercise counselling, ongoing telephone contact, provision of information on physical activity, and supervision during physical activity (Brassington et al., 2002; Hardcastle & Hagger, 2011; Leahey et al., 2010; McAuley et al., 2003; Ross et al., 2009).

Given that social support may be important to initiating and maintaining physical activity (Lindstrom, Hanson, & Ostergren, 2001; Litt, Kleppinger, & Judge, 2002; Stähl et al., 2001), people may seek social support as part of their endeavours to be more active. This form of agency is taken to represent a strategy for physical activity, described by Kitsantas, (2000, p. 811) as “social assistance seeking”, and by McAuley et al. (2011, p. 286) as “eliciting social support”. Social support elicitation appears in physical activity programs (e.g. Anderson-Bill et al., 2011; Prestwich et al., 2012; Roesch et al., 2010), however, similar to self-regulation, research is transient on the everyday or informal forms of social support elicitation.
In the current thesis, the construct of social support elicitation is intended to capture both thoughts of drawing on others in order to be physically active, as well as actual practices of ‘being with’ others as a cue to one’s own activity. This conceptualisation is very similar to that of Umstattd et al. (2009) in considering skills such as approaching a person for advice, but takes into account a larger breadth of thoughts and practices, such as being accountable to others, engaging with others on the topic of active living, and arranging to meet for physical activity.

From a sociological perspective, social support elicitation may be construed as a type of sociality dominant in Western modernity. Specifically, from the point of view of ‘ideal types’ of social action espoused by Max Weber (1968 [1925]), social support elicitation is a case of instrumental rational action. For instance, skills and strategies of seeking social support reflect an orientation of self to others as instruments in capital accumulation.

There does not appear to be previous research on whether social support elicitation may lead to physical activity variety. As argued later, there are good reasons to anticipate that there is a direct effect of these social skills and strategies on physical activity variety.

**Cultural participation**

Cultural participation is a form of agency where people participate in activities in the public sphere, such as going to music concerts, museums, cinemas, and art galleries (e.g. Bennett et al., 1999). These forms of recreational participation have been extensively investigated in sociology, and primarily through population data (Bennett et al., 2009; Bunting et al., 2008; Chan & Goldthorpe, 2007a; van Eijk, 1999).
The presence of cultural participation in the PAV model is significant as it represents a form of agency not normally considered in health psychology and public health in terms of promoting physical activity. The pertinence of cultural participation has been considered in policy – for instance, in Victoria (Australia) there is an initiative to enable more activity through funding community arts projects that involve movement (VicHealth, 2010, pp. 16-17). Health psychology and public health research on environmental enrichment look at some aspects of cultural participation (e.g. Stevens et al., 2001; Fratiglioni, Paillard-Borg, &Winblad, 2004), and cultural participaton as a means to better health (Johansson, Konlaan, & Bygren, 2001; Konlaan et al., 2000), but research is needed on whether cultural participation is a precursor to physical activity variety.

**Cognitive ability**

Cognitive ability has been argued to be a potential confound for educational differences in practices and health, hence the current focus on ability in this thesis. For instance, Pesta et al. (2012, p. 112) stated that: “Often there are compelling theoretical reasons exist for controlling education when testing the effects of IQ (or vice versa) on some outcome”. Before turning to reasons why ability needs to be analysed in conjunction with education, to firmly establish whether there is a unique role of education in physical activity variety, the concept of cognitive ability is first introduced, and then the research literature on ability in a lifestyle and health context.
The literature on cognitive ability refers to psychological capacities for reasoning and problem solving (Lubinski, 2004). While there is much debate on the validity of psychometric approaches to ability and the notion of differences in intelligence (see Gould, 1996 [1981]; Privateer, 2006; Sternberg & Grigorenko, 2002), this perspective is prominent in current psychology and public health research.

Psychometric research has established that there is a robust hierarchical structure to cognitive ability differences. Although numerous structural models have been investigated (e.g. Eysenck, 1979; Guilford, 1982; Horn, 1968), Carroll’s (1993) model is widely regarded as the consensus point on the structure of cognitive abilities (Deary, 2000; Lubinsky, 2004). Carroll’s (1993) factor analysis of a composite of over four hundred data sets, found a three-level hierarchy in generality of domains of ability. At the bottom of the hierarchy are content-specific abilities, which are then subsumed by domain general abilities, that are in turn, all subsumed by a general (content free) cognitive ability (Carroll, 1993). A major distinction in cognitive ability research, and that is in keeping with Carroll’s model, is that between fluid cognitive ability and crystallised ability (Horn, 1968). Crystallised intelligence reflects level of knowledge and vocabulary that has arisen out of previous learning. In contrast, fluid cognitive ability is more to do with effective responding to novel situations and active problem solving. As Deary et al. (2010, p. 55) put it: “Fluid intelligence involves working out things mentally on the spot”.
Cognitive epidemiology is concerned with analysis of distributions of risks to health and incidence of morbidity and early mortality, as a function of differences in cognitive ability (for reviews, Batty, Deary, & Gottfredson, 2007; Deary, 2012; Murray et al., 2012). Through a range of population studies internationally, it is now established that childhood ability (as well as ability measured in early or middle adulthood), is associated with longevity and morbidity status in middle age and older age (Batty et al., 2007; Batty, Deary, & Gottfredson, 2007; Power et al., 2010). Intelligence Quotient (IQ) is an age-standardised operationalisation of cognitive ability (Deary & Batty, 2007). There is much debate on the nexus of associations between ability (or ‘intelligence’), education, other indicators of ‘socio-economic status’, lifestyle patterns and health (for reviews see Deary, 2012; Deary & Johnson, 2010; Link & Phelan, 2005; Mirowsky & Ross, 2003). For instance, it is reported that the relationship between ability and health is accounted for, or greatly reduced by socio-economic circumstances that co-vary with ability (Hemmingsson et al., 2007). It has also been argued that cognitive ability has a health protective role independently of, or in concert with education level (see Batty et al., 2007; Power, Jefferis, & Manor, 2010).

Cognitive ability needs to be investigated simultaneously with education as: (a) the cognitive capacities argued to derive from formal education and the conceptualisation of cognitive ability are very similar – such as leading to a general capacity to learn and to problem-solve (Lubinski, 2004; Mirowsky & Ross, 2003, p. 27), and (b) both variables are consistently correlated with income, occupation level, social mobility and health (e.g. Batty et al., 2007; Calvin et al., 2011; Deary, 2012; Galobardes et al., 2006; Gottfredson, 1997; Judge, Illies, & Dimotakis, 2010; Lubinsky, 2004; Mirowsky & Ross, 2003; Strenze, 2007). Overall, it is claimed that to provide a stringent test of the role of education or ability, both need to be
included in empirical studies (Deary & Johnson, 2010), for instance, to check that ability is not a confounding variable.

In sociology, person differences in “information processing capacity” (Alderson, Junisbai, & Heacock, 2007, p. 202; Chan & Goldthorpe, 2007b) are discussed, and this description is basically equivalent to what is meant by ‘cognitive ability’ in differential psychology. At the same time, sociology has provided a much needed critical perspective on cognitive abilities, such as challenging the legitimacy of intelligence testing and notion of people differing in intelligence (e.g. see Privateer, 2006; Bourdieu, 1978). A major problem, that this thesis will not address (due to the already large scope of the research), is that these critical perspectives have not been acknowledged as relevant, nor used to inform, current debates on inequalities in health.

**Age and gender**

Physical activity contributes to well-being of men and women of all ages (Heesch et al., 2012; Lee et al., 2000; Shiroma & Lee, 2010; USDHHS, 2008). In the three key fields there is extensive research on gender and age, such as gender roles (Bem, 1974, 1981; Markus, Mullaly, & Kitayama, 1997, pp. 45-48; Wood & Eagly, 2002), and on structures of power, such as patriarchy (Connell, 1995; Williams, 1993). However, basic research on how gender and age figure in proximal agency and physical activity variety is needed.
Rationale for current theoretical perspective

Across the fields just reviewed (health psychology, public health and sociology) there is growing consensus on the need for combined attention on individuals and the wider social and material environments they are embedded in (see e.g. Bandura, 2004; Ewart, 1991; Green & Kreuter, 2000; King & Sallis, 2009; Stokols, 1992). It is clear from the above background of the key literatures, concepts and research gaps that, to effectively address the current RQs, a coherent theoretical framework is needed to provide guidance in developing an integrated model. A major purpose of the FMC of social-cultural psychology is to provide integration and synthesis (e.g. see Markus & Hamedani, 2007, p. 6), and is useful in this case. However, the FMC has not been applied to the current research topic, so needed to be tailored, extended and developed. The next section provides a brief introduction to the FMC, and then extensions to it are described.

The Framework of Mutual Constitution

The Framework of Mutual Constitution (FMC) derives from a theoretical principle in social-cultural psychology – that people are ‘made’ by the environment, and in turn, shape that environment (Markus & Hamedani, 2007). The relations between person (psyche and practice) and social-cultural environment, are inter-dependent, recursive, and bi-directional. There are numerous theoretical frameworks that are subsumed by this principle (for review, see Markus & Hamedani, 2007), and of these, the FMC offered by Markus and colleagues, is the most articulate one (e.g., Markus & Kitayama, 2003, p. 282; Markus & Kitayama, 2010; Plaut, Markus, & Lachman, 2002; Snibbe & Markus, 2005).
The notion of ‘mutual constitution’ points to a process, where, throughout a person’s lifecourse there is a constancy and dynamism of continued attunement – of person to culture, and of culture to person (Markus & Kitayama, 2010). Development takes place through attunement to social environments and context. Similar to other frameworks in psychology (e.g. Bandura, 1986; Bronfenbrenner, 1986; Mischel, 2004), in the FMC, the socialisation process is taken to involve both explicit instruction and more tacit forms of learning. Figure 3 also conveys that people are not ‘passive’, but active agents in influencing the processes of society and culture (Markus & Hamedani, 2007, p. 5). While the process of mutual constitution is taken to be dynamic and by definition, reciprocal and cyclical, in addressing the RQs, the focus in this thesis is on the direction from social-cultural environment to person-based agency and practice.

The research program under the FMC is large in scope, as it was developed to challenge universalisms in psychological theorising, by comparing differences such as in culture and self (see also, Arnett, 2008; Plaut, 2010) – fostering development of a social cultural psychology that sees human beings as simultaneously social, cultural, biological and historical (e.g. Fiske, 2006, 2012; Kashima, 2000; Markus & Hamedani, 2007).

Figure 3 presents a slightly modified depiction of the FMC by Markus and colleagues (see esp. Markus & Kitayama, 2010, p. 422; for variations on the FMC, see Kim & Markus, 1999, p. 797; Markus & Kitayama, 1994, p. 571). The person is embedded in three layers – each of them comprising the social-cultural environment. The person is characterised as composed of “perception”, “cognition”, “emotion”, “motivation” and “action” (Markus & Kitayama, 2010, p. 422). For the purposes of this thesis, the respective layers or ‘tiers’ of the FMC will be numbered left to right (1 to 4) as a reference point (as shown in Figure 3).
Figure 3. The Framework of Mutual Constitution (e.g. Markus & Kitayama, 1994).

Societal Factors & Pervasive Ideas
- Ecological, economic, & historical factors
- What is good?
- What is moral?
- What is self?

Institutions & Products
- Educational
- Language
- Political
- Media
- Legal
- Religious

Daily Situations & Practices (Local worlds)
- Home
- School
- Workplace
- Neighbourhood

Self
- Perception
- Cognition
- Emotion
- Motivation

Everyday Practice

TIER 1
TIER 2
TIER 3
TIER 4
TIER 4a
While clearly there are other person-environment interactionist frameworks in psychology (e.g. Bronfenbrenner, 1986; Mischel, 2004; Vygotsky, 1978), the FMC has the attributes to address the current set of RQs, and in particular, it’s potential to provide a ‘scaffold’ for integration of specific fields without undermining the strengths of each of them.

**Pertinence of the FMC to integration of literature**

What is critically important in addressing the RQs is that the FMC allows consideration of both individual-level accounts of physical activity, as well as accounts that foreground the wider social-cultural environment, ranging from the immediate setting that people occupy, to broad cultural, political, economic and historical forces. Figure 3 is useful for illustrating the different foci of the key areas of literature that require integration for the current research. Health psychology focuses on Tier 4 and 4a. Public health traverses mainly Tiers 2, 3, and 4, with much applied research on psychology and physical activity in settings (Tiers 3, 4, and 4a). For population studies on the sociology of culture, data on variables at Tier 4 are interpreted mainly in terms of Tiers 1 and 2.

The FMC emphasises that people are social and relational beings and can only be understood in terms of the habitats they occupy and traverse. This focus protects against the cognitive reductionism and de-contextualisation that is viewed to be a problem with health psychology. Figure 3 (the FMC) conveys the idea that psychology and practice in real time, and at every moment, is shaped by the social-cultural environment, and that very environment has strong inertia with previous cultures and
environments (see Tier 1; Markus, 2008). It is here that the FMC resonates with sociology, such as that of Bourdieu (1978), who characterises people as carrying history in their bodies and deploying that inertia into the future. The FMC adds that the person can impinge through agency directly on Tiers 2 and 3 (‘daily situations and practices, and institutions and products’) and indirectly on Tier 1 (‘societal factors and pervasive ideas’).

The tenets of the FMC are highly consistent with much research in public health. Population research suggests that participation in types of activity are highly stratified by place, gender, age, socio-economic level, and ethnicity (Hunt, Ford, & Mutrie, 2001), and within-country differences endure across time (Scheerder, Vanreusel, & Taks, 2005). Although stratification is not the focus of this analysis, findings of public health research (e.g. Berkman & Kawachi, 2000; Braveman, Egerter, & Williams, 2011; Marmot, 2003, 2006) are consistent with the general notion of the FMC that there may be factors at Tiers 1 to 3 that affect patterns in lifestyles and health. Finally, the FMC invites combined attention to individual differences research as well as research on ‘age’ and ‘gender’ as social-cultural structures and practices (see also Cockerham, 2007; Denton & Walters, 1999; Godin et al., 2010), and the corresponding normative expectations of how to be a certain age and gender, or do age and gender (Connell, 1995; de Beauvoir, 2011 [1949]; Estes, Biggs, & Phillipson, 2003; Vertinsky, 1991). This allows integration of divergent strands of inquiry on the role of age and gender in boomer self-agency and physical activity.
The FMC on education and agency

Education has been a key variable in social-cultural research that takes a FMC perspective, where the objective has been to demonstrate group differences in modalities of self and agency – in this, case between ‘working class’ and ‘middle class’ groups in the US. For instance, Markus takes a nominalist approach to education, in arguing for “different local worlds” in the US (Markus & Kitayama, 2003, p. 36), based on whether or not the person continues education after high school (e.g. Snibbe & Markus, 2005). The different environments of those with less and more education lead to different psychological modalities of being and agency (Markus & Kitayama, 2003, p. 36). Higher education (and middle class contexts) tend to correspond to independent (or disjoint) selves and modalities of agency, while less education (working class contexts) tend to correspondent to interdependent (or conjoint) selves and modalities of agency (Snibbe & Markus, 2005). It is important that the general FMC was not designed to be reducible to this two-modality theory of agency, to maximise openness in research to what may be a great diversity of forms and types of human agency, across different contexts (Markus, Mullally & Kitayama, 1997).

For theoretical and empirical reasons, in developing the PAV model, this thesis departed from the major theory attached to the FMC, that there are two primary modalities of self, environment and agency. The reasons for not adopting the independent-interdependent distinction are as follows:

(a) Identifying group differences or qualitatively distinct modes of self or agency was not the aim of the current research. In beginning to look at context to address the research questions introduced earlier, the current research is only a
first step in adopting a social-cultural perspective, and so is a ‘light’ adoption of the FMC (i.e. minimal in committing to a full structuralist perspective).

(b) While group differences can affect individual differences, it is unclear whether the theory of independent-interdependent modalities of agency would generalise to Australia, and to establish evidence for this distinction in that region is well beyond the scope of a single research project. It is important to note that a premise of the FMC is that agency is organised by the context of place and time; the independent-interdependent distinction may not necessarily apply to all places, such as Australia. While there are clearly structural differences in Australia (Greig, Lewins, & White, 2003), including differential outcomes by education, it is not established that the differences are so large as to confer differences in modalities of being between people.

(c) Evidence for the presence of independent and interdependent modalities of agency is only preliminary. For instance, evidence of group differences on independence-interdependence is not strong (see esp. Matsumoto, 1999).

(d) The approach of categorising people into two groups on education (e.g. Snibbe & Markus, 2005) was viewed here as problematic in terms of the current research topic. Without evidence that people differ on independent-interdependent modalities, there was not a strong basis for dichotomising formal education. This was not only because structural differences in Australia may not be as pronounced as in the US, but also because splitting people into two groups leads to a loss of detail in measurement, thus reducing the capacity to detect effects on agency and physical activity. Such a method may even
‘force’ the notion that people differ on the basis of education. Research in health psychology and public health indicates that it is important to analyse education in detail (e.g. years of schooling, levels of attainment; Mirowsky & Ross, 2003). In addition, looking at levels and continuums is in keeping with the FMC perspective on micro-processes at Tier 4, where, as earlier stated, there is the notion of incremental attunement of person to world as part of larger processes of mutual constitution.

Revisions to the FMC to incorporate health psychology, public health and sociology

The three key fields (health psychology, public health, sociology) may illuminate, in unique ways, the processes involved in psychology that lead to particular patterns of everyday practice. Health psychology is good at testing constructs and evaluating the proximal relationships between psychological constructs and practice (Ajzen, Albarracín, & Hornik, 2007; Bandura, 1986), but tends to neglect context (Pasick et al., 2009). At the same time, social-cultural psychology and sociology embraces context, such as the world that the person experiences, that may come to ‘constitute’ them (Bourdieu, 1978; Markus & Kitayama, 2010), while, ecological perspectives in public health seek to identify environmental and social determinants (e.g. Ding et al., 2012; Grzywacz & Marks, 2001). Although better attuned to context than health psychology, sociology and ecological perspectives tend to neglect the dynamic interplay between proximal constructs in determining everyday practices. The last section suggests that, by drawing on the FMC, these research approaches and accompanying literatures can be integrated, to begin to substantively determine how
education may effect physical activity variety. However, to do this, the FMC needed to be adapted and extended to do so. As illustrated below, by drawing on the analytic concept of ‘habitus’, the FMC is enabled to adopt (a) from health psychology, the psychological processes of enacting practices, and (b) from the sociology of culture, attention to *multiple* tendencies and practices. These two developments are mainly concerned with Tier 4 of the FMC (Figure 3).

**Habitus as a working concept**

‘Habitus’ is a major working concept, or thinking tool from the social sciences (Grenfell, 2004; Swartz, 1997). In habitus, people are conceived as embodying their habitat, as a set of tendencies of psychology and practice (Bourdieu, 1977 [1972]). The term ‘habitus’ began with Aristotle, who was referring to dispositions established through repeated practices (see Nederman, 1989-1990).

Before looking at the value of ‘habitus’ in the current analysis, it is important to note that in proposing habitus, social scientists differ from mainstream psychology in that the research aim is not to measure or operationalise it. Rather, habitus is a *guide* to thinking about the research object (Grenfell, 2004; Swartz, 1997). In particular, it is intended to aid inductive analysis while emphasising (similar to the FMC) that people are social and relational beings and can only be understood in terms of the habitats they occupy and traverse. It is also important to note that by habitus, people are conceived as having internalised their habitat. The internalisation manifests as a set of tendencies, or dispositions, of psychology and practice (see esp. Bourdieu, 1978; Mauss, 1979 [1950];
Wacquant, 2004). Habitus does not mean ‘habit’, but in pointing to systems of dispositions, leaves open consideration of habits when analysing everyday practices (Swartz, 2002).

Habitus serves a number of general purposes, that are canvassed here before looking at how the concept will be used to tailor the FMC: (1) Habitus is considered for the current review as it has tremendous capacity for integration of disparate research and ideas. The drawing on ‘habitus’ in many fields outside of sociology, such as developmental psychology (Marjoribanks, 2006), public health (Lindbladh & Lyttkens, 2002), and accounting (Baxter & Chua, 2008), demonstrate pliability of the concept across areas of inquiry. (2) Habitus resonates greatly with the FMC, as acknowledged in parts by Markus and colleagues (e.g. Markus, Mullally, & Kitayama, 1997, p. 21) as it focuses on the constitutive relations between person and world. In addition, habitus while considering the interplay of persons and environments, provides a fuller account of this constitution as it considers both psychological tendencies and everyday practices; the latter is neglected in the FMC. (3) In habitus, there is an emphasis on the body, and people as “socialized bodies” (Bourdieu, 2000 [1997], p. 155). The emphasis on people as bodily and relational is needed to address some research problems. ‘Physical activity’ is about movement of the body. While this is seemingly to state the obvious, perhaps due to the abstraction of physical activity in health psychology and public health as a ‘health-related behaviour’, the centrality of the body and bodily movement is lost in theorising in these fields. Examples of how habitus focuses on the body includes – how learning takes place through the body and capacities such as skills, are embodied, and how the body is used, deployed and experienced (see esp. Bourdieu, 1977 [1972], 2000
People engage in locomotion (activities) that arise from an interaction of their bodily and psychological tendencies (particular “attunements” to the world), with corresponding features of the social-cultural environment (habitat). (4) Habitus represents what is “practical sense” (Bourdieu, 2000 [1997], p. 143); dispositions that are practical in the most fundamental sense (i.e. survival and ‘getting on’ in the world). Critically, this form of agency does not manifest only as conscious or calculative strategising, but is more in the realm of intuition, and in this way, ties in with this psychological concept (for a review on intuition, see Hodgkinson, Langan-Fox, & Sadler-Smith, 2008). While the use of habitus is often interpreted as suggesting that people hold little agency (Jenkins, 2002), people are agentic via habitus as it is the basis for being, thinking and doing in the world (Hilgers, 2009). (5) Habitus helps look at the significance of education as a social practice that shapes the person. Again, this was the interest of Aristotle when discussing habitus (see Sayer, 2011). From the view of the sociology of culture, education constitutes the person in fundamental ways (e.g. manner of speech, feelings, postures and activities)(e.g. Bourdieu & Passeron, 2011 [1977]). Schooling is a practice – continual exercises and reinforcements. Those with ‘higher’ education become more attuned to the normative orientations of the wider society (Durkheim, 1938 [1895]). (6) Habitus provides a useful analytic tool by focusing on what may be common or homogenous in a nation that people share, more or less, as a disposition derived from that habitat (e.g. see Hage, 2000; Kuipers, 2012).

Summary of extensions to the FMC via incorporation of habitus at Tier 4

‘Habitus’ is adopted as a ‘way of thinking’ that assists the current integration of literature, and in particular, to incorporate strengths of health psychology (the notion of
processes leading to practices), and a strength of sociology (analysis of multiple practices, such as level of variety). Habitus is the bodily site of practical tendencies and mediator of habitat and everyday practices. Accordingly, the concept of habitus invites inquiry into what are the proclivities of the group called “baby boomers” (such as, in light of their formal education), and incorporate insights from health psychology on immediate constructs of self-agency for physical activity (e.g. self-regulation, social support elicitation) and practices of general agency (e.g. cultural participation, such as attendance at cultural venues in the public sphere).

(a) Processes proximal to practices

The FMC does not consider in detail how psychological processes may lead to everyday practices. The process models of health-related behaviour in health psychology are important here for extending the FMC at Tier 4. For instance, self-regulation theories of behaviour and behaviour change delineate hierarchies of steps that lead to an episode of practice (e.g. Carver & Scheier, 1998; Schwarzer, 1999).

The current thesis considers two themes in health psychology – self-regulation and social support – on their salience to general and everyday physical activities – that is, conscious attention to keeping active, that may lead to variety, as well as skills and strategies more to do with implementation and sustaining activity, than with deliberation.

(b) Multiple domains of practice and transfer effects

Sociology has much in common with the FMC (i.e. social-cultural psychology) in looking at psychological tendencies as flowing from social-cultural context. While
the FMC may provide rich accounts of the interaction between social-cultural environment and individual psychology, it tends to neglect the intersection of the former with patterns of everyday practices. This is where the sociology of culture provides much insight, including a large body of empirical literature. Sociology also helps extend this by looking at tendencies in everyday practices, and in particular, psychological tendencies to transfer across practices, such as analysis of multiple domains of practice. At the same time, health psychology and public health investigate multiple practices, but only if they are taken to relate to risks (e.g. ‘sedentary behaviour’, diet, smoking) (e.g. Berrigan et al., 2003; Noar, Chabot, & Zimmerman, 2008; Sanchez et al., 2008; Tobias et al., 2007). This centricity inhibits analysis of ‘non-health’ aspects of life (e.g. cultural participation) that may foster or impede physical activity.

Sociology has gained much insight from analysis of multiple domains of practice and how they intersect – where again the analytic concept of habitus has been fruitful (see e.g. Bourdieu, 2005 [1979]). As will be shown, extending the FMC to look at relationships between domains of practice enables thinking about the role of education in conferring not only cognitive capacities, and multiple tendencies in psychology (e.g. self-regulation), but also how these may determine multiplicities of practice (e.g. cultural participation, physical activity variety), and how these dynamics are affected by the social-cultural environment.

\((c)\) Oscillation between implicit and explicit processes

Habitus is useful for connecting concepts on the distinction between conscious and non-conscious processes in psychology and practice. All three fields, as well as the FMC, takes into account that psychological processes and everyday practices seem to
vary in terms of whether they are conscious and explicit, or non-conscious and implicit (i.e. tacit) (Aarts, Paulussen, & Schaalma, 1997; Bargh & Chartrand, 1999; Markus & Kitayama, 2010; Williams, 1995). For instance, there is growing inter-disciplinary research around dual-process models of cognitive systems and how they inter-play with everyday practices and environmental features (Bargh & Barndollar, 1996; Stanovich & West, 2000; Wood & Neal, 2007; however, see Stanovich, 2009). The interplay between explicit and implicit processes and mechanisms is of keen interest in health psychology (e.g. Keatley, Clarke, & Hagger, 2013).

The current analysis takes the distinction between conscious and non-conscious automatic processes into account in looking at processes of agency between education and physical activity variety. Habitus is useful for integrating relevant literature on these dynamics, as it is often advanced to remind of the non-conscious or tacit aspects of much everyday psychology and practice (see esp. Bourdieu, 2000 [1997]), but also can still incorporate the notion of conscious and rational-actor accounts of practice (cf. Noble & Watkins, 2003) that are assumed in health psychology and public health.

**Summary of extension to FMC**

The FMC was revised to meet the current research objective, and most of all, by adopting the working concept of habitus from sociology. This strengthens the foundations for mapping of the social-cultural environment highlighted in Tiers 1 to 3, and how this environment (habitat) ‘plays out’, to ‘constitute’ the person at Tier 4 (now
conceived in terms of habitus), that is, in terms of immediate dynamics of self-agency of adult physical activity.

The social-cultural environment of the baby boomer generation

To address the current RQs, the FMC provides a good starting point for considering the broad social-cultural context of the baby boomers, such as the major forms of ideation, social processes, political events, and types of institutions, after WWII. Tier 1 of the FMC is about mapping out the social-cultural context of a region and cohort, towards considering what imperatives (explicit or latent) are present. Specifically, Markus and Kitayama (2010, p. 422) invite researchers to ask: “What is ‘good’?” and “What is self?” – as well as consider the economic, historical and political climate, and “ideological foundation” of place (Plaut, Markus, & Lachman, 2002, p. 162). Consistent with this approach of social-cultural psychology, the current synthesis of literature begins with the broadest social-cultural level and then proceeds to the immediate context of the person. Specifically, the remainder of Chapter 1 moves from the macro and meso levels (i.e., Tiers 1, 2 and 3), to the immediate (or micro) dynamics of agency at the individual level, at Tier 4 of Figure 4. Figure 4 now presents Tier 4 and 4a in terms of the current changes to the FMC (shaded in grey), of incorporating habitus
Figure 4. The Framework of Mutual Constitution, extended and tailored to address the current research questions.
to aid analysis: (1) psychological processes leading to practices, and (2) domains of practice. Also, physical activity variety is shown as the form of everyday practice of main interest. As the sub-population of interest is the boomer generation in Melbourne, the following social-cultural account will focus on Australia, and the broader trajectory of Western (‘democratic’ and ‘liberal’) nation states.

**Historical, economic and social factors: Tier 1**

In Western rationalism, physical activity was connected to numerous disciplinary regimes, and most notably – monasticism, aestheticism, and Protestantism (e.g. Protestant work ethic; Turner, 2008), and capitalism (Privateer, 2006). From Ancient Greece, through to the Renaissance, Enlightenment, Romantic period to the industrial revolution and post-industrial age, the idea of physical activity and exercise took on multiple meanings where, for instance, regulation of bodies was thought about in terms of health, fitness, salvation, healing, emancipation, escapism, wellness, rehabilitation, recovery, rejuvenation, competition, improvement, efficiency, character building, achievement, and productiveness (e.g. see Bourdieu, 2005 [1979]; Foucault, 1977 [1975]; Kendall et al., 2011; Kirk & Twigg, 1995; Lindquist, 1988; Mangan, 1989; Park, 2007; Petersen & Lupton, 1996; Rose, 1998; Turner, 2008).
Social-cultural environment of the baby boomer generation: Tiers 1 to 3

Consideration of the social-cultural environment that the baby boomers experienced, points to events, processes and their cumulative effects on people. The period of the boomers in Australia was marked by relative economic stability immediately after WWII, but also unprecedented political, economic and cultural change (for details, see Appendix 4). According to the literature, a set of broad social processes took place, among them – secularisation, individualisation, informationalisation, globalisation, consumerisation, urbanisation and neo-liberalisation (see Appendix 5 for descriptions). What is common across these processes are manifestations of homogenisation (more similarity) and heterogenisation (more difference). A summary of examples of homogenisation and heterogenisation for major themes in the current thesis (health, education, physical activity, self, cultural participation, and sociality) are presented in Table 3. Table 3 indicates that while homogenisation and heterogenisation were both apparent throughout the boomer era, forms of the latter were most pervasive after 1970. In this section it will be argued that the broad social processes and their culmination in concurrent homogeneity and heterogeneity would have significant implications for development of boomer ‘habitus’.
Table 3. Broad processes of homogeneity and heterogeneity during the age of the boomers, in parallel to current concepts

<table>
<thead>
<tr>
<th>HOMOGENISATION</th>
<th>Concept</th>
<th>HETEROGENISATION</th>
<th>Concept</th>
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<tr>
<td></td>
<td><strong>More similarity</strong></td>
<td></td>
<td><strong>More difference</strong></td>
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<tr>
<td></td>
<td>Mainly 1945 to 1970</td>
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<td>Mainly 1971 to 2005</td>
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<tr>
<td>Nationalisation of health care(^1) (e.g. Medicare)</td>
<td>Health</td>
<td>The new public health: lifestyle approaches, citizen as health consumer, consumerisation of health(^14)</td>
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<tr>
<td>Start of “epidemiological transition”(^2)</td>
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<td>Challenges to medicine as health authority(^19)</td>
<td></td>
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<tr>
<td>National Prevention Institutes(^3)</td>
<td></td>
<td>† Concepts of health &amp; ambiguity on meaning of “being well”(^20)</td>
<td></td>
</tr>
<tr>
<td>Symbolism: health &amp; vitality for national identity, competitiveness, productivity &amp; strength(^7)</td>
<td>Education</td>
<td>†Sources of informal education(^21) (e.g. internet, reality TV)</td>
<td></td>
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<td>Mass secular education(^3)</td>
<td></td>
<td>† Institutions for ‘lifelong learning’(^22)</td>
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<td>Implementation of national (and state-based) testing regimes(^6) (continues in 2005: NAPLAN, citizenship test)</td>
<td>Physical activity</td>
<td>Commercialisation &amp; marketisation of exercise(^25)</td>
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<tr>
<td>Physical education in schools(^2) (circa 1950s)</td>
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<td>Diversification of activities &amp; institutions for activity (e.g. sports)(^24)</td>
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<td>Military training &amp; mass exercise(^3) (inertia of war years)</td>
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<td>“Active living”, where health through variety, but guidelines are generic and prescriptions for health, ambiguous(^23)</td>
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<td>National physical activity campaigns(^3) (circa 1990 to 2000)</td>
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<td>Singular routine &amp; exercise regime for health(^10) (esp. 1960-1980s)</td>
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<td>Growth of fitness industry(^11)</td>
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<td>Physical activity as solution to “obesity epidemic” in Australia(^12)</td>
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<td>Imperative of good citizenship as active citizen: work &amp; play(^13)</td>
<td>Cultural participation</td>
<td>Immigration &amp; multi-culturalism(^26)</td>
<td></td>
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<tr>
<td>Imperative to be active consumer(^14)</td>
<td></td>
<td>† Variety in tastes &amp; practices, access to more subcultures &amp; lifestyles(^27)</td>
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<tr>
<td></td>
<td></td>
<td>New themes: cosmopolitanism, eclecticism, post-modern lifestyle(^28)</td>
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<td>HOMOGENISATION</td>
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<td><strong>More similarity</strong></td>
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<td>Mainly 1945 to 1970</td>
<td>Mainly 1971 to 2005</td>
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| Normalisation through schooling: build self-regulation in all | Self-Regulation as part of “independent self”, seeking uniqueness, individuality, distinction |
| Emphasis on individualism as normative orientation (esp. post-1970s) | Market message: design identity through physical activity |
| | Self-regulation as part of “entrepreneurial self” (i.e. innovation, enterprise) |
| | Notion of ‘multiple selves’ and possible selves in academic psychology |

| Communitarianism strong just after WWII | Sociality |
| Increase in theme of social networks & capital | Increase in individualism as social expansiveness |

Note: † Increase in prevalence, or intensification of process


**Forms of national-level similarity**

The FMC prompts analysis of what may be homogenous at a national level, as demonstrated by Plaut, Markus and Lachman (2002, pp. 162-163) for the US. The social, political, and economic environment from the 1950s to 1970s was primarily one
of nationalism, including nationalisation of public health care, welfare services and mass education. For instance, in the immediate years after WWII there was much rebuilding of nations, a prominence of social democratic thinking, national protectionism, and centralised government (Baum, 2008; Sewell, 2009; van Krieken et al., 2010). Increased homogeneity included symbolism of national strength, dynamism, and productivity, of which physical activity was a central theme.

**Forms of national-level difference**

While homogeneity was most visible during the 1950s, heterogeneity became more apparent during the 1960s and 1970s as a result of major political and cultural movements, and much social experimentation. Following these events, and governmental responses to economic recessions of the 1970s, there was an opening of markets, such as privatisation, commodification and marketisation (Sewell, 2009). Economic and political changes during the late 1970s and 1980s, such as the rise of neo-liberalism, are usually offered to account for the massive rise in differentiation, decentralisation, fragmentation, individualism, and consumerism at the end of the 20th century (e.g. Grenfell, 2004; Harvey, 2005; Sewell, 2009).

*The emergence of variety in tastes and practices of individual adults*

The single empirical regularity that stands out in sociology that illustrates heterogeneity, is the increase in prevalence of individuals participating in variety and exhibiting eclecticism (see cultural participation, in Table 3). After WWII, more and
more forms of lifestyle emerged, and this differentiation intensified in the 1960s and 1970s (Zablocki & Kanter, 1976). For cohorts prior to WWII there seemed to be correspondences between socio-economic position and lifestyle (Peterson, 2005). There is consensus that, after WWII, cultural repertoires were characterised by variety in tastes and practices, and especially in ‘middle’ and ‘upper’ socio-economic groups (Gayo-Call, Savage, & Warde, 2006; Prieur, Rosenlund, & Skjott-Larsen, 2008; Zablocki & Kanter, 1976). Within the sociology of culture literature, the main interest has been in the broadening of repertoires for individuals included incorporation of tastes and practices that were viewed as ‘middle brow’, ‘low brow’ or ‘popular’ forms were displayed by those with much economic and cultural capital, and called “cultural omnivores” (Peterson & Kern, 1996).

Variety in tastes and practices has been identified through population research in sociology, and as manifesting within and across domains of taste and practice, such as: music (Katz-Gerro, 1999; van Eijck & Lievens, 2008; Warde & Gayo-Cal, 2009), books and other literary materials (Purhonen, Gronow, & Rahkonen, 2010; Warde & Gayo-Cal, 2009), art (Sintas & Alvarez, 2004), and place of ‘eating out’ (Warde, Martens, & Olsen, 1999). The omnivore trend is global, and primarily Western. A review by Peterson (2005) found reporting of high variety in tastes and participation in at least 12 countries.

There are numerous speculations as to the reasons for cultural omnivority and participation in variety (see Bauman, 2000; Beck, 1992 [1986]; Cheyne & Binder, 2010, pp. 338-339; Emmison, 2003; Giddens, 1991; Holt, 1997; Lahire, 2008; Lamont, 1992; Lizardo & Skiles, 2012; Peterson, 2005; Peterson & Kern, 1996; van Eijck &
Bargeman, 2004, pp. 440-443; Warde et al., 2005; Wright, 2011). For instance, the primary social processes of heterogenisation (right column of Table 3), have all been raised as sparking an increase in variety of tastes and practices. A common thread through these accounts is that people, especially after the 1970s, were ‘opened up’ to a broadening range of cultures and traditions, choices, lifestyles, symbols status, conceptions of health and well-being, and models of the ‘good life’. While previous generations were socialised by a couple of common traditional sources such as the state, religion and family, there was considerable diversification and proliferation of groups and ways of life from 1945 to 2005. The implication of the range of social processes then, is that at Tiers 3 and 4, people during the boomer era would experience an increase in opportunities for cultural participation, ways of being and tastes, a relaxing of what is deemed as acceptable practice, and the ideal of eclecticism.

**Education and variety level**

At a population level, variety in recreation is found to vary with age, education, occupation level, gender, ‘race’, ‘ethnicity’, and household structure (Bihagen & Katz-Gerro, 2000; Gayo-Cal, Savage, & Warde, 2006; Katz-Gerro, 1999; Trienekens, 2002; Warde & Gayo-Cal, 2009). Among these, education is one of the most consistent predictors of variety in practices (e.g. Alderson et al., 2007; van Eijck, 1999; van Eijck & Bargeman, 2004; Warde et al., 2005), and tastes (e.g. Bennett et al., 1999; Bourdieu, 2005 [1979]; Purhoenen, Gronow, & Rahkonen, 2010).
Physical activity at the interface of similarity and variety

Through all the complexity, change and heterogenisation summarised in Table 3, one constant, arguably was that ‘being active’ remained a normative ideal, as well as the idea that physical activity was good for health (i.e. a type of homogeneity).

Physical activity is a domain of recreational practices where both homogeneity and heterogeneity applied (Table 3). It is significant that from the 1950s to the end of the century, physical activity levels declined, prompting government policy on physical activity promotion, and more general moralisation of physical activity and health through markets and nation states in the 1970s onwards (Petersen & Lupton, 1996; for US, see Howell & Ingham, 2001). Much of this moralisation was a co-optation of Western ideals throughout history (canvassed earlier) that could be ‘performed’ through physical activity (e.g. see Turner, 2008). Physical activity policy became common at all levels of governance in Australia, and also internationally (see Appendix 6 for examples), and efforts at promoting physical activity are replete for many settings at Tier 3 of the FMC (see Appendix 7). Nevertheless, ways to have a physically active lifestyle are ambiguous, such as what physical activity to do, and how, to realise the health benefits. Further, there were general impositions stemming from broader processes (e.g. consumerisation) to adopt variety in general. The message to the boomer was an ambiguous yet forceful one: to be ‘good’ and ‘well’ was to be an active citizen and consumer, to exercise self-responsibility, to exercise choice, and most of all, do all this through physical exercise. In other words, there was a tension between conformism and individualism. Physical activity variety is likely to be common, as people are caught
between overtures for living an activity lifestyle while also adopting variety in their everyday practices.

Implications of the social-cultural context and formal education of the baby boomer generation: formation of habitus for physical activity variety

As noted earlier in the chapter, formal education is a major process of socialisation into the normative features of a society, including development of competencies for participation in societal norms (Durkheim, 1938 [1895]). Given that education is theorised to arise in a ‘habitus’ for society’s norms including capacities to engage with and challenge them, and given the environment just described, it could be argued that those with more formal education would become more attuned to the rather ambiguous normative pressure to conform (e.g. dictates to be ‘active’, ‘good’, and ‘well’) by taking part in difference and diversity. Overall, those with education would gravitate in practice to physical activity variety, as it combines the two internalisations that the generation experienced that become intensified with formal education – inclination towards normative morals and ideals (be good, well, healthy, productive), and capacity to engage in (including ‘getting lost’ in) the ambiguities and constant changes to means and ends (e.g. myriad choices, ideals, lifestyles) that arise from the individualising effects of education.
Research on education and physical activity variety

The above inference from the totality of the literature suggests a relationship between education and physical activity variety. Is there evidence for this in the literature? Epidemiological studies demonstrate a positive relationship between education and physical activity (Adabonyan et al., 2010; Cotter & Lachman, 2010; Droomers et al., 1998; Maitra, 2010; Pratt, Macera, & Branton, 1999; Trost et al., 2002). However, these studies did not look at physical activity variety, per se. Nevertheless, there is some indirect evidence from the literature that the general relationship between education and tendencies for participation in variety identified in cultural research, may generalise to physical activity. Onge and Krueger (2011) investigated the role of education in physical activity in the US (n = 17,455), and this sample included the baby boomer generation. The research was on participation in each of 15 types of activity in the previous two weeks, and a factor analysis revealed three clusters ‘team’, ‘fitness’ and ‘facilities’. Education predicted participation in each of the three domains of activity. Although there was not a single variable to designate physical activity variety, the comprehensiveness of education as a predictor of multiple domains of activity is indirect evidence of a link between education and physical activity variety. However, the Onge and Krueger (2011) study did not consider immediate dynamics of agency that may inform the link between education and variety were not investigated.
Summary of contextualisation of the baby boomer generation

In returning to the three major questions posed in the FMC (Tier 1), at the start of this section – “what is good?”, “what is moral?”, and “what is self?” (Markus & Kitayama, 2010, p. 422), the current synthesis of literature suggests that the baby boomer generation experienced a complex social-cultural and political environment that issued imperatives for both sameness and difference. Physical activity was at the intersection of both impositions. The normative orientation (sameness) was to be participative, productive and flexible, as well as engaging in physical activity for purposes of health. At the same time there was great heterogeneity (differences) as what the ‘ends’ may be, and the means to the ends were far from coherent. There was a broadening of ways to be an agent, especially with consumerisation in the 1980s.

It was argued that the experience of living amidst the tension arising from processes of similarity (homogeneity) and difference (heterogeneity) would create a relationship between education and physical activity variety of the baby boomers. People born between 1945 and 1965, would come to internalise these processes, and such internalisation would be most intense for those with more formal education. Education inculcates internal and external capacities of individual boomers for both attunement to normative ideals, but also embracing the ambiguity of those offerings – leading to a pluralisation of practices in current life. As physical activity was promoted as a dominant form of normative ideal, and this ideal was ambiguous (e.g. how to ‘be active’ unclear and multifarious), physical activity variety is an important dimension of everyday practice that could be linked to education.
Overall, a general pattern is anticipated, where those with more formal education exhibit a higher level of physical activity variety. Consistent with a social-cultural perspective (mutual constitution), the nature of this significance of education on baby boomer agency and practices is not invariant, but highly contingent on the social-cultural context (Snibbe & Markus, 2005) – in this case, the macro-level significance of education for the baby boomer generation, coupled with emphases on physical activity, cultural participation, self(-regulation) and instrumental sociality (Table 3). These emphases are replete at a material level (Tiers 2 and 3), for instance, Melbourne offers opportunities for variety, and for this in physical activity and cultural participation (please see Appendix 8 for examples).

The overall contextualisation of the baby boomer generation in this section suggests that there would be a general relationship between formal education and physical activity variety, and there is some indirect evidence for such a link (Onge & Krueger, 2011). But how would this take place in terms of processes at the level of individuals (i.e. at Tier 4 – immediate self-regulation, and lifestyle patterns)?

Chapter 1 now turns to the issue of how this general relation takes place in terms of proximal agency – i.e. the pathways intervening education and physical activity variety in the PAV model – in light of the social-cultural environment just described. It will be argued that the impact of education on physical activity variety, takes place primarily via two pathways: (1) first, self-regulation and social support elicitation, and (2) cultural participation. Then the case is made that education influences physical activity variety independent of, and in conjunction with, cognitive ability. The final
sections look at age and gender – the two exogenous variables that sit alongside education in the PAV model. In moving through sub-parts of the PAV model, hypotheses are proposed at the end of each, and Chapter 1 finishes with the list of hypotheses. For parsimony in Chapter 1, additional hypotheses are briefly referred to as they become relevant in each section, and details of these are provided in the Appendices.

**Two major structural paths**

Research questions at the start of Chapter 1 were: Does education determine physical activity variety (RQ1)? – and – Is any effect of education mediated by proximal agency, such as (a) self-regulation, (b) social support elicitation, and (c) cultural participation? (RQ2). It is proposed below that formal education of the baby boomer generation inculcated at least two tendencies that lead to physical activity variety: (1) paying attention to physical activity in the form of self-regulation and seeking social support, and (2) adoption of general variety in recreational participation, where there is no cognisance of keeping physically active.

1) *Education, self-regulation, and social support elicitation*

The starting point in the proposed pathway is education directly impinging on self-regulation of physical activity. Education increases agency, and this impact is wide-ranging, as shown by psychological research (Bandura, 1997).
Education may lead to more self-regulation in everyday life, and in particular, for physical activity. It is commonly found that those with more education engage in higher levels of physical activity (Adabonyan et al., 2010; Droomers et al., 1998; Mirowsky & Ross, 2003; Murakami et al., 2011), although other studies find no association, and education is not firmly established as a determinant of physical activity (Bauman et al., 2012). Insofar as education is tied to physical activity participation, self-regulation of physical activity is one potential explanation for the link. Indeed, a major premise of health education and public health campaigns is to encourage or enable self-regulation (Bandura, 2004).

Before looking in detail at processes for the latter two steps of the pathway (self-regulation → social support elicitation → physical activity variety), it is important to reiterate the notion of processes of agency leading to everyday practices. Forms of implementing and securing practices are needed to enact everyday practices (Johnston et al., 2004, p. 533). In the case of physical activity variety, important skills would include self-monitoring of levels of physical activity (as part of self-regulation), and ‘setting up’ bouts of activity (i.e. asking friend to join for activity).

The next segment of the proposed pathway is self-regulation influencing social support elicitation. A major form of sociality of baby boomers is instrumentalism (Table 3), such as seeking social support. Two skill sets that comprise self-regulation – problem solving and monitoring – may lead the adult to consider seeking social support as a route towards keeping physically active. The notion of “eliciting social support” has been argued to represent a self-regulatory strategy in itself (e.g. Umstattd et al.,
Indeed, social support elicitation has been modelled as an indicator of, or extension of self-regulation as a latent construct (e.g. Rovniak et al., 2002).

The final segment of the pathway is a transition from social support elicitation to physical activity variety. Again, social support elicitation is posed here as the critical bridge from attention to physical activity (self-regulation), to everyday practice (physical activity). For instance, social support elicitation involves strategies such as contacting a friend for a get together to exercise; this could be a step towards a ‘bout’ of physical activity. Part of the process of social support elicitation leading to physical activity may also include transfer of control of practice instigation to the environment. This process parallels concepts from health psychology, such as “collaborative implementation intentions” (Prestwich et al., 2012, p. 486), and “action planning” (Allan, 2008, p. 62), as mechanisms that lead to episodes of physical activity. This process is also similar, in part, to the notion in classical sociology of “physio-psychosociological assemblages of series of actions” (Mauss, 1979 [1950], p. 120).

The transition from social support elicitation is not claimed here to take place simply in terms of physical activity, but physical activity variety. Going to others for support is likely to propel the person into variety of physical activity, as: (1) others are likely to do other activities than the person seeking support as there are multiple activity options in the current environment (e.g. recall Appendix 8 on infrastructures for physical activity in Melbourne); (2) asking for information and how to keep active is likely to lead to awareness of other activities, and opportunities for participation; and (3) the interpersonal dynamic that follows solicitation may lead to invitations to take part in new activities.
Overall, it is asserted that formal education for the baby boomer generation was pervasive in shaping the boomers’ psyche and everyday practices, where, in this case, those with higher education will tend to pay attention to physical activity in the form of self-regulation and seeking social support. Social support would in turn, generate participation in a diversity of physical activities. At an operational level, this can be investigated as indirect and mediational relationships. A strong test would also need to take account of age, gender and ability in physical activity variety – potential determinants considered in the forthcoming sections.

The first hypothesis is that:

- $H1$: Controlling for age, gender and ability, education will be a positive and indirect determinant of physical activity variety, where (a) education has a direct positive effect on self-regulation, (b) self-regulation has a direct positive effect on social support elicitation, and (c) social support elicitation has a direct positive effect on physical activity variety.

It is conceivable that social support elicitation precedes rather than follows self-regulation. It is also plausible that cultural participation may determine the frequency of self-regulation of physical activity. The arguments for these alternative (or competing) pathways are presented in Appendix 9.
2) Education, cultural participation, and physical activity variety

Before looking at sub-steps of the proposed pathway: education → cultural participation → physical activity variety – the overall theory behind it is first outlined. The general claim for this pathway is that, with more formal education there is an increased tendency to adopt general variety in recreational participation.

It was earlier argued that while the baby boomers collectively would have a tendency to variety as an outcome of their more or less shared social-cultural environment, and this tendency for mobility and variety is intensified by an experience of more formal education. Education provides basic psychological and external resources to participate in the world, which of course is one of the institutional goals of formal education (Durkheim, 1938 [1895]), but the emphasis here is on how this becomes internalised in a deeply bodily way (cf. Bourdieu, 2000 [1997]). In the case of the broad ‘baby boomer’ context described earlier, education transfers into a bodily orientation for movement that manifests as a wide variety of participation in cultural participation. The repeated practices that come from formal education are argued to lead to an internalised bodily tendency to be outward, expansive, but as a form of being (i.e. as emphasised in the Aristotelian notion of habitus). Education is one form of generalisation of an internalised tendency to be expansive. Education confers enablement for general mobility in the form of a bodily-tendency for cross-situation transfer. The tendency to variety arises out of attunement to solicitations in the environment on what are taken as normative ideals of being ‘good’ and ‘well’ (cf. Markus & Kitayama, 2010), but at the same time, adoption in practice of the ambiguity in means and ends, that this expansiveness entails.
In terms of the first segment of the pathway (education → cultural participation), it is reiterated that (a) variety was a key characteristic of lifestyle patterns during the age of the boomers, and (b) there is a consistent positive association between education and variety in participation (e.g. Bennett et al., 1999; van Eijck & Bargeman, 2004).

The second segment of the pathway (cultural participation → physical activity variety) is part of the same process as the first segment – that is, there is a tendency to be expansive and outward that is realised in varieties of practice. The process is one where physical activity variety is a more specific form of variety arising out of general variety that is indexed by cultural participation. It is anticipated that there would be a generalisation effect, whereby cultural participation takes place and leads to physical activity variety.

Across disciplines there is a distinction between conscious and effortful agency and unconscious (or pre-conscious) or automatic agency (Aarts, Paulussen, & Schaalma, 1997). Such processes are discussed with respect to ‘habitus’, in sociology and culture research – that is, transfer of the person across situations and settings as a social disposition (e.g. Bourdieu, 2005 [1979]; Lizardo & Skiles, 2012). In terms of the current topic, the nature of the proposed mediation (education → cultural participation → physical activity variety) may occur largely as a tacit, generative, and non-conscious process. If this pathway takes place in a primarily non-conscious way, it is suggested that the pathway (a) occurs via recreational participation, and (b) takes effect, independent of levels of self-regulation of physical activity (i.e. the first major pathway proposed for PAV model). This would be partly supported, if it is shown that the pathway takes place independent of conscious self-regulation (i.e. $H1$).
Overall it is proposed that education determines physical activity variety due to a tendency to take part in variety in general, as exemplified by participation in cultural practices (e.g. visiting cultural venues in the public sphere). Importantly, the anticipated pathway from education to physical activity variety via cultural participation is argued here to take place independently of what is the focus of health psychology – that is, conscious self-regulation of physical activity (i.e. \( H1 \)). It is predicted that:

- \( H2 \): Controlling for age, gender, ability, self-regulation and social support elicitation, education will indirectly and positively determine physical activity variety, where (a) education directly effects cultural participation, (b) cultural participation directly effects physical activity variety.

**Cognitive ability**

This sub-section considers the role of cognitive ability in the dynamics between education, and agency of physical activity variety. It concerns RQ3, that is: does cognitive ability play a role in proximal agency, and physical activity variety?

**Education and cognitive ability**

There is consensus that education is connected to cognitive ability (Judge, Illies, & Dimotakis, 2010; Nisbett et al., 2012, pp. 151-152), and evidence is provided that schooling is a determinant of level of cognitive ability (Ceci, 1991). In the US, Ceci and Williams (1997) reported that exposure to school learning was associated with ‘higher intelligence’ (IQ). In Sweden, Cliffordson and Gustafsson (2008) reported length of
schooling to be associated with increased intelligence such as fluid cognitive ability, and that this link remained after controlling for age.

The FMC prompts attention to the environment in constituting people, including their agentic capacities, such as abilities. Considering Tier 3 of the FMC (settings such as schools, Figure 2), environmental ‘enrichment’ is an inter-disciplinary concept, whereby environments ‘nourish’ and ‘nurture’, including increased ability levels. This developmental view points to the experience of schooling as fostering cognitive problem solving capacities, as is a key purpose of education (Barnett & Ceci, 2002). Again, it is important to recognise the cultural-historical legacy to these ideas. In particular, Aristotle discussed the role of education as repeated practice and training (paideia; Thomson, 1953), in establishing a disposition that can be applied in various situations, including development of intelligence (e.g. nous; Warne, 2006).

While the early stages of development of cognitive ability is influenced by environments (Garlick, 2002), the level of malleability or change of fluid cognitive ability in adulthood is a matter of much debate (Jaeggi et al., 2008). A major source of evidence for the role of the macro-environment in changing ability levels is the ‘Flynn effect’, which refers to the increase in population level cognitive ability, as indexed by rises in IQ levels since the 1930s (Dickens & Flynn, 2001; Flynn, 1987, 1999). The major explanation for this effect is increased “environmental complexity” during the second half of the 20th century (Schooler, 2007; i.e. Tiers 2 to 3 of FMC), leading people to increase their learning capacities as they adapt and strive in the midst of the cognitive demands of the ecology (as described in the earlier contextualisation of the boomer era) such as wider access to formal education.
Additional evidence of the role of environment in levels of ability comes from longitudinal findings of Schooler and Mulatu (2001; see Schooler, 2007, pp. 375-376) on development of “intellectual functioning” in jobs varying in technical complexity (i.e. at Tier 3 of FMC). Specifically, those with more education are more likely to enter and engage in ‘higher’ level occupations, that in turn develop cognitive ability in adulthood. Finally, there is evidence from neuroscience on changes to brain structures as a result of context-specific experience, such as type of occupation (Maguire et al., 2000, cf. Park & Huang, 2010).

The notion of education developing cognitive ability is also found in human capital perspectives within health psychology, public health and economics. From this view, education is understood to build multiple forms of capital in individuals, that improve general functioning and well-being (Mirowsky & Ross, 2003). Individuals become independent agents of capital and capital accumulation (Becker, 1962). From this perspective, cognitive ability is a type of “mental capital” that is an outcome of capital accumulation (Feinstein, Vorhaus, & Sabates, 2008).

An integration of these literatures on ability and education suggests that education enables people via acquisition of cognitive abilities and capacities, including (a) through direct instruction, training and practice of ways of thinking (e.g. technical problem solving), and (b) exposure to environmental complexity outside of (and following) formal education, that comes with diverse resources afforded by education, including an internalised propensity to seek that complexity, and gains in cognitive ability as a result of continued learning in those environments. It is predicted that:
• **H3:** Education will have a direct and positive effect on level of cognitive ability.

**Cognitive ability and self-regulation**

Batty, Deary and Gottfredson (2007, p. 284) proposed that the relationship between ability and mortality is mediated by prevention and management of chronic disease. Self-regulation and physical activity are both considered as important to chronic disease management and prevention (USDHHS, 2008). Constructs or forms of functioning that are argued to be isomorphic with cognitive ability, such as working memory and executive functioning, are also proposed to play a role in proximal agency for physical activity and health (e.g. Hall, Crossley & D’Arcy, 2010; Miller et al., 2011).

It is commonly claimed that cognitive ability is linked to self-regulation and ‘healthy lifestyles’ (e.g. Gottfredson & Deary, 2004). Research on cognitive abilities takes a task-based view of everyday practices. Ability is argued to determine ‘performance’ on tasks conceived to lead to, or comprise, health-related behaviours, and particularly those viewed to have higher task complexity (e.g. building knowledge, problem solving, choice making, anticipating long-term implications of a practice, following complex instructions on self-care) (e.g. Batty et al., 2006; Beier & Ackerman, 2003; Gottfredson, 1997, 2004). For instance, Gottfredson (2004) argues that instrumental tasks of self-care resemble tasks that are found in the occupational domain. Abilities differentiate work performance (e.g. see Gottfredson, 1997; Kuncel, Hezlett, & Ones, 2004; Schmidt & Hunter, 1998, 2004), and ability may generalise to
‘performance’ in settings outside of education and work, as evidenced by robust correlations of IQ with a range of life outcomes (Gottfredson, 2004).

The just-cited literatures also propose that cognitive ability is associated with more attention to physical activity. For instance, it has been argued that higher cognitive ability is more likely to lead to knowledge on risks of everyday practices, increased likelihood of having a future time perspective (e.g. mindfulness of long-term implications of immediate practices for health), and would, with socio-economic mobility, circulate in settings that emphasise health and prevention, and provide the resources for it (e.g. health services, safe environments) (see Gottfredson, 2004).

Both education and cognitive ability have been proposed as determinants of how much self-regulation is conducted, but both potential factors have not been looked at together as predictors of self-regulation of physical activity. Taking into account claims that ability may affect self-regulation independently of education level (e.g. Gottfredson & Deary, 2004), it is predicted that:

- $H4$: Cognitive ability will have a direct and positive effect on self-regulation.

Some scholars argue that cognitive ability plays a pervasive role in everyday agency and behaviour (see esp. Brand, 1987; Jensen, 1998). In the current analysis, two alternative models are described that are consistent with the notion of a central role of cognitive ability in self-agency and everyday practices (see Appendix 10).
Age and gender

The final research question was: what is the role of age and gender in adult agency and physical activity variety? (RQ4). Age as a determinant of cognitive ability and physical activity variety is discussed first, followed by differences in cultural participation and physical activity variety as a function of gender.

Age and cognitive ability

Cognitive abilities are found, generally, to begin to decrease between 20 and 30 years of age (Salthouse, 1998; Schroeder & Salthouse, 2004). However, a closer look shows that the relationship between age and cognitive ability is complex, as it is contingent on age interval, type and level of cognitive functioning, performance domain, cohort and region (Avolio & Waldman, 1994; Brayne, 2007; Grady, 2012; Hedden & Gabrieli, 2004; Li et al., 2004; Schaie & Willis, 1993). For example, from middle age to older age, fluid cognitive ability is found to decline from middle age to older age (Salthouse, Pink, & Tucker-Drob, 2008; Schaie & Willis, 1993), crystallised intelligence, such as vocabulary, found to remain stable or increase (Li, 2003; Li et al., 2004; Park et al., 2002; Salthouse, 2004). Reduced cognitive processing speed with advanced age is believed to contribute to decreases in fluid cognitive ability (Deary, 2000; Salthouse, 1996).

There is no definitive framework on causes of age-related differences in cognitive abilities, or cognitive functions thought to underly ability. Nevertheless, there is consensus that biological, psychological, cultural, social, behavioural, and economic
processes all contribute to changes in cognitive ability across the lifespan (Grady, 2012; Li et al., 2004; Lindenberger & Baltes, 1997; Park & Gutchess, 2006; Schaie, 2011).

To summarise, the empirical literature consistently reports a negative relationship between age and fluid ability at the ‘middle age’ interval of life (Salthouse, 2004). The common anticipation across these accounts, and the empirical literature, is that:

- \( H5 \): Age will have a direct negative effect on cognitive ability.

**Age and physical activity variety**

In Western countries, age is consistently associated with lower levels of general physical activity (e.g., Anderson-Bill et al., 2011; Norman et al., 2003; Shaw & Spokane, 2008; Sisson et al., 2012). The nature of relationship between age and participation level in particular types of physical activity is much more variable (e.g. walking, aerobics, sports; ABS, 2007; Bélanger, Townsend, & Foster, 2011). While the potential effects of age on physical activity level has received much attention, literature on the relationship of age to physical activity variety is sporadic. Lefèvre and Ohl (2012) conducted a sociological study of recreational activity in France (n = 6,526; age 15 to 75) and found that those of older age to report a lower level of physical activity variety. In Australia, Dafna et al. (2012) looked directly at variety of physical activity, however it was for adults over 65 (i.e. not including the boomer generation). Considering these studies, it is unclear whether age is associated with less variety in physical activity for boomers in Australia.
To clarify whether and how age may effect physical activity variety, the FMC affords attention to biological, social and cultural factors. Biological perspectives point to reduction in physical capacities and functioning with age (e.g. Mechling & Netz, 2009), such as maximum oxygen consumption (Lemura, von Duvillard, & Mookerjee, 2000). Age-related biological change may limit the amount of physical activity (Lemura, von Duvillard, & Mookerjee, 2000; Sallis, 2000), explaining how the negative activity-age relation is most pronounced for vigorous physical activity (Bélanger, Townsend, & Foster, 2011; Pratt, Macera, & Blanton, 1999), and more vulnerability to injury with age, where the boomers are a major group seeking health care for physical injuries resulting from physical activity (Rutherford, 2001). Changes of physical functioning with age may also impact on physical mobility (Chakravarthy & Booth, 2003), and so, constrain the level of variety of physical activity in recreation.

The social-cultural point of view directs attention to ‘age’ as a social process, such as the impacts of ageism, thereby partly challenging the notion of invariant change sometimes implied by biological perspectives. For instance, stereotypes of ageing, age-defined social roles and institutionalisation of ageing (Estes, Biggs, & Phillipson, 2003), are likely to reduce level of physical activity with chronological age, such as mitigating or accelerating biological aging (Ory et al., 2003). Although environments continue to not be ‘age-friendly’ when it comes to physical activity (WHO, 2007), there are emerging initiatives to address this (e.g. see Satariano et al., 2012).
Overall, across perspectives on age and physical activity, there is convergence on the prediction that:

- \( H6: \) Age will have a direct negative effect on physical activity variety.

**Gender, cultural participation and physical activity variety**

Research indicates that females in Western countries engage in more variety in general recreation than males (van Eijck & Bargeman, 2004; for an exception, see Alderson, Junisbai, & Heacock, 2007). In a major study in the UK, Bennett et al. (2009) concluded that “…female cultural repertoires are more varied and versatile than those of men.” (p. 232-3). These patterns may reflect the great changes in participation in women in the public sphere, especially after the women’s liberation movements of the 1960s and 1970s. Increased participation was not only in higher education and in occupational work (Evans, 2003; Sewell, 2009), but also cultural participation (van Eijck & Bargeman, 2004).

As well established in the social psychology and sociology of gender, there are social roles bestowed on men and women via socialisation and institutionalisation (Chalabaev et al., 2013; Connell, 1995). During the primary socialisation of the boomers, the conservative view of gender roles prevailed, such as a strong emphasis on the role of women in the domestic sphere, and men in the public sphere (Friedan, 1963; Greer, 1970). In Australia, in the 1960s and especially during the 1970s, these views and norms were challenged and there followed increasing participation of women in the labour force and attaining higher education (Stephenson, 1970).
Would the growing participation of women in ‘all walks of life’ during the second half of the 21st century also include participation in a variety of recreational physical activities? While it is often reported that males do more physical activity than females (e.g. Bauman et al., 2009; Caspersen, Pereira, & Curran, 2000; Haley & Andel, 2010; MacDougall et al., 1997; Trost et al., 2002), the relationship between gender and physical activity varies geographically (AIHW, 2012, p. 206) and by type of activity (Garrard, 2003; Lox et al., 1999). For instance, in Australia, males and females report similar levels of physical activity, where males have higher sports and outdoor activity participation (Bennett et al., 1999), and are marginally more likely to meet guidelines of ‘sufficient’ physical activity (AIHW, 2012, p. 206; Vandelanotte et al., 2010).

Similar to age, direct research on gender and physical activity variety is scarce. Dafna et al. (2012) investigated the physical activity variety of adults of elderly age in Australia (n = 20,050), and found no statistically significant association between gender and physical activity variety. The absence of attention to physical activity variety and its relation to gender, again prompts consideration of social-cultural factors. There have clearly been changes in cultural norms with respect to gender and types of activity. For instance, in Melbourne at the end of the 19th century, cycling by women in public space was conducted with particular attire, at a particular speed, in particular places, or otherwise was frowned upon (see Kinsey, 2011). In contrast, in the 21st century, cycling is becoming more common for women and men in Melbourne (e.g. see Pucher, Garrard, & Greaves, 2011). At Tiers 2 and 3 of the FMC, ‘democratisation of sport’ with respect to gender, has occurred in the last few decades (see Scheerder et al., 2005). However, there remain strong gendered norms for specific sports (Haig-Muir, 2000; Mangan,
Although cultural norms with respect to gender and physical activity changed in diverse ways over the course of the boomer era, it does not appear to have done so to the extent of reduced gender differences in physical activity variety.

In summation, ‘liberalisation’ of women in the public sphere was a significant feature of the boomer era, leading to a trajectory of more female than male participation in cultural participation. But in considering gender differences in population studies, it appears that these social changes may have not extended as far as evening levels of participation in physical activities. If this interpretation is correct, it is anticipated that:

- **H7**: The relationship between gender and recreational participation will depend on the nature of participation: 7a: Females (relative to males) participate in a higher level of cultural participation, and 7b: Females (relative to males) participate less in physical activity variety.

**Summary of literature review and list of hypotheses**

The current review, by substantiating the PAV model, advances the literature by delineating the role of education as a potential determinant of an important dimension of physical activity – physical activity variety, and illuminates what may be intervening processes of agency between education and physical activity variety.
Table 4 summarises the hypotheses. It is proposed that formal education in conjunction with the unique social-cultural environment, constituted the ‘boomers’ in a way that conferred multiple tendencies for movement and variety. This process of education leading to physical activity variety via psychological and bodily tendencies suggest indirect relationships between education and physical activity variety. Two major underlying processes are argued to be (1) self-regulation and social support elicitation; and (2) expansiveness, in the form of cultural participation.

Besides education level, gender and age are also likely to have an independent bearing on physical activity variety. Relative to men, women are anticipated to exhibit a higher level of cultural participation, and less physical activity variety. Age is proposed to determine less physical activity variety. Consistent with the FMC, the current PAV model is not proposed to be universal, but is based on the nexus of social, cultural factors specific to time and place (cf. Markus & Kitayama, 1994) – in this case, baby boomers in Melbourne, Australia.
Figure 5. Model of Physical Activity Variety with hypothesised paths, including valence of association (positive or negative).
Table 4. Summary of hypotheses of PAV model

- **H1**: Controlling for age, gender and ability, education will positively and indirectly determine physical activity variety, where (a) education has a direct positive effect on self-regulation, (b) self-regulation has a direct positive effect on social support elicitation, and (c) social support elicitation has a direct positive effect on physical activity variety.

- **H2**: Controlling for age, gender, ability, self-regulation and social support elicitation, education will indirectly and positively determine physical activity variety, where (a) education directly effects cultural participation, and (b) cultural participation directly effects physical activity variety.

- **H3**: Education will have a direct positive effect on cognitive ability.

- **H4**: Cognitive ability will have a direct positive effect on self-regulation.

- **H5**: Age will have a direct negative effect on cognitive ability.

- **H6**: Age will have a direct negative effect on physical activity variety.

- **H7**: The relationship between gender and participation will depend on the nature of participation: (a) Females (relative to males) will participate in higher cultural participation (b) Females (relative to males) will participate less in physical activity variety.
Chapter 2: Method

Overview

The empirical goal of the current thesis was to test the developed Model of Physical Activity Variety (“PAV model”), including evaluating its plausibility relative to alternative structural models. There were three field studies in the current thesis: Study 1 (Pilot\(_1\)), Study 2 (Pilot\(_2\)) and Study 3 (Main study). As the two pilot studies were designed to prepare measures and questions for the Main Study (Study 3), methodology of all three studies are reported together in this Chapter. Sections of Chapter 2 are as follows: first an outline of the empirical approach is provided; second, an overview of similarities and differences between the three studies; third, an introduction to the psychological measures; and fourth, the details of each of the field studies (participants, research materials and procedures). A common set of psychological measures, and a set of questionnaires were progressively developed across the three field studies. Given this, although a description of psychological measures and other survey questions are normally presented study by study, for brevity, in this Chapter all measures and survey questions are presented simultaneously.

Scope and depth of empirical investigation

The current investigation was large in scope, in terms of questions and measures, as well as highly detailed on physical activity patterns. There were five
reasons to investigate a range of variables (*beyond* those required for the PAV model) and to do so in detail:

(1) There was a need to focus on the research problem of neglect of everyday contexts and practices of the boomer generation, including the context of health. This was addressed by considering variables that reflect FMC Tiers 3 to 4a such as multiple settings, types of everyday practice and life situations.

(2) To ascertain the level of generalisability of the current samples, inclusion of other relevant variables enabled assessment of sample representativeness, such as for physical activity levels.

(3) To gauge the general validity of the data and veracity of theoretical assumptions, the validity of data could be assessed by looking at relationships between variables (e.g. education and income) that are well established in the literature to be associated. Importantly, this included checking of underlying assumptions of the thesis and academic literature (e.g. Mirowsky & Ross, 2003), namely that – (a) education is associated with health, (b) education is associated with external resources that are conducive to health, and health-related behaviour, (c) education is associated with particular tendencies (e.g. to adopt health-related behaviours), and (d) physical activity is associated with health.

(4) There were detailed questions on physical activity patterns which were to address (1), (2), and (3) above, and to establish that physical activity variety – the main dependent variable in the PAV model – is a separate dimension to the usual patterns of activity in public health and health psychology (e.g. frequency, duration of exercise).
(5) To check whether there were any variables connected to activity variety other than those hypothesised in the PAV model. The literature indicates that the potential determinants of general physical activity are large (Bauman et al., 2002; Seefeldt et al., 2002; Trost et al., 2002), and the current survey incorporated consistent determinants from this literature that were connected to context (e.g. perceived neighbourhood attributes, occupation level), that may also apply to physical activity variety.

**Self-report methods**

Apart from measurement of cognitive ability, data was based on self-report. Self-report provided several advantages in terms of data collection. It allowed for a range of variables to be measured in a convenient way. Self-report methods are logistically efficient, and can be flexibly tailored to the research question of interest (Sallis & Saelens, 2000). Self-report is a common method in physical activity and health research (Kriska & Casperson, 1997; Rhodes & Nasuti, 2011). However, adopting self-report also presents a range of well recognised research challenges. Issues tied to self-report data include: social desirability effects (such as overestimation of activity; cf. Droomers et al., 1998), the cognitive demands imposed by recall (see Sallis & Saelens, 2000), and other sources of over or underestimation of activity levels (Patterson, 2000).

A number of strategies were taken to minimise these potential limitations in order to maximise the capacity to rigorously test the PAV model. Among these strategies was development and refining of self-report questions, consideration of the
ordering of questions in the survey, close analysis of scales and their psychometric properties, such as construct validity and reliability, and accounting for measurement error through latent variable modelling. Also, many of the measures adopted from the literature were adjusted (i.e. extended or reworded), to suit the general adult population.

**Overview of three studies**

Figure 6 (next page) is a flow chart of the three studies and the empirical aims of each. Given the need to develop and psychometrically evaluate self-report measures of variables in preparation for the testing of the PAV model (specifically – self-regulation and social support elicitation), two pilot studies were conducted. In addition, the chosen measure of cognitive ability had to be validated with Australian adults. Evaluation of the ability test was conducted in Study 2 (Pilot$_2$). Overall, Study 1 and Study 2 were pilot studies, and Study 3 was the main study. Table 5 provides an overview of the key differences and similarities between the three studies. For all studies the main design feature was a self-report survey with closed-format questions, with the majority of questions for psychological measures, having a Likert-type design. Participants for Study 2 and Study 3 were adults aged between 38 and 62 years (baby boomer cohort), from the general communities of metropolitan Melbourne, in the state of Victoria, Australia.
Figure 6. Overview of three field studies and their aims.

The procedures differed between Study 2 and Study 3. For instance, in Study 3 all data collection was conducted with the participant. Study 1 (Pilot₁) was based on a larger age range, to develop new self-report measures. Compared to Study 1, Study 2 included more questions on lifestyle patterns. In addition, Study 2 focused on development and trialling of self-report measures of physical activity and self-regulation of activity, as well as evaluating the construct and criterion validity of the measure of cognitive ability.
Table 5. Comparison of the three field studies

<table>
<thead>
<tr>
<th>Aspect of study:</th>
<th>Study 1: Pilot₁ (Scale Development)</th>
<th>Study 2: Pilot₂ (Scale Development)</th>
<th>Study 3: Main Study (Test: Structural model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>218</td>
<td>106</td>
<td>217</td>
</tr>
<tr>
<td>Design</td>
<td>Cross-sectional</td>
<td>Cross-sectional</td>
<td>Cross-sectional</td>
</tr>
<tr>
<td>Criterion for participation: age</td>
<td>Over 16 years</td>
<td>38-62 years</td>
<td>38-62 years</td>
</tr>
<tr>
<td>Participant differences between studies</td>
<td>Included university students</td>
<td>Higher education than Study 3</td>
<td>Lower education than Study 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Higher occupation than Study 3</td>
<td>Lower occupation than Study 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower unemployment % than Study 3</td>
<td>Higher unemployment % than Study 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Higher level of physical activity than Study 3</td>
<td>Lower level of physical activity than Study 2</td>
</tr>
<tr>
<td>Incentives</td>
<td>Optional report on study findings</td>
<td>Optional report on study findings</td>
<td>Optional report on study findings</td>
</tr>
<tr>
<td></td>
<td>University sub-sample: course credit</td>
<td></td>
<td>Cash-in-hand</td>
</tr>
<tr>
<td>Length of participation</td>
<td>Minimum 40 minutes</td>
<td>Minimum 2 hours</td>
<td>Minimum 1 hour</td>
</tr>
<tr>
<td>Length of participation in-person with researcher</td>
<td>1 hour</td>
<td>1 hour 15 minutes</td>
<td>Minimum 1 hour</td>
</tr>
<tr>
<td>Survey questions unique to the study</td>
<td>Exercise barriers</td>
<td>Life events</td>
<td>Cultural participation, Parental occupation level, Health orientation, Self-perceived health, Physical activity knowledge, Alcohol consumption, TV and internet use, Meal preparation, Musical tastes</td>
</tr>
<tr>
<td></td>
<td>Organisation of exercise (e.g. structured)</td>
<td>Physical activity: friends, relatives</td>
<td></td>
</tr>
<tr>
<td>Procedure for survey</td>
<td>Survey conducted in presence of investigator</td>
<td>Survey conducted alone</td>
<td>Survey conducted in presence of investigator</td>
</tr>
<tr>
<td>Measure of cognitive abilities</td>
<td>No tests</td>
<td>Culture Fair Intelligence Test (Cattell &amp; Cattell, 1960)</td>
<td>Culture Fair Intelligence Test (Cattell &amp; Cattell, 1960)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ekstrom tests (1976): Vocabulary, Letter Sets, Different Uses</td>
<td></td>
</tr>
<tr>
<td>Period of data collection</td>
<td>2001</td>
<td>2003-2004</td>
<td>November 2007 to April 2008</td>
</tr>
</tbody>
</table>
Study 3 (Main study) was designed to provide an overall rigorous test of the PAV model and alternative or competing models of the relationships between education, self-agency and physical activity variety. Study 3 included questions for measuring cultural participation (such as visiting libraries and going to cultural festivals) – a major variable in the PAV model. The independent variable of interest was formal education level. In terms of everyday practice, the primary focus was on recreational physical activity patterns. In order to check validity of the data, there was also empirical attention to health-related variables, such as smoking, fruit and vegetable intake, visits to fast food outlets, visiting doctor and hospital, and ‘sedentary’ behaviours such as TV watching.

In terms of life background the major difference between samples in each study was employment status or orientation to the labour force. Study 2 had a good proportion of full-time and part-time workers while a large group in Study 3 were people who were unemployed. This difference can be partly attributed to the method of recruitment between both samples – Study 3 were provided a cash incentive, which may have appealed more to those who were not currently employed in the workforce.

**Research ethics**

All studies presented in this thesis were reviewed and approved by the Human Research Ethics Committee of the University of Melbourne. As each of the studies are introduced, measures taken to ensure voluntary consent, anonymity and confidentiality of participation will be described.
Psychological Measures and Questionnaires

The structure and number of measures and questions was complex, and cut across the three field studies. To simplify referencing, the measures and question areas are numbered. It should be noted that the numbers do not represent the ordering of questions and measures during data collection.

Table 6 summarises the features and source of the psychological measures of the three field studies. The key measures for purposes of testing of the PAV model were self-regulation and social support elicitation (both assessed in Measure 1), and cognitive fluid ability (Measure 4).

Appendix 1 provides details of all survey questions other than the psychological self-report measures in Table 6. For ease of reference, the questions are grouped into four areas, and these categories do not indicate the manner of how they were presented in the surveys: (A) general life background; (B) health, such as chronic disease status and experience of symptoms, such as pain; (C) physical activity patterns, including practices during physical activity; and (D) lifestyle patterns and tastes, such as newspaper readership, and practices considered as health-related behaviour in public health and health psychology (e.g. diet, smoking). The questions in Appendix 1 provide good coverage of variables at Tiers 3 and 4 of the FMC (i.e., settings, psychological processes, and practices).
Table 6. Psychological measures for the three studies

<table>
<thead>
<tr>
<th>No.</th>
<th>Study</th>
<th>Name of measure &amp; source</th>
<th>Number of items</th>
<th>Item description</th>
<th>Response format</th>
<th>Empirical studies that have used the measure, or similar variable:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Self-Regulation Strategies, Social Support Elicitation</td>
<td>General Exercise Strategies &amp; Skills Questionnaire (Mainly new items, with items incorporated from other surveys – e.g. Saelens et al. (2000))</td>
<td>S1: 148 S2, S3: 50</td>
<td>Please rate how often you use each strategy IN THE LAST THREE MONTHS UP TO NOW, according to the following scale [For full question – see Appendices 12, 15 &amp; 20 for full versions]</td>
<td>0-Never, 1-Seldom, 2- Sometimes, 3-Often, 4-Always</td>
<td>&quot;Rovniak et al. (2002)&quot;</td>
</tr>
<tr>
<td>2</td>
<td>Main activity: practices</td>
<td>New</td>
<td>S1: 60 S2, S3: 30</td>
<td>Please rate how often you use each strategy in the last three months up to today, using the scale below: [For full question see Appendices 15 &amp; 20]</td>
<td>0-Never, 1-Seldom, 2- Sometimes, 3-Often, 4-Always</td>
<td></td>
</tr>
</tbody>
</table>

**NOMINATED MAIN PHYSICAL ACTIVITY: PRACTICES & MOTIVATION**

<table>
<thead>
<tr>
<th>No.</th>
<th>Measure</th>
<th>Study</th>
<th>Name of measure &amp; source</th>
<th>Number of items</th>
<th>Item description</th>
<th>Response format</th>
<th>Empirical studies that have used the measure, or similar variable:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Reasons for exercise</td>
<td>Motivation for Physical Activity Measure – Revised (Ryan et al., 1997)</td>
<td>S1: 26 S2: 17 S3: 16</td>
<td>The following is a list of reasons by people engage in physical activities such as exercise and sports. Keeping in mind your MAIN type of exercise for the last three months, respond to each reason according to how often it is true for you, using the scale below:</td>
<td>S1: 0-Never, 1-Seldom, 2-Sometimes, 3-Often, 4-Always S2, S3: 1 (not at all true for me) to 7 (very true for me)</td>
<td>&quot;Frederick, Morrison, &amp; Manning (1996); Ryan et al. (1997)&quot;</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Psychological construct (or process)</td>
<td>Study</td>
<td>Name of measure &amp; source</td>
<td>Number of items</td>
<td>Item description</td>
<td>Response format</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
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<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cognitive fluid ability</td>
<td>2 &amp; 3</td>
<td>Cultural Fair Intelligence Test (Cattell &amp; Cattell, 1960)</td>
<td>S2,3; 46</td>
<td>See in-text description</td>
<td>See in-text description</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Induction</td>
<td>2</td>
<td>Letter sets test, L-1 (Ekstrom et al., 1976)</td>
<td>30</td>
<td>See in-text description</td>
<td>See in-text description</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Crystallised ability</td>
<td>2</td>
<td>Advanced vocabulary, V-4 (Ekstrom et al., 1976)</td>
<td>36</td>
<td>See in-text description</td>
<td>See in-text description</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Crystallised ability</td>
<td>2</td>
<td>Extended range vocabulary, V-3 (Ekstrom et al., 1976)</td>
<td>30</td>
<td>See in-text description</td>
<td>See in-text description</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Flexibility of use</td>
<td>2</td>
<td>Different Uses, XU-4 (Ekstrom et al., 1976)</td>
<td>10</td>
<td>See in-text description</td>
<td>See in-text description</td>
<td></td>
</tr>
</tbody>
</table>

**Health**

<table>
<thead>
<tr>
<th>No.</th>
<th>Psychological construct (or process)</th>
<th>Study</th>
<th>Name of measure &amp; source</th>
<th>Number of items</th>
<th>Item description</th>
<th>Response format</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Subjective health complaints</td>
<td>2 &amp; 3</td>
<td>Ursin Symptoms Inventory (Ursin, Endresen, &amp; Ursin, 1988)</td>
<td>S2,3; 29</td>
<td>On the following page you will find some ordinary health problems and complaints. We want you to look at each and every one of them and report to what extent you have been affected during the last three months, and the number of days you have been suffering from the problem.</td>
<td>For each item: Not at all, A little, Some, Serious Number of days (open response)</td>
</tr>
<tr>
<td>No.</td>
<td>Psychological construct (or process)</td>
<td>Study</td>
<td>Name of measure &amp; source</td>
<td>Number of items</td>
<td>Item description</td>
<td>Response format</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------</td>
<td>-------</td>
<td>----------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>10</td>
<td>Life events</td>
<td>2</td>
<td>Adapted from Social Readjustment Rating Scale (Holmes &amp; Rahe, 1967)</td>
<td>45</td>
<td>Please tick beside each event in the list below that you have experienced in the last 3 months</td>
<td>e.g. Divorce, Trouble with boss, Change in social activities</td>
</tr>
<tr>
<td>11</td>
<td>Neighbourhood perceived</td>
<td>2 &amp; 3</td>
<td>Neighbourhood Environment Scale (Sallis et al., 1997)</td>
<td>S2,3: 10</td>
<td>Please indicate which of the following apply to your neighbourhood</td>
<td>e.g. Pavement/sidewalk, Enjoyable scenery</td>
</tr>
</tbody>
</table>

Note: *Number for psychological measure.
Measurement of the main dependent variable: physical activity variety

Before introducing each of the three field studies, the common approach to investigation of physical activity is briefly described. Self-report is the most common method in field studies of physical activity (Sallis & Saelens, 2000) and was deemed as the best way to capture variety of physical activity (i.e. the outcome variable of interest), as well as investigate other dimensions of physical activity patterns. The approach to measure physical activity variety was to do so indirectly, in order to reduce the risk of social desirability bias. That is, there was no direct question in the survey on breadth of types of physical activity. Instead, the measure of variety was based on a compilation of individual responses to questions on physical activity. The details of how physical activity variety was calculated by tallying multiple domains of physical activity covered in the surveys to follow, is described in the Results section (Chapter 3).

It is important to note that self-reported physical activity variety has not received any analysis in terms of validity and reliability. However, arguably such a measure would be less susceptible to challenges posed by the usual dimensions of physical activity investigated, such as frequency. Self-report data for physical activity variety is likely to be more accurate than for dimensions such as frequency and duration, as it is a particular type of activity occurring (e.g. jogging, yoga). People are more likely to recall types of activity because of their salience or uniqueness. Frequency of bouts of a specific activity was not included in the operationalisation of physical activity variety. In contrast, self-report measures of frequency of past participation is vulnerable to the experience of cognitive retrieval (Aarts & Dijksterhuis, 1999), and frequency tends to be over-estimated, especially for vigorous activities (Sallis & Saelens, 2000).
Study 1 (Pilot)

**Purpose of study**

Study 1 aimed to trial and develop new self-report instruments of self-regulation, social-support elicitation, and physical activity patterns (esp. physical activity variety), as well as trial questions on contextual features of everyday life.

**Participants**

Participants were men and women over the age of 16, and residing in Melbourne.

**Recruitment process**

Participants were sourced from three different types of educational institutions, representing different forms of organised education in Australia – Universities, Technical and Further Education, and University of the 3rd Age. In terms of university, students were from an undergraduate program on psychology, at one of the major universities in Melbourne and Australia. The Technical and Further Education (TAFE) institutions provide formal education in preparation for a range of vocational and professional fields (e.g. business, engineering, health services). There are around 18 TAFE institutions in the State of Victoria. The University of the Third Age (U3A) is a community-based (i.e. not-for-profit) and lifelong learning organisation for older adults (for a background on U3As, see Swindell, 1993; Swindell & Thompson, 1995). U3A offer a range of courses to the wider community, and are taught by volunteers from the
Education is informal and there are no assessments or formal qualifications required. At the time of data collection there were around 70 U3A campuses. Membership to U3A is typically an age of 50 as a minimum. To protect anonymity, names of the university, TAFEs and U3As are not reported.

The process of data collection differed by sub-sample. University students participated as part of a requirement of their undergraduate studies in psychology, to learn about psychological research by gaining experience as a participant in a research project. Prospective participants could sign up for the project, which was offered as one of a number of research projects.

The TAFE students were informed about the study through course co-ordinators in subjects on social services, such as disability and aged care. As part of gaining access to participants it was agreed between researcher and TAFE that a short workshop would be provided before asking for participation. For instance, a session was held for exploring ways of promoting physical activity for people with disabilities, which was a future ‘client’ base for one of the student cohorts. There were short activities about physical activity and its importance to health of the recipients of social services. The survey took place immediately following the workshop. All these activities took place at the TAFE student campus.

For U3A members, participation was conducted in conjunction with a short-course delivered by the researcher. In this case the course was on “successful ageing”, in which the researcher provided an introduction to evidence-based research on “healthy living”. The course varied slightly by the U3A campus, but generally took place once a week over the course of seven weeks. The survey was conducted towards the end of the
short course, and all sessions were at the U3A campus. Depending on the campus, U3A classes take place in facilities exclusively for the U3A members, in municipal spaces, or rooms at a university. All three types of spaces were sites for data collection in this study.

**Participant background**

Table 7 (next page) presents the background of participants for Study 1 (Pilot$_1$). The largest sub-sample were students from university (46%). 42.7% were between the age of 15 and 20 years. 72.5% were female. In terms of relationships, 37.2% reported being single and 32.6% married or de-facto.
Table 7. Participant demographic background for Study 1 (Pilot 1, n = 218)

<table>
<thead>
<tr>
<th>Demographic background</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>100</td>
<td>45.9%</td>
</tr>
<tr>
<td>TAFE</td>
<td>93</td>
<td>42.7%</td>
</tr>
<tr>
<td>U3A</td>
<td>25</td>
<td>11.5%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-20</td>
<td>93</td>
<td>42.7%</td>
</tr>
<tr>
<td>21-25</td>
<td>22</td>
<td>10.1%</td>
</tr>
<tr>
<td>26-30</td>
<td>8</td>
<td>3.7%</td>
</tr>
<tr>
<td>31-35</td>
<td>15</td>
<td>6.9%</td>
</tr>
<tr>
<td>36-40</td>
<td>17</td>
<td>7.8%</td>
</tr>
<tr>
<td>41-45</td>
<td>15</td>
<td>6.9%</td>
</tr>
<tr>
<td>46-50</td>
<td>7</td>
<td>3.2%</td>
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<tr>
<td>51-55</td>
<td>11</td>
<td>5.0%</td>
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<tr>
<td>56-60</td>
<td>8</td>
<td>3.7%</td>
</tr>
<tr>
<td>61-65</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>66-70</td>
<td>11</td>
<td>5.0%</td>
</tr>
<tr>
<td>71-75</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td>76-80</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>158</td>
<td>72.5%</td>
</tr>
<tr>
<td>Male</td>
<td>54</td>
<td>24.8%</td>
</tr>
<tr>
<td>Missing</td>
<td>6</td>
<td>2.8%</td>
</tr>
<tr>
<td>Work</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Retired</td>
<td>12</td>
<td>5.5%</td>
</tr>
<tr>
<td>Full-time</td>
<td>14</td>
<td>6.4%</td>
</tr>
<tr>
<td>Part-time</td>
<td>50</td>
<td>22.9%</td>
</tr>
<tr>
<td>Casual</td>
<td>76</td>
<td>34.9%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>36</td>
<td>16.5%</td>
</tr>
<tr>
<td>Voluntary</td>
<td>10</td>
<td>4.6%</td>
</tr>
<tr>
<td>Retired and voluntary</td>
<td>11</td>
<td>5.0%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2.8%</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Living arrangement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>24</td>
<td>11.0%</td>
</tr>
<tr>
<td>Room mates</td>
<td>17</td>
<td>7.8%</td>
</tr>
<tr>
<td>Spouse, other</td>
<td>39</td>
<td>17.9%</td>
</tr>
<tr>
<td>Parents</td>
<td>62</td>
<td>28.4%</td>
</tr>
<tr>
<td>Children</td>
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</tr>
<tr>
<td>Spouse and children</td>
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</tr>
<tr>
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<td>19</td>
<td>8.7%</td>
</tr>
<tr>
<td>Other</td>
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</tr>
<tr>
<td>Missing</td>
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</tr>
<tr>
<td>Has child(ren)</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>86</td>
<td>39.4%</td>
</tr>
<tr>
<td>Child(ren)</td>
<td>87</td>
<td>39.9%</td>
</tr>
<tr>
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<td>20.7%</td>
</tr>
<tr>
<td>Relationship</td>
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<td>Percentage</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>------------</td>
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<tr>
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<td>71</td>
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</tr>
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<td>10.6%</td>
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</tr>
<tr>
<td>Missing</td>
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<td>1.0%</td>
</tr>
</tbody>
</table>

**Materials**

Appendix 12 includes the full pilot survey for Study 1.

*Questionnaires on physical activity self-agency*

The two main self-report measures that were developed in Study 1 were the General Exercise Strategies and Skills Questionnaire (henceforth described as the GESSQ), and Activity Practices Questionnaire. Although both were designed to map out forms of self-agency for sustaining physical activity, the GESSQ will be described herein as this was the measure of two constructs (self-regulation and social support elicitation) for the PAV model of the Main Study (Study 3).
General Exercise Strategies and Skills

The GESSQ (Measure 1, in Table 6) was designed to gauge the adoption of self-regulatory skills and strategies (frequency of usage) as well as other strategies. As indicated in Chapter 1, although there is extensive research on self-regulation of physical activity and social support for physical activity, investigation of informal or ‘everyday’ skills and strategies is less apparent, and a major driver of the current research was to address this gap. Academic research and policy alludes to social support seeking (Kitsantas, 2000), and an empirical goal was to attain a robust set of items representative of this domain of self-agency for physical activity. For current research purposes, it was deemed that a new overall measure was required on a range of self-regulatory strategies and skills and to identify an optimal set of items to take into account classic self-regulatory processes (e.g. self-monitoring), concrete skills or strategies that adults are ‘tasked’ to do in everyday life by health authorities (e.g. “Take the stairs instead of the lift”; Australian Department of Health and Aged Care, 1999), and practices of injury prevention and management (Weldon & Hill, 2003).

The first step in measure development was to create a pool of statements that pertain to day-to-day thoughts and actions connected with recreational physical activity (especially attention towards keeping physically active), and could be responded to in terms of frequency. A range of self-regulation self-report measures were consulted before deciding to develop this new measure. These included the Self-Regulation Inventory (Grossarth-Matick & Eysenck, 1995), the Goal Systems Assessment Battery (Karoly & Ruehlman, 1995), the Processes of Change Questionnaire (Marcus et al.,
1992), and the Ways of Coping Questionnaire (Folkman & Lazarus, 1985). A range of specific strategies and skills proposed in the literature were included, encompassing those in physical activity interventions (e.g. Kitsantas, 2000), exercise sciences and sports psychology (e.g. Campen & Roberts, 2001; Gammage, Hall, & Rodgers, 2000; Thacker et al., 2004), and general theory on self-regulation, control and action (e.g. Bandura, 1997; Karoly & Ruehlman, 1995).

While the majority of item statements were newly developed, some items directly from already available measures were included in the current questionnaire, and especially from an unnamed set of items from Saelens et al. (2000, p. 370), such as “set aside a special time to be active”. Consistent with typical self-report measures of self-regulation and skills (e.g. Karoly & Ruehlman, 1995), the statements were in the format of first-person narrative or self-statements. Once a pool of items was finalised, the second step involved a pilot study (Study 1) to explore the structure of items, and arrive at smaller pool of items, especially on self-regulation and social support elicitation, for research specifically with the ‘boomer’ cohort (Study 2, Pilot 2), and then apply in the Main Study (Study 3) as part of a formal test of the PAV model. The process of measure refinement is described in the results section (Chapter 3).

Study 1 took place with a wide range of age groups as (1) it was envisaged that in the longer term such a measure would be useful for research not only with the ‘baby boomers’ but younger and older generations, and (2) for pragmatic reasons – there was an opportunity for access to sub-groups (e.g. university students), when a maximised sample size is desirable, for close analysis of new items (cf. de Vaus, 2002).
The title on the survey booklet was “General exercise strategies and skills”. The question was ‘we would like to know about your strategies and skills towards maintaining regular exercise in general, and regularity in the previous three months”. Example items are: “I mentally picture myself being regularly active”, “I closely keep track of how much exercise I do”, and “I ask friends how they manage or achieve physical exercise”. The response scale was: never, seldom, sometimes, often, always.

**Questions on physical activity patterns**

First, the approach to assessment of physical activity variety is introduced. Second, the organisation and features of the physical activity questions are described.

**Relevant activity**

In the survey, physical activity was described as “exercise”. From the presentation of the survey it was made clear that exercise was referring to a broad net of specific activities in recreation (e.g. walking, darts, sports), and so was not only about ‘exercise’ as understood in public health – that is, as repetitive purposeful movement strictly for health (e.g. Caspersen, Powell, & Christenson, 1985).

**20 minutes as an episode of activity**

A common feature of question design across the physical activity questions was that activity be conducted for at least 20 minutes ‘in one go’ to ‘count’ as an episode of activity. The minimum of 20 minutes in a self-report survey was also the specification used by Sallis et al. (1997) and others (see e.g. Touvier et al., 2010; Uitenbroek, 1996).
There were several reasons for having a lower bound duration of 20 minutes. From a public health point of view, the threshold of 20 minutes is significant: it is commonly argued that a minimum of 20 to 30 minutes of activity bout is needed to be health-promoting (USDHHS, 1996). Second, it was deemed that an episode of at least 20 minutes would help in recall of an episode of an activity. This criterion remained consistent across the three field studies of the thesis.

*Period of physical activity as last three months*

To capture ‘current’ physical activity patterns, but also to take into account accuracy of recall of physical activity, it was decided to ask participants about the previous three months of their lives. The period of three months has been applied in other self-report studies of physical activity (e.g. Wang et al., 2011). This parameter was retained for Study 2 (Pilot2) and Study 3 (Main study).

*Dimensions of physical activity*

The common dimensions of physical activity in government surveys, health psychology and public health were measured herein – that is, physical activity frequency (number of activity sessions within a certain period), duration, and intensity (AIHW, 2003; Powell, Paluch, & Blair, 2011). This permitted analysis of how the variable of interest – physical activity variety – was related to common dimensions of physical activity in health psychology and public health.
Procedure

Figure 7 (next page) presents the ordering of the research activities that was common across the three sub-samples. Surveys were administered in a group format. For both TAFE and U3A short courses and workshops, prospective participants were informed before the beginning of the event that they would be asked to take part in the survey. They were also informed that participating in the course or workshop did not oblige them to participate, and that participation was voluntary. Prospective participants received a plain language statement and consent form (please see Appendix 13). Then, if consent was provided, participants would proceed to complete the questionnaire. As shown in Figure 7, the survey began with demographic questions and then proceeded to inquire about physical activity. The survey took around half an hour for participants to complete.
Figure 7. Steps of research participation in Study 1 (Pilot1).
Study 2 (Pilot)

Purpose of study

The purpose of Study 2 (Pilot2) was to (1) further refine the major self-report measures developed in Study 1 (Pilot1), and especially, to trial newly developed questions on physical activity, as well as (2) validate the Culture Fair Intelligence Test (Cattell & Cattell, 1960) as a measure of cognitive ability in Australia.

Participants

The age criterion for participation in Study 2 (Pilot2) and later, for Study 3 (Main) was between 38 to 62. This age range took into account that the boomers are most commonly defined as the generation born between 1946 to 1964 (ABS, 2009; Harvard School of Public Health Center for Health Communication, 2004). In 2002, the year the design for Study 2 was finalised, the youngest members of the boomer generation were deemed to be around 38 years of age. Although the upper limit would be 56 years, the older age of 62 was chosen in order to factor in that data collection would take place over a long period of time (i.e. in 2008, the oldest ‘boomer’ would be 62 years). However, as a result of collecting data over several years, there was not a close match between strict age ranges for the generation and the final sample for Study 3 – as the sample included adults younger than what is normally taken to be the boundary of the generation. While this is the case, importantly, the final sample for the Main Study did not exclude adults outside of the age range taken to represent the boomer cohort, thereby maximising chances of attaining a representative sample.
Recruitment Process

Participants were sourced from the same educational institutions in Melbourne as for Study 1 (University, TAFE, U3A), as well as from a broader span of the general adult community. A number of recruitment strategies were employed in Study 2. Some social groups were approached in person, where a three minute talk was given, introducing the study and inviting participation. The main recruitment strategy was through a notice (see Appendix 14) shown on publically accessible notice-boards in local council libraries, fitness centres, TAFE institutions and other public locations. Also, various versions of the notice were included in council newspapers, the Saturday Herald-Sun’s ‘volunteer register’ (a tabloid newspaper), U3A newsletters, and a member magazine for a women’s health network. Interested persons contacted the researcher and a hardcopy of the survey and accompanying ethics documents (plain language statement and consent form) were sent via mail.

The data collection stage took several months, as there was a large number of participants, the need to gain access to numerous locations and conduct data collection on site, as well as the need for meetings to be arranged, and at a time suitable for prospective participants, which included ‘after hours’ (28.6% of the sample were full-time workers and 23.8% were part-time workers).

Participant background

Table 8 (next page), presents the demographic background of participants. The most represented age group was those between 58 and 62 years (34%), followed by 53 to 57 years (25%). Around 20% of the sample was male. Around half of participants
<table>
<thead>
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<th>Demographic background</th>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
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<td></td>
<td>48 – 52 years</td>
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<td>5.7%</td>
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<td></td>
<td>Year 12 or equivalent</td>
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</tr>
<tr>
<td>Marital situation</td>
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<td>4.7%</td>
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</tr>
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<td>Being paid off (with bank assistance)</td>
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<td>Table 8 (continued)</td>
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</tr>
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<td>---------------------------</td>
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</tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
<td></td>
<td>Two</td>
<td>14</td>
<td>13.2%</td>
</tr>
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<td>Three</td>
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<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Over three</td>
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<td>15.1%</td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>28</td>
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</tr>
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<td>15.1%</td>
</tr>
<tr>
<td>Table 8 (continued)</td>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------</td>
<td>-----------</td>
<td>------------</td>
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</tr>
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<td>0.9%</td>
</tr>
<tr>
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<td>67.0%</td>
</tr>
<tr>
<td></td>
<td>Born overseas</td>
<td>35</td>
<td>33.0%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
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<td>0.0%</td>
</tr>
<tr>
<td>Father born Australia</td>
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</tr>
<tr>
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<td>Born overseas</td>
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<td>Uniting church</td>
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<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Lutheran</td>
<td>2</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Islam</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Buddhism</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>14</td>
<td>13.2%</td>
</tr>
<tr>
<td></td>
<td>No religion</td>
<td>35</td>
<td>33.0%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Regularly attend social events</td>
<td>Yes</td>
<td>74</td>
<td>69.8%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>32</td>
<td>30.2%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Table 8 (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friends and family for private matters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nobody</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>1-4 people</td>
<td>48</td>
<td>45.7%</td>
</tr>
<tr>
<td>5-9 people</td>
<td>40</td>
<td>38.1%</td>
</tr>
<tr>
<td>10 or more people</td>
<td>17</td>
<td>16.2%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Note. †Examples of occupation, by skill level (from ABS, 2006) – I: managers, health professionals; II: managing supervisors, hospitality managers, associate professionals; III: construction trades workers, personal assistants; IV: carers, intermediate clerical, rail drivers; V: cleaners, factory workers, sales support workers.

had completed either a bachelor degree, a graduate diploma or honours. Around a quarter reported being retired, a quarter working part-time, and 29% working full-time. About 20% indicated Catholic as their religion, and 33% reported having no religion.

Materials

Appendix 15 presents the full survey used for Study 2. In what follows is a further background to the measures central to the PAV model. This background to measures begins with self-report questions tied to the outcome variable of interest (physical activity variety), followed by self-regulation, social support elicitation, and then the cognitive ability test.
Physical activity patterns

Analysis of the response patterns for the physical activity questions of Study 1 (Pilot\textsubscript{1}) suggested that a major revision to the format and types of questions was needed. Also, in considering the construct of physical activity variety, a broader set of physical activities needed to be specified before conducting the Main Study. For Study 2 (Pilot\textsubscript{2}) the physical activity section was extended and re-configured to provide more comprehensive data on activity patterns and guide the participant through the range of types of activity.

Figure 8 (next page) shows the organisation of the section of the survey on physical activity in Study 2. In Figure 8, measures that were interwoven with questions directly on physical activity are depicted with dashed lines. It was important that questions were on single domains of activity, one at a time, as recommended by Jacobs et al. (1993). As shown in Figure 8, the section on physical activity asked about a range of participation patterns. The questionnaire was structured and compiled using a variety of measures, such as the Kaiser Permanente Physical Activity Scale, for home activity and work domains (Greendale et al., 2003), and was mainly based on adaptations of these measures. The survey attempted to increase likelihood of participants accurately reporting their activities, by emphasising the importance of accuracy, suggesting use of personal diaries to recall activities, and encouraging extensive memory search by asking about several domains of activity.
Figure 8. Ordering of sections on physical activity patterns (Study 2, Pilot2).
Walking was given immediate and specific attention as it is well documented as the main physical activity engaged in by adults (Bélanger, Townsend, & Foster, 2011; Giles-Corti & Donovan, 2002; Morris & Hardman, 1997). Subsequent to walking was a short section on occupational activity, and then a section on housework and gardening.

As the current research was concerned with the everyday contexts of physical activity and people are likely to want the opportunity to reflect on physical activity that is important to them, a section of the physical activity questionnaire focused on one’s ‘main’ activity. This section asked in detail about a nominated main activity. Before this a detailed definition of ‘main activity’ was provided, including that the main activity had to be the one most important to the person in terms of their personal goals and health (p. 27 of survey in Appendix 15).

**Moderate/Vigorous and Light Activities**

To attain a detailed picture of the structure of physical activity patterns and provide an indirect measure of variety, there were two sub-sections about frequency of specific activities – (1) for moderate-vigorous types of activity (87 types), and (2) for mild types of activity (37 types). These two sets of activities were drawn from Ainsworth et al.’s (2000) compendium of physical activities. In Ainsworth et al. (2000), following Pate et al. (2005), physical activity was classified as ‘light’ if it required less than three metabolic equivalents (METs), “moderate” if between three and six METs, and “vigorous” if deemed to be over six METs. The list also has been applied in Australian government research on physical activity participation (e.g. ABS, 2007). The Ainsworth et al. (2000) compendium was not intended for survey design, and so activities were selected from the larger list, simplified, and questions set so that
participants could indicate which activities on the list they had taken part in, in the last three months. The pool of physical activities was presented in two groups in order to break up the survey (to sustain participant interest) and to make it clearer to participants that ‘mild’ activities were not part of the definition for ‘main’ activity. The moderate-to-vigorous physical activity list, while seemingly exhaustive, increases the likelihood that ‘idiosyncratic’ activities would be covered, and that participants would have properly reflected on what activities they had participated in.

_Cognitive ability tests_

The materials for participants to enter their responses to the cognitive ability tests came in the form of an A4 booklet, entitled “Thinking Skills booklet” (please see Appendix 16 for cover sheet).

The measure intended to capture cognitive ability for a cohort in Australia was the Culture Fair Intelligence Test (CFIT; Cattell & Cattell, 1960, 1973). However, the CFIT has not been applied for the boomer generation in Australia, so validation of this measure was needed, before use of the measure in Study 3 (Main study). A set of ability tests were included in this pilot study in order to establish the construct validity of the CFIT in Australia.

As described in Chapter 1, in the psychometric tradition of abilities research, the consensus is on a three-level structure where there are content-based specific cognitive abilities, followed by general domains of ability, followed by a general ability factor (for more detail see Carroll, 1993; also Deary, 2000). CFIT is viewed to be a measure of general fluid cognitive ability, labeled as Factor 2F (“Fluid Intelligence”) in Carroll’s
model (1993, p. 626). That is, fluid cognitive ability is a second order factor, and the one in that stratum to be most highly connected with general ‘content free’ ability (Factor 3G in Carroll’s model). As indicated in Chapter 1, it is these general levels of cognitive ability that are most commonly thought to affect health-related behaviours, such as physical activity, as well as general health (Batty, Deary, & Gottfredson, 2007; Lubinski, 2004).

Ability measures were partly selected on the basis that they needed to be relatively short (given the time restrictions with participants) and applicable to the general public. Tests are presented in the order that they appeared in the booklet.

*Culture Fair Intelligence Test (CFIT; Cattell & Cattell, 1960)*

General cognitive fluid ability needed to be measured in order to address RQ3. The Culture Fair Intelligence Test (CFIT) was planned for use in the main study, and evaluated in the current pilot study, as: (a) it is established as a valid measure of general fluid cognitive ability (Kline, 1991), (b) it is designed for individual or group test administration for adults (Cattell & Cattell, 1973), (c) it is taken to be less culturally biased than other ability tests, such as those that put a primacy on mastery of a particular language, (d) has been used in health-related research (e.g. Grigorenko & Sternberg, 2001), and (e) compared to other ability tests, was deemed to involve activities that the participants would find interesting and challenging. Scale II of Form A was used as it is best suited to the general adult population (Cattell & Cattell, 1973).

CFIT (Cattell & Cattell, 1960) includes four subtests of inductive reasoning. Each subtest represented a different kind of question, and all required problem solving
with geometric representations (Cattell & Cattell, 1973; see also Cattell, 1940). Subtest 1 ("series", 12 questions) requires finishing the last of a series of four pictures, out of a set of five choices. Subtest 2 ("classification", 14 questions) presents a row of five pictures, and four of the five are similar (e.g. same shape). The task is to identify the one picture that does not follow the classification rule. Subtest 3 ("matrices", 12 questions) presents a two-by-two matrix that contains one or more patterns, and one of the four segments is missing. The task in this case is to choose from among a row of five segments, the segment that finishes the matrix correctly. Subtest 4 ("conditions", 8 questions) requires identifying a rule contained in a graphical representation (the location of a dot relative to other shapes), and then finding which of a set of five pictures shares the same rule. In Study 2, the inter-test reliability was .77.

For the current research, the CFIT was provided by PsychPress, a test distribution company and consultancy for businesses in Australia. Specifically, PsychPress provided the CFIT question booklets and response sheets, both of A4 size, and permission to use these materials. The question booklets were plastic laminated. In exchange for access and use of the CFIT, PsychPress and the affiliated Institute for Personality and Ability Testing were to be provided with the raw data from the test scores. Prospective participants were informed that part of their data would be provided de-identified, to PsychPress and that it may be used for commercial purposes. Part of the arrangement was that the data would be provided to PsychPress, in addition to four demographic variables (age, gender, English as first language, country of origin). Prospective participants were also informed of this in the plain language statement
Ekstrom cognitive ability tests

The CFIT was developed in the USA and most academic research that involves this measure has taken place in that region (e.g. Etnier & Berry, 2001). For the purpose of validating the CFIT for use with people in Australia, this ability measure was conducted in conjunction with a sub-set of tests from the Ekstrom et al. (1976) test battery. Ekstrom et al. (1976) provide reference tests for “aptitude factors” (p. 4). The current investigation of validity of CFIT could be conducted by checking whether Ekstrom test scores co-vary with CFIT scores in a way that is keeping with what is known about the structure of cognitive abilities. Therefore, each of the Ekstrom tests was carefully chosen on the basis of how much the corresponding ability would be expected to ‘load’ on a general fluid ability factor. The section of measures to test for concurrent validity of the CFIT involved tests for tapping three of the 23 factors in the Ekstrom test battery: verbal comprehension (V), flexibility of use (XU), and induction (I). Based on knowledge from previous research on the psychometric proximity of general fluid ability to other abilities, CFIT was expected to be most correlated with induction (also a measure of fluid ability), followed by flexibility of use, and then by verbal comprehension and vocabulary (representing crystallised abilities).
Letter Sets Test (L-1)

This test is a measure of Induction (Factor I), or inductive reasoning. Induction is regarded as a major indicator of fluid ability (Horn, 1968). Inductive ability is defined in the Ekstrom et al. (1976) manual as “the kinds of reasoning abilities involved in forming and trying out hypotheses that will fit a set of data.” (p.79). The participant is provided with five sets of a series of four letters (e.g. HITY), and three of the four letters share a rule (e.g. are in alphabetical order). The participant is asked to work out which letter set is the odd one out. Letter Sets is a commonly used test in field studies of adult ability as inductive reasoning (eg. Allaire & Marsiske, 1999; Anstey & Smith, 1999; Reese et al., 2001). For a detailed background to this test, see Ekstrom et al. (1976, pp. 79-81). For the current data, the inter-test reliability was .80.

Extended Range Vocabulary Test (V-3)

The Extended Range Vocabulary Test is intended as a measure of verbal comprehension (Factor V), and in broader terms, is regarded as an indicator of crystallised intelligence (Horn, 1968). A word is presented, and the participant is required to choose from a list of four words, the one that is most similar in meaning (i.e. the synonym). The V-3 is widely used in field studies of adult abilities (e.g. Ackerman & Beier, 2003; Hultsch et al., 1999). For a detail background to this test, see Ekstrom et al. (1976, p. 167). The inter-test reliability in the current pilot study was .93.
**Advanced Vocabulary Test I (V-4)**

The Advanced Vocabulary Test, another synonym choice-test, was very similar to V-3, but included more difficult words. Having V-4 served the purpose of differentiating individuals in the higher range of crystallised ability. One weakness of the V-4 was that it included ‘old-fashioned’ and American words that not all adults would have had equal exposure to. However, no appropriate Australian equivalent measure was found to tap crystallised intelligence or to be as well established as the V-4. For a detailed background to this test, see Ekstrom et al. (1976, p.168). Based on data from the current pilot study, the inter-test reliability was .93.

**Different Uses Test (XU-4)**

The Different Uses Test is one measure of Flexibility of Use (Factor XU). This is a cognitive capacity for generation of means (i.e. variety of uses of an object), and in this way represents a form of divergent thinking. For this test, participants are required to generate (and write down) up to six different uses for each of eight common objects (cake of soap, barrel, paper clip, sock, table, paper cup, comb, button). For a detailed background to this test, see Ekstrom et al. (1976, p. 79). The inter-test reliability found in the current study was .83.
Procedure

An overview of the procedure for Study 2 (Pilot2) is presented in Figure 9. Study 2 was comprised of two sessions – Session 1 and Session 2. Apart from those recruited at U3As (described at the end of this sub-section), interested persons were sent the survey booklet in the postal mail, including the plain language statement and consent form (Appendix 17). Prospective participants were instructed that they could proceed with the survey at any time, as long as they would respond to the survey within a two week period. It was not required that participants had to finish the survey in one session. It was hoped this flexibility would increase the number of completed surveys. The survey was designed to take around one hour to complete. After completing the survey, participants were required to contact the investigator to arrange a meeting for Session 2. Participants returned the survey at the start of Session 2.

Session 2 involved cognitive ability testing and took place through a meeting between the researcher and participant. Data collection in person was important for this session, as the instructions for the cognitive ability tests were complex, and allowed the researcher to control the testing conditions and ensure they were as identical as possible across the sample. In addition, meeting in person provided an opportunity for the participant (or participants) to discuss participation in the survey and ask the researcher about the study. Most of the meetings took place in one of five settings, depending on where the participant was recruited from, and what was most convenient for them: (1) at the participant’s home, (2) at the participant’s workplace, (3) at the psychology department (University of Melbourne), (4) at a U3A campus, or (5) at a local council library.
Figure 9. Steps in research participation for Session 2 (Study 2, Pilot2).

Plain Language Statement

Handing in of survey booklet

ABILITY TESTS

Culture Fair Test
Test 1: 3 mins
Test 2: 4 mins
Test 3: 3 mins
Test 4: 2½ mins

Letter Sets Test
Parts I & II: 7 mins each

Advanced Vocabulary
Parts I & II: 4 mins each

Extended Vocabulary
Parts I & II: 6 mins each

Different Uses
Parts I & II: 5 mins each

Debrief Statement
After the activities for Session 2 were introduced by the researcher, and if consent provided by the participant(s), data collection proceeded. The instructions for all tests were given via audio cassette, in the voice of the researcher (male). All participants heard the same audio tape, albeit at slightly different volume levels, depending on the noise levels at the location of testing. Every effort was made to ensure similar conditions, including a well lit room, ventilation, and refreshments (non-alcoholic drink and snacks). However in some cases, such as in library meeting rooms, conditions were not ideal (e.g. low artificial light). At the end of Session 2, participants were given a debrief statement (Appendix 18).

**Study 3: Main Study**

**Purpose of main study**

The aim of the Main Study was to attain data for testing the hypothesised PAV model, and alternative structural models. In keeping with a focus on culture and everyday contexts, the complementary purpose was to attain highly detailed data on the life background and everyday practices of the cohort.

**Participants**

The criteria for participation was adults between the ages of 38 and 62, and residing in Melbourne or near Melbourne’s outskirts.
**Recruitment Process**

For the main study, a broad as possible segment of the general population of boomers in Melbourne was sought. To recruit a general sample of boomers, a range of channels were taken to inform the general community of the study and to invite participation. Specifically, a notice on the study was presented on community notice-boards, at local council libraries and in the most purchased newspaper in Melbourne – the Herald-Sun. In addition, the content of the notice was made more general to the one for the pilot studies, in order to apply to a broader audience and to minimise bias (e.g. selecting only those who are more active and interested in physical activity). This was achieved by taking out the topic of physical activity from the notice, and replacing it with the more general theme of adult health and wellbeing. The notice is included as Appendix 19. Interested persons were asked to contact the researcher via phone or email. The initial contact was typically about arrangement of a meeting for data collection.

**Participant background**

Table 9 presents the demographic background of the 217 participants. There was a relatively even spread of age groups of the boomer cohort, with over 10% in each age category. In terms of gender, 68% were female. The highest represented education levels completed was TAFE (18%), Bachelor degree (17%) and finishing Year 12 (15%). Full-time workers represented about 14% of the sample, part-time workers 21%, casual workers 16%, and unemployed, 35%. At least 10% of all the five major occupational levels were represented. Around a quarter of participants reported earning
$160 to $299 per week. Around 12% reported receiving less than $160 per week in income, and around 12% receiving $1,000 or over. The most common relationship situation was married or de-facto (40%), and never married or single (26%). The most common living situation was with spouse (or partner) and children (24%). The participants were reasonably well representative of the Melbourne region – 92 postcodes were indicated overall. Around 70% reported being born in Australia, and 8% born in the United Kingdom. As shown in Table 9, participants born outside of Australia were sparsely represented across the world. In terms of religion, just as for Study 2, Catholic was the most reported affiliation (22%) followed by “no religion” (27%). Over 60% of participants reported social support of one to four people (friends or family), for sharing private matters, and for daily tasks. The representativeness of the current sample is discussed at the end of this section.

Not included in Table 9 is the proportion of the current sample that would be classified by health authorities as “sufficiently active” for health, based on the Australian Physical Activity Guidelines (Victorian Department of Human Services, 2006). This was based on questions unique to Study 3 (Main) on physical activity in the last week, that were borrowed from the Victorian Population Health Survey (to be introduced shortly). Over half of participants (n = 123, 56.7%) reported participation in physical activity at a level classified as “sufficient”, a smaller proportion (n = 82, 37.8%) reported levels that were “insufficient”, and a small proportion (n = 12, 5.5%), could not be classified due to missing information across criterion variables (e.g. regularity and duration of walking in previous week). The overall proportion reporting a sufficient level of activity was very similar to that found in the Victorian Population
Table 9. Participant background for Main Study (Study 3, n = 217)

<table>
<thead>
<tr>
<th>Demographic Background</th>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>38 – 42 years</td>
<td>49</td>
<td>22.4%</td>
</tr>
<tr>
<td></td>
<td>43 – 47 years</td>
<td>58</td>
<td>26.7%</td>
</tr>
<tr>
<td></td>
<td>48 – 52 years</td>
<td>39</td>
<td>17.9%</td>
</tr>
<tr>
<td></td>
<td>53 – 57 years</td>
<td>38</td>
<td>17.5%</td>
</tr>
<tr>
<td></td>
<td>58 – 62 years</td>
<td>32</td>
<td>14.7%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>70</td>
<td>32.3%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>147</td>
<td>67.7%</td>
</tr>
<tr>
<td>Education level</td>
<td>Year 9 or below</td>
<td>21</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>Year 10 or equivalent</td>
<td>20</td>
<td>9.2%</td>
</tr>
<tr>
<td></td>
<td>Year 11 or equivalent</td>
<td>22</td>
<td>10.1%</td>
</tr>
<tr>
<td></td>
<td>Year 12 or equivalent</td>
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<td>15.2%</td>
</tr>
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<td></td>
<td>TAFE/Trade</td>
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<td>18.4%</td>
</tr>
<tr>
<td></td>
<td>Bachelor</td>
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<td>17.5%</td>
</tr>
<tr>
<td></td>
<td>Graduate Diploma/Honors</td>
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</tr>
<tr>
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<td>Masters/Doctorate</td>
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</tr>
<tr>
<td></td>
<td>Work full-time</td>
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<td>13.8%</td>
</tr>
<tr>
<td></td>
<td>Work part-time</td>
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</tr>
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<td></td>
<td>Casual</td>
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<td>15.7%</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
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<tr>
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<td>Other</td>
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<td>3.2%</td>
</tr>
<tr>
<td>Table 9 (continued)</td>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Occupation level†</td>
<td>Level I</td>
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<td>29.0%</td>
</tr>
<tr>
<td></td>
<td>Level II</td>
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<td>11.1%</td>
</tr>
<tr>
<td></td>
<td>Level III</td>
<td>24</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td>Level IV</td>
<td>49</td>
<td>22.6%</td>
</tr>
<tr>
<td></td>
<td>Level V</td>
<td>34</td>
<td>15.7%</td>
</tr>
<tr>
<td></td>
<td>Not classified</td>
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<td>10.6%</td>
</tr>
<tr>
<td>Income level</td>
<td>Nil income</td>
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<td>4.1%</td>
</tr>
<tr>
<td></td>
<td>$1-79 p.w.</td>
<td>9</td>
<td>4.1%</td>
</tr>
<tr>
<td></td>
<td>$80-159 p.w.</td>
<td>9</td>
<td>4.1%</td>
</tr>
<tr>
<td></td>
<td>$160-299 p.w.</td>
<td>54</td>
<td>24.9%</td>
</tr>
<tr>
<td></td>
<td>$300-499 p.w</td>
<td>45</td>
<td>20.7%</td>
</tr>
<tr>
<td></td>
<td>$500-699 p.w</td>
<td>32</td>
<td>14.7%</td>
</tr>
<tr>
<td></td>
<td>$700-899 p.w</td>
<td>25</td>
<td>11.5%</td>
</tr>
<tr>
<td></td>
<td>$1000 or more</td>
<td>26</td>
<td>12.0%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>8</td>
<td>3.7%</td>
</tr>
<tr>
<td>Household income</td>
<td>Less than $10,000</td>
<td>16</td>
<td>7.4%</td>
</tr>
<tr>
<td></td>
<td>$10,000 - $20,000</td>
<td>38</td>
<td>17.5%</td>
</tr>
<tr>
<td></td>
<td>$20,000 - $40,000</td>
<td>37</td>
<td>17.1%</td>
</tr>
<tr>
<td></td>
<td>$40,000 - $60,000</td>
<td>35</td>
<td>16.1%</td>
</tr>
<tr>
<td></td>
<td>$60,000 - $80,000</td>
<td>30</td>
<td>13.8%</td>
</tr>
<tr>
<td></td>
<td>$80,000 and over</td>
<td>33</td>
<td>15.2%</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>18</td>
<td>8.3%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>10</td>
<td>4.6%</td>
</tr>
<tr>
<td>Type of dwelling</td>
<td>House</td>
<td>147</td>
<td>68.7%</td>
</tr>
<tr>
<td></td>
<td>Flat or unit</td>
<td>56</td>
<td>26.2%</td>
</tr>
<tr>
<td></td>
<td>Caravan/mobile home</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Type of dwelling</td>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>(continued)</td>
<td>Retirement village</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Townhouse</td>
<td>4</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Rented room</td>
<td>7</td>
<td>3.3%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Home situation</td>
<td>Fully owned (paid off)</td>
<td>75</td>
<td>34.7%</td>
</tr>
<tr>
<td></td>
<td>Being paid off (with bank assistance)</td>
<td>59</td>
<td>27.3%</td>
</tr>
<tr>
<td></td>
<td>Being rented</td>
<td>74</td>
<td>34.3%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>8</td>
<td>3.7%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Marital situation</td>
<td>Never married (single)</td>
<td>57</td>
<td>26.5%</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>4</td>
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</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>47</td>
<td>21.9%</td>
</tr>
<tr>
<td></td>
<td>Separated (but not divorced)</td>
<td>21</td>
<td>9.8%</td>
</tr>
<tr>
<td></td>
<td>Married (or ‘de facto’)</td>
<td>86</td>
<td>40.0%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Living situation</td>
<td>Alone</td>
<td>49</td>
<td>22.6%</td>
</tr>
<tr>
<td></td>
<td>With room mates</td>
<td>23</td>
<td>10.6%</td>
</tr>
<tr>
<td></td>
<td>With spouse (or partner)</td>
<td>37</td>
<td>17.1%</td>
</tr>
<tr>
<td></td>
<td>With spouse (or partner) and children</td>
<td>52</td>
<td>24.0%</td>
</tr>
<tr>
<td></td>
<td>With parent(s)</td>
<td>12</td>
<td>5.5%</td>
</tr>
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<td></td>
<td>With parent(s) and children</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td>Alone with child(ren)</td>
<td>32</td>
<td>14.7%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>9</td>
<td>4.1%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Children under 5</td>
<td>None</td>
<td>197</td>
<td>90.8%</td>
</tr>
<tr>
<td></td>
<td>One</td>
<td>12</td>
<td>5.5%</td>
</tr>
<tr>
<td>Table 9 (continued)</td>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
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<td>------------</td>
</tr>
<tr>
<td>Children under 5</td>
<td>Two</td>
<td>4</td>
<td>1.8%</td>
</tr>
<tr>
<td></td>
<td>(continued)</td>
<td>Three</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over three</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Missing</td>
<td>0</td>
</tr>
<tr>
<td>Children between 5 and 18</td>
<td>None</td>
<td>135</td>
<td>62.2%</td>
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<tr>
<td></td>
<td>One</td>
<td>34</td>
<td>15.7%</td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>37</td>
<td>17.1%</td>
</tr>
<tr>
<td></td>
<td>Three</td>
<td>11</td>
<td>5.1%</td>
</tr>
<tr>
<td></td>
<td>Over three</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Children over 18</td>
<td>None</td>
<td>129</td>
<td>59.4%</td>
</tr>
<tr>
<td></td>
<td>One</td>
<td>36</td>
<td>16.6%</td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>33</td>
<td>15.2%</td>
</tr>
<tr>
<td></td>
<td>Three</td>
<td>10</td>
<td>4.6%</td>
</tr>
<tr>
<td></td>
<td>Over three</td>
<td>7</td>
<td>3.2%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Carer role for parents</td>
<td>No</td>
<td>177</td>
<td>81.6%</td>
</tr>
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<td></td>
<td>Yes</td>
<td>40</td>
<td>18.4%</td>
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<tr>
<td>Languages spoken at home</td>
<td>Non-English language</td>
<td>31</td>
<td>14.4%</td>
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<tr>
<td></td>
<td>Only English</td>
<td>185</td>
<td>85.6%</td>
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<td></td>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Mother born Australia</td>
<td>Born Australia</td>
<td>115</td>
<td>53.0%</td>
</tr>
<tr>
<td></td>
<td>Born overseas</td>
<td>100</td>
<td>46.1%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Father born Australia</td>
<td>Born Australia</td>
<td>110</td>
<td>51.2%</td>
</tr>
<tr>
<td></td>
<td>Born overseas</td>
<td>104</td>
<td>48.4%</td>
</tr>
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<td></td>
<td>Do not know</td>
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<td>0.5%</td>
</tr>
<tr>
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<td>0.9%</td>
</tr>
<tr>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td></td>
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<tr>
<td><strong>Region of birth</strong></td>
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</tr>
<tr>
<td>Australia</td>
<td>153</td>
<td>70.5%</td>
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</tr>
<tr>
<td>Europe: Southern</td>
<td>8</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td>Europe Western</td>
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<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Europe: Northern</td>
<td>1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>Europe: Eastern</td>
<td>4</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>America: North</td>
<td>1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>America: Central</td>
<td>1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>2</td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>Middle East</td>
<td>4</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>Former USSR/Baltic states</td>
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<td></td>
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<td>UK/Ireland</td>
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<td>7.8%</td>
<td></td>
</tr>
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<td>Asia: Southeast</td>
<td>7</td>
<td>3.2%</td>
<td></td>
</tr>
<tr>
<td>Asia: Northeast</td>
<td>3</td>
<td>1.4%</td>
<td></td>
</tr>
<tr>
<td>Asia: Southern</td>
<td>7</td>
<td>3.2%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>6.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Own car</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>155</td>
<td>71.8%</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>61</td>
<td>28.2%</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td><strong>Federal politics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian democrat</td>
<td>1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>105</td>
<td>49.5%</td>
<td></td>
</tr>
<tr>
<td>Liberal</td>
<td>24</td>
<td>11.3%</td>
<td></td>
</tr>
<tr>
<td>Swinging voter</td>
<td>42</td>
<td>19.8%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>40</td>
<td>18.9%</td>
<td></td>
</tr>
<tr>
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<td>5</td>
<td>2.3%</td>
<td></td>
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<td>Table 9 (continued)</td>
<td>Category</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Religion</td>
<td>Catholic</td>
<td>47</td>
<td>21.8%</td>
</tr>
<tr>
<td></td>
<td>Anglican (Church of England)</td>
<td>25</td>
<td>11.6%</td>
</tr>
<tr>
<td></td>
<td>Uniting church</td>
<td>9</td>
<td>4.2%</td>
</tr>
<tr>
<td></td>
<td>Presbytarian</td>
<td>8</td>
<td>3.7%</td>
</tr>
<tr>
<td></td>
<td>Greek Orthodox</td>
<td>4</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Baptist</td>
<td>12</td>
<td>5.6%</td>
</tr>
<tr>
<td></td>
<td>Lutheran</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Islam</td>
<td>4</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>Buddhism</td>
<td>12</td>
<td>5.6%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>37</td>
<td>17.1%</td>
</tr>
<tr>
<td></td>
<td>No religion</td>
<td>58</td>
<td>26.9%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Regularly attend social events</td>
<td>Yes</td>
<td>123</td>
<td>57.7%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>90</td>
<td>42.3%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>4</td>
<td>1.8%</td>
</tr>
<tr>
<td>Friends and family for private matters</td>
<td>Nobody</td>
<td>11</td>
<td>5.1%</td>
</tr>
<tr>
<td></td>
<td>1-4 people</td>
<td>132</td>
<td>61.1%</td>
</tr>
<tr>
<td></td>
<td>5-9 people</td>
<td>47</td>
<td>21.8%</td>
</tr>
<tr>
<td></td>
<td>10 or more people</td>
<td>26</td>
<td>12.0%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Friends/family for daily tasks</td>
<td>Nobody</td>
<td>32</td>
<td>14.8%</td>
</tr>
<tr>
<td></td>
<td>1-4 people</td>
<td>145</td>
<td>67.1%</td>
</tr>
<tr>
<td></td>
<td>5-9 people</td>
<td>23</td>
<td>10.6%</td>
</tr>
<tr>
<td></td>
<td>10 or more people</td>
<td>16</td>
<td>7.4%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
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<td>0.5%</td>
</tr>
</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use internet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>23</td>
<td>10.6%</td>
</tr>
<tr>
<td>Seldom</td>
<td>24</td>
<td>11.1%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>49</td>
<td>22.6%</td>
</tr>
<tr>
<td>Often</td>
<td>63</td>
<td>29.0%</td>
</tr>
<tr>
<td>Always</td>
<td>57</td>
<td>26.3%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Note. † Based on Australian and New Zealand Standard Classification of Occupations (ABS, 2006). Examples of occupation skill level – I: managers, health professionals; II: managing supervisors, hospitality managers, associate professionals; III: construction trades workers, personal assistants; IV: carers, intermediate clerical, rail drivers; V: cleaners, factory workers, sales support workers.

Health Survey of 2004 (56.8% in this larger study), although it should be noted that the estimate from this research is based on a wider age group (18 and over) and people in and outside of Melbourne.

Materials

Appendix 20 is the full survey compiled for Study 3, and Figure 10 provides an outline of the ordering of sections. The survey cover was entitled “Everyday Cultures and Health Survey”. In what follows is a background to the additional measures (i.e. those not piloted in Study 2), and the rationale for their inclusion. The most significant additions were questions from the Bennett et al. (1999) study of cultures in Australia,
and items from the Victorian Population Health Survey (Victorian Department of Health Services, 2006). The section on physical activity patterns was also extended.

**Everyday Cultures Survey of Bennett, Emmison & Frow (1999)**

Bennett et al. (1999) conducted the largest empirical study of cultural patterns in Australia. This study was mainly based on the Everyday Cultures Survey (see Bennett et al., 1999, pp. 272-289). As shown in Appendix 11 (Category D), various questions were drawn from this survey in order to provide a more detailed background to lifestyle patterns and cultural tastes.

**Cultural Participation**

For purposes of testing the PAV model, the most important set of questions borrowed from the Everyday Cultures Survey was on cultural participation (e.g. ‘attendance at cultural venues’). Participants were asked to rate frequency of participation in 21 cultural and publically-provided activities. These included art gallery visits, night clubs and cultural festivals. The response scale used in the current study was never, seldom, sometimes, often, always. This response format differs from the original one used by Bennett et al. (1999): often, sometimes, hardly ever, never, not available where I live. The response format was changed for purposes of consistency with the other questions in the current survey on frequency (e.g. use of self-regulation skills).
Figure 10. Ordering of questions and measures in the survey booklet of Study 3 (Main study).

Demographic Background
  ↓
General demographics
  ↓
Health and lifestyle patterns
  ↓
Physical Activity Patterns ‘Exercise Questionnaire’
    ↓
Walking
    ↓
Workplace Physical Activity
    ↓
Housework & Gardening/Yardwork
    ↓
Moderate-Vigorous Activities
    ↓
Main Physical Activity
    ↓
Light Activities
    ↓
Skills & Strategy Use (inc. self-regulation & social support elicitation)
    ↓
Ursin Symptom Inventory
    ↓
Everyday Cultures Questionnaire
It should be noted that while Bennett et al. (1999) presented a list of cultural activities, and they conducted principal components analysis to explore dimensionality of cultural participation, their questions were not designed to construct a scale as understood in the discipline of psychology. For instance, the reliability of responses were not reported by these authors. Nevertheless, as will be illustrated in Chapter 3, items to represent cultural participation displayed unidimensionality and good internal consistency.

**Victorian Population Health Survey**

The Victorian Population Health Survey is the main source of data on the health-related behaviours and health of people over 18, residing in Melbourne. This survey is administered every four years by the State Government of Victoria, of which Melbourne is the capital city. In order to attain a more detailed background on the lifestyle patterns of the cohort using validated self-report questions, as well as the capacity to evaluate the generalisability of the sample, parts of the Victorian Population Health Survey were integrated into the survey for Study 3. Permission for use of a set of questions (requested by the researcher) was provided by the Victorian Department of Health: specifically, on physical activity in the past week, health-related behaviours (e.g. fruit consumption and alcohol), and health status. Appendix 11 indicates the questions adopted from the Victorian Population Survey.
Physical activity patterns

The current survey of physical activity patterns was similar to that of Study 2 (Pilot2), with the exception that there were additional questions on the features of the participant’s main nominated activity (e.g. stability, use or not of equipment), to attain a more detailed information on the context of physical activities. To ensure the physical activity survey was not longer due to the additional questions, a section with repetitive questions from Study 2 (Pilot2, called “overall activity”), was not included in Study 3.

Procedure

All aspects of data collection for Study 3 (survey and ability test) were conducted in person with participants. Most of the data collection took place in small groups. Similar to Study 2, the field settings were diverse, including the participant’s home, meeting rooms at local council libraries, and workplaces. Steps in the data collection process are presented in Figure 11. The plain language statement and consent form were presented at the start of the meeting between researcher and prospective participant(s) (see Appendix 21 for these forms). As CFIT requires maximal performance, and so is best conducted when participants are ‘fresh’, this test was conducted first. Similar to Study 2 (Pilot2), instructions were delivered via tape. Just as for Study 2, efforts were made to make the conditions for ability testing as uniform as possible across settings where data collection took place. As shown in Figure 11, after the CFIT, participants proceeded to do the survey. Survey completion was between 30 and 60 minutes in duration. Drink and snacks (e.g. water, and biscuits) were provided at all sessions and participants were informed that they could take regular breaks. The
most regular rest period was immediately after the CFIT. Once participants handed back the survey, they were given $50 in appreciation for their participation, as well as a copy of the debrief statement (Appendix 22).

Figure 11. Procedure of data collection for Study 3 (Main study).

Sample representativeness and validity of data

The representativeness of the sample to the wider population was analysed by matching the current data to population research on physical activity patterns in Australia. Appendix 23 reports on the level of similarity of percentages for specific physical activities, where a one-to-one matching of data was feasible. In general there were correspondences in patterns, such as in ordering of the most frequent physical
activities, and the prevalence of the most common types of physical activity. Although this approach does not provide a definite judgement of sample representation, Appendix 23 suggests that sampling bias for data of the Main Study, at least with respect to physical activity patterns, was minimal.
Chapter 3: Results

Overview

Chapter 3 has three major sections. Section 1 is a rationale and background to the quantitative methods, including criteria for evaluating statistical models. Section 2 presents findings of the preliminary analyses of the self-report and ability measures. As the purpose of the two pilot studies (Study 1, Study 2) was to develop and validate measures for the main study (Study 3), for brevity, instead of dividing results by successive studies, the analyses are reported measure by measure. Also, preparation of latent variables are presented first, followed by procedures for operationalisation of the observed variables. Section 3 presents results for the hypothesised model and series of alternative models.

Background to analytic approach

Multivariate statistical analysis was the empirical approach of the current thesis. The aim of the thesis was to investigate the plausibility of the Model of Physical Activity Variety (“PAV model”). A multivariate statistical approach called Structural Equation Modelling was utilised to rigorously evaluate the PAV model.
**Structural equation modelling**

Structural equation modelling (SEM) involves analysis of variances and covariances, including a statistical test of the discrepancy between the observed matrix and predicted matrix (Kline, 1998). As SEM looks at relationships between variables, it is similar to traditional regression and pathway analysis (e.g. Wright, 1934), but is an advance on these techniques in that one or more variables are modelled as latent constructs (Byrne, 2012), whereby the ‘true’ relationships between latent constructs are identified by estimating and ‘extracting out’ measurement error (see Kline, 1998). The structural model of a system distinguishes between exogenous and endogenous variables (Byrne, 2012; i.e. external to, and internal to the system, respectively). SEM is applied in physical activity research (Ayotte, Margrett, & Hicks-Patrick, 2010; Baker, Little, & Brownell, 2003; Ishii, Shibata, & Oka, 2010; Mäkinen et al., 2010; Motl et al., 2007; Rhodes et al., 2006; Rovniak et al., 2002; Saklofske, et al., 2007; Stanley et al., 2012; Umstattd et al., 2008), and empirical inquiries into other health-related practices (e.g. Hampson et al., 2007).

The statistical programs used were Mplus, Version 6.1 (Muthén & Muthén, 1998-2010) and the Statistical Package for the Social Sciences, Version 19.0 (IBM SPSS Inc., Chicago, IL, 2010). While Mplus was the primary program for confirmatory factor analysis and SEM, results were double checked in the AMOS® application of SPSS (Analysis of Moment Structures; Arbuckle, 1995-2008).
Rationale for structural equation modelling

There are several strengths of SEM (Byrne, 2012; Kline, 1998) with respect to the empirical challenges of the current inquiry. First, SEM provides the capacity to simultaneously test multiple relationships. This was important as most of the current hypotheses required controlling for a range of variables. Second, SEM is flexible, allowing the specification of complex relationships. For instance, indirect effects can be investigated, such as those specified in hypothesis 1 ($H1$), between education, self-regulation, social-support elicitation and physical activity variety. Third, as canvassed above, through latent variable modelling, the role of measurement error is estimated and controlled for. Minimising error variance was important to the current analysis as self-report measures were used. Fourth, SEM is flexible in allowing for inclusion of different types of variables (observed and latent) in the one model. The operational variables for the hypothesised model included observed variables (e.g. age) and latent variables (e.g. self-regulation), and both types could be modelled together. Fifth, through comparison of different configurations (structural relations) of a set of variables, the relative validity of SEMs can be compared.
Major steps in structural equation modelling

The steps in SEM are pictured in Figure 12. The process depicted in Figure 12 takes into account major phases of modelling described by Byrne (2012; see also Boomsma, 2000; Hoyle & Panter, 1995). SEMs are comprised of a ‘measurement model’ and the structural relations between measured components. In terms of the overall process, a measurement model is first established (top of Figure 12). The current approach to establishing the measurement part of SEMs will be elaborated on shortly. In the next step, the relations are specified between variables (i.e. structural relations) and resulting parameter estimates are evaluated. SEM allows for testing of alternative and competing models – the latter called the “competing models strategy” (Hair et al., 2006, p. 733). Variations on the PAV model were considered (alternative models, such as where social support elicitation precedes self-regulation), as well as competing accounts (in this case, a central role of cognitive ability in self-agency and physical activity variety). All of the above steps involve (a) estimation of parameters (e.g. error variances), and (b) evaluation of parameters (e.g. good of fit indices). Testing of multiple models involves the chi-square ($\chi^2$) difference test between the original model and competing (or alternative) model.

If there is significant local or global mis-fit in the model, the model may be mis-specified. The dashed rectangle in Figure 12 indicates additional steps where modifications to the model (e.g. addition or removal of a path) are made. Deciding on whether to re-specify a model should be based on substantive theory and technical assessment of model fit (Jöreskog, 1993). Such adjustments should only be applied if there are theoretical grounds to do so (Byrne, 2012). Also, as this step signifies a shift
from a priori to exploratory or post hoc analysis, each modification risks reducing the
generalisability of the model, as it may be accommodating particularities of the sample
data. Given this, alterations to a model should be kept to a minimum (Byrne, 2012). In
the final step, a decision is made on the final model, taking into account theoretical
issues, relative model fit, and parsimony.

Figure 12. Overview of the process of structural equation modelling.
Scale development

To address the current research questions, a number of measures needed to be developed (e.g. of social support elicitation), and already established measures (e.g. of cognitive ability) required validation for use with the current population of interest (‘baby boomer’ adults from the general community, in Melbourne, Australia).

An important distinction in analytic approaches to scale development, refinement and validation is between exploratory techniques (e.g. principal components and exploratory factor analysis) and confirmatory methods (e.g. confirmatory factor analysis). In cases where the factor structure is not known, as well as when there is need to reduce data (such as the number of items in a measure) – principal components is a pathway to exploring the structure of items and to psychometrically assess measures (Field, 2009). In situations where there are theoretical or conceptual grounds for how items are grouped, how many factors may underlie a correlation matrix, confirmatory models are desirable, as there is more control over specification (Fabrigar et al., 1999). Measurement models verified through confirmatory factor analyses have served well in the evaluation of self-report measures of self-regulation for physical activity (e.g. Ayotte, Margarett, & Hicks-Patrick, 2010; Umstattd et al., 2008), as well as principal components analysis in developing these instruments (e.g. Anshel & Porter, 1996). To ensure brevity for the remainder of the Chapter – principal components analysis will be referred to as PCA, and confirmatory factor analysis referred to as CFA.
Table 10 provides an overview of whether PCA or CFA was applied for each measure, and according to which study. The choice of PCA or CFA depended on the scenario of analysis, along the lines described above. As indicated in Chapter 2, the self-report measures for self-regulation and social support elicitation were newly developed, and trialled in Study 1 (Pilot₁). Based on the structure of items identified in Study 1, CFA could be conducted with the new sample from Study 2 (Pilot₂), and cross-validated in Study 3 (Main study). For CFAs in Study 2 and Study 3, some refinements to measures were conducted, in order to establish psychometrically sound constructs for inclusion in the SEM. For instance, the sample for Study 2 was the basis for model generation for the constructs of self-regulation and social support elicitation, and Study 3 was a validation sample. Scale development and evaluation also took place for the Ursin Symptoms Inventory (Ursin, Endresen, & Ursin, 1988), Activity Practices Questionnaire (new measure), and Motivation for Physical Activity Measure (Ryan et al., 1997). As these constructs were not relevant to testing of the hypotheses, a summary of results are reported in Appendices 24 to 26.
Table 10. Overview of psychological measures submitted to psychometric analysis

<table>
<thead>
<tr>
<th>Measure</th>
<th>Type of analysis</th>
<th>Variable included in PAV model&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Report of findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive ability</td>
<td>CFA&lt;sub&gt;S1&lt;/sub&gt;</td>
<td>Yes</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Self-regulation of physical activity</td>
<td>PCA&lt;sub&gt;S1&lt;/sub&gt;, CFA&lt;sub&gt;S2,3&lt;/sub&gt;</td>
<td>Yes</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Social support elicitation</td>
<td>PCA&lt;sub&gt;S1&lt;/sub&gt;, CFA&lt;sub&gt;S2,3&lt;/sub&gt;</td>
<td>Yes</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Cultural participation</td>
<td>PCA&lt;sub&gt;S3&lt;/sub&gt;</td>
<td>Yes</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Subjective symptoms</td>
<td>PCA&lt;sub&gt;S2,3&lt;/sub&gt;</td>
<td>No</td>
<td>Appendix 24</td>
</tr>
<tr>
<td>Reasons for main physical activity</td>
<td>PCA&lt;sub&gt;S1&lt;/sub&gt;, CFA&lt;sub&gt;S2,3&lt;/sub&gt;</td>
<td>No</td>
<td>Appendix 25</td>
</tr>
<tr>
<td>Practices during main physical activity</td>
<td>PCA&lt;sub&gt;S1&lt;/sub&gt;, CFA&lt;sub&gt;S2,3&lt;/sub&gt;</td>
<td>No</td>
<td>Appendix 26</td>
</tr>
</tbody>
</table>

<sup>a</sup>Scales not included in the PAV model were used for supplementary analyses.
Principal components analysis

As earlier stated, PCA is a data reduction technique and can be applied when there are no a priori specifications on what items may fall together (i.e. a type of exploratory analysis). The following methods were applied as part of the iterative approach of PCA, towards attaining simple structure for items.

Factorability of data

Apart from scanning the size of correlation coefficients, factorability of the data was assessed through the Kaiser Sampling Adequacy Index (KSA; Kaiser, 1970). Kaiser (1974, p. 35) provided evaluation of KSA values as follows: .90s ("marvellous"), .80s ("meritorious"), .70s ("middling"), .60s ("mediocre"), .50s ("miserable"), and .50 or less ("unacceptable").

Number of components to extract

Multiple sources of information are useful for determining the number of components to keep (cf. Hayton, Allen, & Scarpello, 2004; Zwick & Velicer, 1986). The issue of what number of components to extract is a decision making process that is vigilant to the risks of ‘overextraction’ and ‘underextraction’ (Costello & Osborne, 2005; O’Connor, 2000). In the current analysis, judgements on the number of components to retain included consideration of (1) the content of sets of items (i.e. substantive judgement), (2) the Cattell (1966) scree plot, (3) the Kaiser (1960) Eigenvalue-1 Rule of Eigenvalues of one or more in value, (4) Parallel test (Horn, 1965), and (5) Velicer’s (1976) Minimum Average Partial Test (‘MAP test’). The
Parallel test and MAP test correct for the tendency of decision-making based on the scree plot, to overestimate the number of components (Hayton, Allen & Scarpello, 2004).

*Interpretation of components, and derivation and refinement of scales*

Component solutions were rotated in order to interpret the factorial structure. For data on psychological phenomena, dimensions are expected to be related, in which case oblique rotation is more appropriate than orthogonal rotation (cf. Kline, 1998). The content of items was considered in conjunction with the psychometric information of the PCA solution. For oblique rotation, the pattern matrix was analysed to interpret component loadings and identify cross-loading items. Component loadings were deemed ‘acceptable’ if they had a magnitude of at least ±.40 (Field, 2009), and ‘good’ if over ±.70 (Hair et al., 2006). Communalities were inspected as well as variance explained by each component. As the main aim was to arrive at scales for testing models, any items not meeting these general criteria were considered for removal. If applicable, this process would take place one item at a time, with reapplication of the PCA with each refinement.

*Data issues and analytic strategies*

The analytic procedures for CFA and SEM are now introduced, beginning with statistical assumptions and data preparation, and then turning to criteria for assessing construct validity and reliability.
Normality and checking of statistical assumptions

Multivariate normality in the data is an important statistical assumption for maximum likelihood estimation in SEM (McDonald & Ho, 2002). Multivariate kurtosis is particularly problematic when using maximum likelihood, leading to risk of misinterpretation of the results (Byrne, 2012). For confirmatory factor models and SEM, the Mardia coefficient is an index for level of multivariate kurtosis (Mardia, 1970), and can be generated in AMOS. Although there is no consensus on “cut-offs” for multivariate kurtosis (Byrne, 2012), the normalised value of the Mardia coefficient that is of in excess of 1.96 serves as a sign of deviation from normality (Kline, 1998), and a coefficient value of 10 is a general marker for multivariate kurtosis that is large (Bentler, 1998, cited in Swerdzewski, 2008, p. 62). For model testing, where the assumption of multivariate normality was not met, an estimation procedure more immune to non-normality than general maximum likelihood was applied, such as Weighted Least Squares (WLSMV in Mplus), and for the SEMs, parcelling of indicator variables for factors was applied to reduce non-normality (Little et al., 2002).

Missing values

Typically, the number of missing values was very low (less than 5%), including for all of the variables included in the SEM. Where missing data was addressed, the method varied depending on the context of the analysis. For the overall model, Full Information Maximum Likelihood (FIML; Enders, 2001) was used. FIML is the missing data default strategy in Mplus. Enders (2001) demonstrated, through Monte Carlo simulations, that FIML generates lower biased estimates than traditional missing
data strategies such as value imputation and replacement. For education (a manifest variable), Expectation Maximisation (EM; Acock, 2005; Graham, 2009) was utilised, and the accuracy of EM imputed values could be checked. These steps are described later in the Chapter.

Types of variables

There was a variety of variable types among variables for the hypothesised model: dichotomous (gender), continuous (e.g. education, age), and ordinal categorical (e.g. five-level Likert-type response format for items on self-regulation and social support elicitation). For inferences on relationships between ordered categorical variables, polychoric correlations were applied (cf. Holgado-Tello et al., 2010). Pearson correlations tend to underestimate the true association between categorical ordered variables, whereas polychoric correlations provide a more accurate estimate (Bollen & Barb, 1981). For supplementary analyses, such as checking assumptions in the thesis (e.g. relationship between education and health), other types of correlation were applied (e.g. Spearman rho coefficient, point-biserial coefficient) in accordance with the type of variables investigated.
Evaluation criteria for factor analyses and structural equation models

Assessment of construct validity includes unidimensionality and internal reliability of single factors, and discriminant validity between factors. To assess the validity of individual constructs and the overall structural model, measures of local and global fit were employed.

Over-identification and scaling of variables

It was ensured that all self-report measures of psychological constructs (e.g. self-regulation) had at least three indicators for assessment of unidimensionality (e.g. scree plot), and permit identification of a factor (cf. Kline, 1998). For CFAs, in order to provide a metric to each unobserved latent variable, in line with convention (cf. Byrne, 2012, pp. 33-34), the parameter for the loading of the first indicator on the hypothesised factor was set at one (1.0).

Convergent validity and internal consistency

The following criteria were applied in assessment of the validity and reliability of factors. Consistent with rules of thumb applied for the PCAs, an ‘acceptable’ loading was taken to be over ±.4 (Field, 2009), and ‘good’ loading to be over ±.7 (Hair et al., 2006). An item was considered as cross-loading if it loaded on more than one factor by a magnitude of ±.3 (a slightly more conservative estimate than .32 cited in Costello & Osborne, 2005). In addiction to size of loadings, indicators specified for a factor were judged as ‘belonging’ to that factor if the t-statistic for the pathway from the factor to the indicator was significant at p < .05 (Byrne, 2012). Convergent validity is indicated by all of the indicators loading significantly on the specified factor (Hair et al., 2006).
Unidimensionality of a set of items was checked for all factor analyses by inspection of the Scree plot (Cattell, 1966). Internal consistency (reliability) was assessed using the Cronbach’s (1951) alpha coefficient. Construct validity was used as a complement to Cronbach’s alpha (cf. Hair et al., 2006; Fornell & Larcker, 1981). This validity estimate ($\rho_\eta$) is operationalised as the square of the sum of standardised factor loadings, divided by the square of the sum of standardised factor loadings added to the sum of error variances for the set of items (see Fornell & Larcker, 1981, p. 45).

**Discriminant validity**

As there is no definitive test of discriminant validity in the literature, two analytic strategies of discriminant validity were conducted to provide an overall judgement. The first step was to check the size of the correlation coefficient between factors, with a coefficient above .70 as flagging a lack of discrimination between factors, and over .80 as indicating poor discrimination. As a second step, the “average variance extracted versus shared variance test” (Farrell, 2010, p. 325; Fornell & Larcker, 1981) was performed. For this test, evidence for discriminant validity occurs when unique variance for a factor (by the specified set of items) is higher than the shared variance between factors. A strength of this type of test is that in confirmatory factor modelling, computation of the average extracted variance takes into account error variances (for formula, see Fornell & Larcker, 1981, p. 45).
Criteria for global and local fit

For assessment of global fit, absolute and comparative or ‘incremental’ fit indices are available (see Byrne, 2012; Hair et al., 2006). The criterion for assessment of model fit broadly followed that set by Byrne (2012) and reviews of reporting of CFAs and SEMs (Bentler, 1990). The \( \chi^2 \) test served as the main assessment of global fit. A non-significant p-value indicates that the data does not differ significantly from the implied model. As the \( \chi^2 \) statistic is prone to bias with large sample size, irrespective of the plausibility of a model (Bentler & Bonett, 1980), the \( \chi^2 \) divided by the degrees of freedom to correct for this over-sensitivity (Marsh, Balla, & McDonald, 1988), was also inspected – called the “normed \( \chi^2 \)”.

For Hair et al. (2006, p. 748) better fit is indicated by “3:1 or less” as the size of ratio of \( \chi^2 \) statistic, to degrees of freedom. Although the current samples in this study were not excessively ‘large’, this index was included to account for potential bias of the \( \chi^2 \). Alongside the normed \( \chi^2 \) test, numerous tests of global fit or “ancillary indices” (Jackson, Gillaspy, & Purc-Stephenson, 2009, p. 10) are proposed in the literature. While the optimal set of tests is a matter of ongoing debate, a sound approach is to draw on multiple indices (Byrne, 2012). For the current analysis, the main absolute fit criterion was the Root Mean Square Error of Approximation (RMSEA) and accompanying 90% confidence interval (CI). As articulated by Byrne (2012), RMSEA indicates “…the extent to which it [a hypothesised model] fits reasonably well in the population.” (p. 74). A RMSEA 90% CI anywhere between 0.00 and 0.08 was deemed as evidence of model fit. A point estimate below .06 is indicative of good fit (Hu & Bentler, 1999). In addition, the Standardised Root-Mean-Square Residual (SRMR) was taken into account. The SRMR is calculated as the mean of the
standardised divergence between the variance-covariance matrices of the observed data and predicted model (for details, see Byrne, 2012, pp. 73-74). An SRMR under .06 is indicative of model fit (Hu & Bentler, 1999), and under .05 as suggestive of good fit (Byrne, 2012).

For incremental fit indices, the criteria used were the Tucker Lewis Index (TLI; Tucker & Lewis, 1973), and Comparative Fit Index (CFI; Bentler, 1990). The Non Normed Fit Index is another name for the TLI (Hu & Bentler, 1999). For both TLI and CFI, a level above .95 was taken as indicating model fit, less than .95 as under-fit, and over unity as over-fit (Hu & Bentler, 1999). Finally, for comparison of SEMs, the parsimony index of Akaike Information Criterion (AIC; Akaike, 1987) was investigated.

For local fit in CFAs and SEMs, standardised residuals of ±2 indicate potential discrepancy between the implied model and data for individual indicators, and ±4 indicate a significant divergence (Hair et al., 2006, p. 795). In addition, modification indices were inspected. Mplus provides modification indices (MIs), and Expected Changes in Parameters (ECPs) if the relation was specified (Byrne, 2012). An ECP is the “predicted estimated change in either a positive or negative direction for each fixed parameter in the model should it be estimated in a subsequent test of the model” (Byrne, 2012, p. 86). In considering sources of model misspecification, the MIs were inspected, with 3.84 and 10 as cut-off points for parameter estimate changes that would be significant (Byrne, 2012). As MIs are entirely based on mathematical procedures, decision-making based on this information needs to be guided by theory.
Sample size

There is no consensus on what holds as a sufficient sample size for conducting CFA and SEM. Based on Monte Carlo analyses, MacCallum et al. (1999), found that adequacy of sample size is contingent on the number of factors, and indicators to factors, and the level of communality. Another important feature is the ratio of number of parameters estimated to the number of participants. It is recommended that for robust estimates, an absolute minimum of five participants per parameter is needed; but at least ten participants per estimated parameter is preferred (e.g. Kline, 1998, p. 277). For CFA, Kline (2005; cited in Worthington & Whitakker, 2006, p. 826) suggested 100 participants as an absolute minimum.

The sample size for Study 3 (n = 217) was deemed adequate for an overall CFA. For SEM, to increase degrees of freedom and minimise multivariate non-normality, two constructs were specified as single-indicator latent variables. This modelling approach is described later in this Chapter.

Testing competing or alternative models

As stated earlier in the Chapter, an analytic advantage of SEM is to compare the relative plausibility of complex multivariate models through changes in model fit. As described earlier, the change in $\chi^2$ test was applied (i.e. difference between the $\chi^2$ values and degrees of freedom for the two models) for comparing SEMs. Differences in $\chi^2$ follow a chi-square distribution. A statistically significant change in $\chi^2$, where the original model has a higher $\chi^2$ than the alternative model would indicate that the alternative model led to substantive improvement in the fit of the restricted matrix, to the data.
Investigating mediation and indirect effects

Structural relationships were deemed to be either a non-effect, direct effect, or type of indirect effect (full mediated effect, partial mediated or non-mediated). Types of effects are illustrated in traditional mediation analysis (Baron & Kenny, 1986), by configurations between three variables (X, Y, and M), where Y is the dependent variable, M is a candidate mediator, and X is the independent variable. The following scenario provides evidence for a mediated effect: (1) X effects M, (2) M effects Y, and (3) in the absence of M, X effects Y. Full mediation is demonstrated when the non-zero path from X to Y becomes a zero one when the M is introduced as an intervening variable. Partial mediation is demonstrated when the regression co-efficient between X and Y remains a non-zero one, but reduces in magnitude of effect, when M is introduced to intervene X and Y. A non-mediated indirect effect occurs when the relationship between two variables X and Y is not significant, and if the intervening variable is introduced (M), pathways from X to M, and from the M to Y, are both non-zero (Holmbeck, 1997). Sobel’s test (Sobel, 1982, cited in Baron & Kenny, 1986, p. 1177) is applied in Mplus for the presence of indirect effects. Following Hair et al. (2006, p. 880) an indirect effect was deemed as “small” if the coefficient was below .08.
Preliminary Analyses

**General Exercise Strategies Questionnaire**

As described in the Method, the General Exercise Strategies Questionnaire (GESQ) was developed to establish the constructs of self-regulation and social support elicitation. This took place through two pilot studies (Study 1 and 2), in preparation for SEM analysis in Study 3. As indicated earlier in Table 10, Study 1 (Pilot1) involved PCA, Study 2 (Pilot2) a CFA, and Study 3 involved a validation test of the factor model from Study 2.

**Study 1 (Pilot): Exploratory analysis**

The correlation matrix for items of the self-regulation questionnaire was found to be factorable (KMO = .53, in the region described by Kaiser, 1974, p. 35, as “miserable”, but not “unacceptable”). For the full set of items, communalities ranged from .65 to .86. The domains covered in the survey were assumed to be inter-related as they all pertained to seeking to keep physically active. Given this, an oblique rotation was chosen (promax). The Eigenvalue-1 rule suggested 36 components to extract. This high number is not surprising given the range of concrete strategies and skills included in the survey. The other technical indicators of how many components to retain provided diverging results: 5 to 7 components by the scree plot, 15 components according to the parallel test, and 9 components by the MAP test. Given this pattern of results, a range of principal component models were explored, ranging from three
components to fourteen components. Across the principal component solutions where three or more components were extracted, there were consistent sets of items. The most conceptually sound pattern of items was found for PCA with eight components extracted. Through an iterative process, the overall measure was reduced from 148 to 44 items. For the final PCA solution of the 44 items, 57.3% of item variance was accounted for by the first eight components.

The final solution demonstrated simple structure, as shown by the pattern matrix, presented in Table 11. Communalities ranged from .42 to .79. Each component designated specific types of self-regulatory skills and strategies, and in general, encompassed forms of self-agency that were drawn from the academic literature (Karoly & Ruehlman, 1995; Kitsantas, 2000; Saelens et al., 2000), and public health guidelines on self-directed approaches to physical activity (Australian Department of Health and Aged Care, 1999). Component 1 was labelled ‘self-regulation’. This domain covers classic forms of cognition and tasks involved in regulation such as planning, self-monitoring, and lifestyle management. These items were intended for the representation of self-regulation of physical activity in Study 3 (Main study). Component 2 was labelled ‘self-reflection’ and included a range of thoughts tied to interest in doing more activity, such as envisaging being more physically active, and self-talk to be more active. Component 3 was labelled ‘social support elicitation’. Social support elicitation contained items on efforts to build social support for physical activity. As described in Chapters 1 and 2, this domain was of central interest to evaluate the PAV model. Component 4 was labelled ‘setting environmental cues’ as the
Table 11. Principal component solution for the General Exercise Strategies Questionnaire (Study 1, n = 218)

<table>
<thead>
<tr>
<th>Item</th>
<th>PC1</th>
<th>PC2</th>
<th>PC3</th>
<th>PC4</th>
<th>PC5</th>
<th>PC6</th>
<th>PC7</th>
<th>PC8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organise my day to ensure I can do exercise</td>
<td>.84</td>
<td>-.19</td>
<td>-.04</td>
<td>-.06</td>
<td>.02</td>
<td>.17</td>
<td>-.04</td>
<td>.12</td>
</tr>
<tr>
<td>If something gets in way of planned exercise, find an alternative way to do it</td>
<td>.79</td>
<td>-.07</td>
<td>-.05</td>
<td>-.04</td>
<td>-.03</td>
<td>.01</td>
<td>.20</td>
<td>-.14</td>
</tr>
<tr>
<td>Find ways to get around barriers to physical activity</td>
<td>.74</td>
<td>-.02</td>
<td>-.10</td>
<td>.05</td>
<td>.042</td>
<td>.12</td>
<td>.10</td>
<td>-.09</td>
</tr>
<tr>
<td>I write my planned exercise activity sessions in an appointment book or calendar</td>
<td>.72</td>
<td>-.17</td>
<td>-.06</td>
<td>.27</td>
<td>-.150</td>
<td>-.25</td>
<td>-.07</td>
<td>.18</td>
</tr>
<tr>
<td>Set aside a special time to do physical activity</td>
<td>.70</td>
<td>-.03</td>
<td>.01</td>
<td>.10</td>
<td>.019</td>
<td>-.11</td>
<td>-.02</td>
<td>.19</td>
</tr>
<tr>
<td>Think about ways of overcoming obstacles to keeping regularly active</td>
<td>.68</td>
<td>.10</td>
<td>-.13</td>
<td>-.01</td>
<td>.010</td>
<td>.15</td>
<td>.19</td>
<td>-.12</td>
</tr>
<tr>
<td>Set goals of how much exercise to do</td>
<td>.60</td>
<td>.22</td>
<td>.15</td>
<td>-.14</td>
<td>.037</td>
<td>-.08</td>
<td>.01</td>
<td>.09</td>
</tr>
<tr>
<td>Try to cut down on other responsibilities to make time or have the energy</td>
<td>.58</td>
<td>-.14</td>
<td>.11</td>
<td>.07</td>
<td>.093</td>
<td>.00</td>
<td>.02</td>
<td>.07</td>
</tr>
<tr>
<td>Closely keep track of how much exercise I do</td>
<td>.57</td>
<td>.20</td>
<td>.03</td>
<td>.06</td>
<td>.042</td>
<td>-.03</td>
<td>-.20</td>
<td>-.12</td>
</tr>
<tr>
<td>Blame myself for not being regularly active</td>
<td>-.25</td>
<td>.88</td>
<td>.07</td>
<td>.03</td>
<td>.011</td>
<td>-.08</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Item</td>
<td>PC1</td>
<td>PC2</td>
<td>PC3</td>
<td>PC4</td>
<td>PC5</td>
<td>PC6</td>
<td>PC7</td>
<td>PC8</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Tell myself I should be more disciplined for not being regularly active</td>
<td>-.29</td>
<td>.87</td>
<td>-.07</td>
<td>.071</td>
<td>.02</td>
<td>.010</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Think about what negative things that could happen if I don't exercise</td>
<td>-.17</td>
<td>.81</td>
<td>-.13</td>
<td>.048</td>
<td>.15</td>
<td>-.03</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Mentally picture myself how I will be if I keep up regular exercise</td>
<td>.20</td>
<td>.73</td>
<td>-.07</td>
<td>.06</td>
<td>-.12</td>
<td>.03</td>
<td>-.18</td>
<td></td>
</tr>
<tr>
<td>Think about people I know who are regularly active</td>
<td>.15</td>
<td>.65</td>
<td>.06</td>
<td>-.10</td>
<td>.00</td>
<td>-.13</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>When I am not active enough, think about why</td>
<td>.28</td>
<td>.61</td>
<td>.02</td>
<td>-.19</td>
<td>-.17</td>
<td>.07</td>
<td>.05</td>
<td>.15</td>
</tr>
<tr>
<td>Mentally picture myself being regularly active</td>
<td>.32</td>
<td>.57</td>
<td>-.09</td>
<td>.08</td>
<td>.07</td>
<td>-.12</td>
<td>-.08</td>
<td>-.18</td>
</tr>
<tr>
<td>Reflect on times in the past when I have achieved regular exercise</td>
<td>.07</td>
<td>.45</td>
<td>.15</td>
<td>-.10</td>
<td>-.26</td>
<td>.09</td>
<td>.11</td>
<td>.28</td>
</tr>
<tr>
<td>Contact a friend to organise a get together for sport, gym, walk or other exercise</td>
<td>-.09</td>
<td>-.18</td>
<td>.90</td>
<td>-.01</td>
<td>-.15</td>
<td>-.01</td>
<td>.03</td>
<td>.04</td>
</tr>
<tr>
<td>Hang around people who are enthusiastic about exercise</td>
<td>.03</td>
<td>.05</td>
<td>.77</td>
<td>-.09</td>
<td>-.21</td>
<td>.11</td>
<td>-.07</td>
<td>.01</td>
</tr>
<tr>
<td>Share my feelings about regular exercise with my exercise partners</td>
<td>.14</td>
<td>-.10</td>
<td>.74</td>
<td>-.08</td>
<td>.07</td>
<td>.02</td>
<td>-.03</td>
<td>-.07</td>
</tr>
<tr>
<td>Item:</td>
<td>PC1</td>
<td>PC2</td>
<td>PC3</td>
<td>PC4</td>
<td>PC5</td>
<td>PC6</td>
<td>PC7</td>
<td>PC8</td>
</tr>
<tr>
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<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Ask my friends/family to remind me to exercise</td>
<td>-.21</td>
<td>-.06</td>
<td>.61</td>
<td>.15</td>
<td>.11</td>
<td>-.04</td>
<td>.28</td>
<td>-.09</td>
</tr>
<tr>
<td>Announce to others my exercise/fitness goals</td>
<td>-.03</td>
<td>.24</td>
<td>.49</td>
<td>.08</td>
<td>.21</td>
<td>-.13</td>
<td>.04</td>
<td>-.05</td>
</tr>
<tr>
<td>Tell others I have been exercising regularly</td>
<td>.13</td>
<td>.24</td>
<td>.48</td>
<td>-.11</td>
<td>.13</td>
<td>-.13</td>
<td>-.10</td>
<td>-.05</td>
</tr>
<tr>
<td>Ask friends how they manage or achieve regular exercise</td>
<td>-.02</td>
<td>.22</td>
<td>.45</td>
<td>.16</td>
<td>.01</td>
<td>.08</td>
<td>.01</td>
<td>-.09</td>
</tr>
<tr>
<td>Put reminders around the house to be physically active</td>
<td>.10</td>
<td>.14</td>
<td>-.16</td>
<td>.72</td>
<td>-.12</td>
<td>-.03</td>
<td>.21</td>
<td>.05</td>
</tr>
<tr>
<td>Deliberately buy magazines on people exercising, to get motivated</td>
<td>-.05</td>
<td>.13</td>
<td>-.05</td>
<td>.65</td>
<td>.03</td>
<td>.14</td>
<td>-.06</td>
<td>-.10</td>
</tr>
<tr>
<td>Put my exercise clothes in a place at home where they remind me to exercise</td>
<td>.15</td>
<td>-.12</td>
<td>.15</td>
<td>.54</td>
<td>-.04</td>
<td>.01</td>
<td>.32</td>
<td>.07</td>
</tr>
<tr>
<td>Watch sports locally or on TV partly to get motivated to exercise</td>
<td>.00</td>
<td>.10</td>
<td>.22</td>
<td>.51</td>
<td>.03</td>
<td>.00</td>
<td>-.05</td>
<td>-.15</td>
</tr>
<tr>
<td>Ask a health professional how they suggest I can keep regularly active</td>
<td>-.03</td>
<td>.12</td>
<td>.02</td>
<td>.43</td>
<td>-.09</td>
<td>.36</td>
<td>-.08</td>
<td>.04</td>
</tr>
<tr>
<td>Make exercise predictable</td>
<td>.02</td>
<td>-.04</td>
<td>-.09</td>
<td>-.03</td>
<td>.92</td>
<td>-.05</td>
<td>.11</td>
<td>.04</td>
</tr>
<tr>
<td>Item:</td>
<td>PC1</td>
<td>PC2</td>
<td>PC3</td>
<td>PC4</td>
<td>PC5</td>
<td>PC6</td>
<td>PC7</td>
<td>PC8</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Try to do more exercise in a similar way every time to make it easier the next time</td>
<td>-.03</td>
<td>.02</td>
<td>-.05</td>
<td>.76</td>
<td>-.00</td>
<td>.08</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>Try to ensure what I do before, during and after exercise is always the same</td>
<td>.20</td>
<td>.04</td>
<td>-.03</td>
<td>-.05</td>
<td>.69</td>
<td>.12</td>
<td>-.14</td>
<td>.07</td>
</tr>
<tr>
<td>Read the health section of magazines and newspapers</td>
<td>-.02</td>
<td>-.06</td>
<td>-.04</td>
<td>.14</td>
<td>-.00</td>
<td>.83</td>
<td>-.03</td>
<td>.05</td>
</tr>
<tr>
<td>Find information about new ways of being physically active</td>
<td>.19</td>
<td>-.05</td>
<td>.09</td>
<td>.24</td>
<td>.01</td>
<td>.65</td>
<td>-.08</td>
<td>.01</td>
</tr>
<tr>
<td>Choose the stairs instead of the elevator</td>
<td>-.07</td>
<td>.15</td>
<td>-.09</td>
<td>-.11</td>
<td>.000</td>
<td>.49</td>
<td>.27</td>
<td>-.03</td>
</tr>
<tr>
<td>Try to help family members to be physically active</td>
<td>.307</td>
<td>-.05</td>
<td>.19</td>
<td>-.15</td>
<td>.079</td>
<td>.44</td>
<td>-.02</td>
<td>-.14</td>
</tr>
<tr>
<td>Integrate exercise into my work activities</td>
<td>.11</td>
<td>-.02</td>
<td>.02</td>
<td>.19</td>
<td>-.08</td>
<td>-.15</td>
<td>.72</td>
<td>-.04</td>
</tr>
<tr>
<td>Change what type of exercise I do to fit it into my lifestyle</td>
<td>.08</td>
<td>.03</td>
<td>-.04</td>
<td>.09</td>
<td>.09</td>
<td>.14</td>
<td>.71</td>
<td>-.11</td>
</tr>
<tr>
<td>Choose activities that are convenient to do</td>
<td>.02</td>
<td>.01</td>
<td>.15</td>
<td>-.11</td>
<td>.14</td>
<td>.04</td>
<td>.65</td>
<td>.21</td>
</tr>
<tr>
<td>Do not exercise too hard so that I can do it again soon (e.g. the same week)</td>
<td>-.12</td>
<td>.09</td>
<td>-.08</td>
<td>.07</td>
<td>.13</td>
<td>.03</td>
<td>-.05</td>
<td>.82</td>
</tr>
<tr>
<td>Item:</td>
<td>PC1</td>
<td>PC2</td>
<td>PC3</td>
<td>PC4</td>
<td>PC5</td>
<td>PC6</td>
<td>PC7</td>
<td>PC8</td>
</tr>
<tr>
<td>-------------------------------------</td>
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<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Take it easy while exercising if I feel I am sore or injured</td>
<td>.20</td>
<td>.16</td>
<td>-.07</td>
<td>-.22</td>
<td>.04</td>
<td>-.05</td>
<td>.10</td>
<td>.71</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>9.79</td>
<td>2.90</td>
<td>2.50</td>
<td>2.15</td>
<td>2.02</td>
<td>1.74</td>
<td>1.52</td>
<td>1.45</td>
</tr>
<tr>
<td>% Variance</td>
<td>23.32</td>
<td>6.90</td>
<td>5.94</td>
<td>5.11</td>
<td>4.82</td>
<td>4.14</td>
<td>3.62</td>
<td>3.46</td>
</tr>
<tr>
<td>Cronbach reliability (α)</td>
<td>.88</td>
<td>.87</td>
<td>.80</td>
<td>.68</td>
<td>.77</td>
<td>.65</td>
<td>.64</td>
<td>.64</td>
</tr>
</tbody>
</table>
common skill captured for this group of items was adjusting the environment to increase readiness and motivation for physical activity. Component 5 was labelled ‘routinisation’ as the strategies were concerned with grounding routines through uniformity of practice of setting up, executing and finishing a bout of activity. Component 6 was labelled ‘information seeking and opportunity mindfulness’. As can be seen from Table 11, the items reflected seeking information on physical activity as well as taking opportunities to be active for oneself and supporting others. Component 7 was labelled ‘lifestyle integration’ as the characteristic strategy for activity was aligning activity with one’s everyday life demands, especially through incorporation into daily living. Component 8 was labelled ‘activity pacing’, as it represents mindfulness to not physically overextend oneself in order to preserve energy for an upcoming bout of activity, and to manage the risk of injury. Reliability levels ranged from .88 to .64. The two scales intended for the hypothesised model (self-regulation and social support elicitation), demonstrated good internal reliability (.88 and .80 respectively). Inter-correlations between the components may be found in Appendix 27.

**Study 2 (Pilot): Confirmatory Factor Models**

The sample for Study 2 was not of sufficient size to test an overall confirmatory factor model. In these scenarios it is appropriate to take a ‘model generation’ approach (Jöreskog, 1993). This begins with testing congeneric models (a single factor model for each set of items, one at a time). If necessary, refinements to each model are made. Provided the set of congeneric models demonstrate validity and unidimensionality,
factors are then tested in pairs, and if applicable, further refinements are made (e.g. removal of cross-loading items). Then, an overall confirmatory factor model is applied (Jöreskog, 1993). As modifications to models take place through this exploratory process, the final set of items are then re-tested with a new and independent sample (i.e. cross-validation or calibration) (Jöreskog, 1993). In accordance with Joreskog (1993), in Study 2, the model generation approach was conducted with the sets of items derived from the PCA of Study 1 (pilot), and data from the main study (Study 3) served as the validation sample.

Following the model generation process from Jöreskog (1993) described above, there were three main findings: (1) support for a two-factor CFA based on self-regulation and social support elicitation – $\chi^2(43) = 50.27, p = .21$, RMSEA = .04 (90% CI: .00, .08), CFI = .99, TLI = .99; (2) items for self-regulation and routinisation formed a common factor (the inter-factor correlation for the two-factor model was .91); and (3) the other scales did not perform well in terms of the psychometric criteria. The correlation matrix for the final items is included in Appendix 28, and shows that polychoric correlation coefficients ranged from .12 to .67. The descriptive statistics of each item, and the parameter estimates for the final factor model are presented in Appendix 29. The means in Appendix 29 indicate that strategy and skill use typically took place “seldom” to “sometimes”. Cronbach alpha reliabilities for self-regulation and social support elicitation were .86 and .75 respectively. Construct reliability for self-regulation was .91, and .80 for social support elicitation. Factor loadings varied from .51 to .82. There was good discriminant validity between the factors in that the correlation between them was .52, and the AVE was higher than the shared variance
explained (self-regulation AVE of .44, social support elicitation AVE of .48, and shared variance of .27).

**Main Study (Study 3): Confirmatory Factor Model**

The final factor model from Study 2 was then tested with the sample for the main study (Study 3), that is, the validation stage of factor modelling. Means, standard deviations, skewness, kurtosis, and the polychoric correlation matrix for the items intended for factor analysis, are included as Appendix 30. Similar to Study 2, the means for strategy use were mainly in the vicinity of “seldom” and “sometimes”. The values for standardised kurtosis in Appendix 30 suggested there may be multivariate non-normality. This was also indicated by a Mardia’s coefficient of 15.45.

The unanticipated common factor from Study 2 (self-regulation and routinisation as a congeneric model) may have been a sample specific effect, and so it was important to check whether a common factor also held for Study 3. CFA began with comparing a two-factor model (pooled items of self-regulation and routinisation specified as the first factor, and social support elicitation as the second factor), with a three-factor model (self-regulation, routinisation and social support elicitation). There was some evidence of fit for the two-factor model: $\chi^2(43) = 91.53, p = .00, \text{RMSEA} = .07 \ (90\% \text{ CI: .05, .09}), \text{CFI} = .97, \text{TLI} = .96$. Then the three-factor CFA was tested, and found to demonstrate similar fit: $\chi^2(43) = 90.96, p = .000, \text{RMSEA} = .08 \ (90\% \text{ CI: .05, 1.00}), \text{CFI} = .97, \text{TLI} = .96$. Although there clearly was not a change in overall fit between these models, for the three-factor model the inter-factor correlation between
self-regulation and routinisation was very large (.98), demonstrating there was no
discriminant validity, and so no grounds for specifying separate factors. In addition, a
scree plot of the items for self-regulation and routinisation clearly demonstrated
unidimensionally.

Returning to the first full model tested, inspection of the MIs showed that the
item ‘I set aside a special time to do physical activity’ was cross-loading with the factor
of social support elicitation. The reason for the cross-loading is probably that those who
organise activity through others are more likely to arrange a specific time. The
correlation between the factors was .66, so there was no sign of a lack of discriminant
validity. However, the strategy of putting aside a special time was deemed to be
redundant with other statements (e.g. ‘I make exercise predictable’), so the item was
removed. The refined model was re-tested and found to have reasonable fit: \( \chi^2(34) = 55.28, p = .01, \) RMSEA = .05 (90%CI: .03, .08), CFI = .98, TLI = .98.

The standardised factor loadings in the final factor model are presented in Figure
13. In keeping with conventional graphics to report results of CFA and SEM, in Figure
13, the latent (unobserved) variables are presented as an ellipse, and indicator variables
(otherwise called ‘observed’ or ‘manifest’ variables) are depicted as rectangles.
Variance of each indicator variable that was not accounted for by the specified factor
(measurement error) is represented as a dashed ellipse to the right. To the far right of
Figure 13 values for internal consistency (Cronbach \( \alpha \)), and construct reliability (CR)
are included. All items significantly loaded on the factor to which each was allocated.
Factor loadings ranged from .46 to .82. Although the responses for one item (“I find
ways to get around barriers to physical activity”) had a factor loading of .46, this
strategy was theoretically important, in that problem solving is a central aspect of self-regulation (Karoly, 2008). Given this, in order to provide a global measure of self-regulation, the item was retained. Discriminant validity was found in that the factors correlated by a magnitude of .64, the AVE explained was higher than the shared variance explained (AVE for self-regulation was .47, AVE for social support elicitation was .52, and shared variance was .41). Scree plots suggested the presence of unidimensionality for each set of items. As shown in Figure 13, the Cronbach alpha reliabilities for self-regulation and social support elicitation were .80 and .75 respectively. The construct reliability coefficients were .84 and .72 respectively.

To summarise, in the validation sample (Study 3), one refinement was made to the model. This shows that the model from Study 2 (Pilot2) generalised well to the one from Study 3 (Main study). There was confirmation of a two-factor model, with self-regulation as one factor and social support elicitation as the other factor.
Figure 13. Confirmatory factor model of self-regulation and social support elicitation (Study 3, n = 217)

Self-Regulation

- Closely keep track of how much exercise I do
- Make exercise predictable
- Try to ensure what I do before, during and after exercise is always the same
- Have a ritual for preparing and doing my exercise activities
- Find ways to get around barriers to physical activity it
- Try to prepare for, do and finish up exercise in a way that makes it second nature it

α = .80
CR = .84

Social Support Elicitation

- Hang around people who are enthusiastic about exercise
- Contact a friend to organise a get together for sport, gym, walk or other exercise
- Ask friends how they manage or achieve regular exercise
- Announce to others my exercise/fitness goals

α = .75
CR = .72
**Validation of the Culture Fair Intelligence Test**

A major purpose of Study 2 (Pilot2) was to evaluate the Culture Fair Test through data from a test battery. As described in the methods section, the Culture Fair Intelligence Test (CFIT; Cattell & Cattell, 1960, 1973) has not been used with the current population of interest and so it was important to assess validity by applying the CFIT in conjunction with a battery of other cognitive ability tests that vary conceptually in their proximity or anticipated ‘loadedness’ on the ability domain that the CFIT is designed to measure (general cognitive fluid ability). The CFIT scores were compared to those for the following measures from the Ekstrom test battery: Advanced and Extended Vocabulary, Different Uses, and Letter Sets. Table 12 presents descriptive statistics for distributions of the ability test scores (means, standard deviations) and inter-correlations. Inter-correlations ranged from .38 to .74, and were all statistically significant ($p < .05$). These correlations are consistent with the empirical regularity of uniform positive associations between test scores (see Lubinski, 2004; Carroll, 1993). As anticipated, correlations were higher between CFIT and the Letter Sets Test (measures of fluid ability) compared to CFIT and the other ability tests (e.g. of crystallised ability).
Table 12. Descriptives for cognitive ability tests (means, standard deviations, minimum, maximum) and inter-correlations (Study 2, n = 106)

<table>
<thead>
<tr>
<th></th>
<th>CFIT</th>
<th>Letter Sets</th>
<th>Advanced Vocabulary</th>
<th>Extended Vocabulary</th>
<th>Different Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFIT</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter sets</td>
<td>.74***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced vocabulary</td>
<td>.40***</td>
<td>.40***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended vocabulary</td>
<td>.35***</td>
<td>.35***</td>
<td>.93***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Different Uses</td>
<td>.38***</td>
<td>.39***</td>
<td>.43***</td>
<td>.39***</td>
<td>1</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>30.69 (5.79)</td>
<td>18.35 (5.70)</td>
<td>24.79 (7.56)</td>
<td>29.68 (9.82)</td>
<td>23.52 (7.66)</td>
</tr>
<tr>
<td>Minimum</td>
<td>17</td>
<td>3.75</td>
<td>-2.25</td>
<td>-3.5</td>
<td>2</td>
</tr>
<tr>
<td>Maximum</td>
<td>42</td>
<td>27</td>
<td>36</td>
<td>45.75</td>
<td>41</td>
</tr>
</tbody>
</table>

* *p < .05, ** p < .01, *** p < .001. Note. CFIT: Cultural Fair Intelligence Test.

If it is the case that CFIT test scores represent a similar latent ability for fluid reasoning as the Letter Sets test, both tests should 'hold' as a single factor, and differentiate from other ability domains (in this case, verbal comprehension and flexibility of use). A confirmatory factor model was then tested where each ability sub-test was included as indicator. Specifically, the sub-tests of CFIT and Letter Sets were set to reflect the same underlying factor, and the remaining factors were specified in accordance with the Ekstrom et al. manual (1976; i.e. verbal comprehension, and flexibility of use). This model was supported: $\chi^2 (51) = 48.44, p = .57$, RMSEA = .00 (90% CI: .00, .06), CFI = 1.00, TLI = 1.00, SRMR = .04. Figure 14 below presents the factor loadings and item residual variances, as well as the reliabilities for each factor. It
shows that all reliability coefficients were above .83. As shown in Figure 14, construct reliability (CR) was over .70 for each of the constructs. There was good discriminant validity with an AVE of .52 for fluid ability, an AVE of .84 for verbal comprehension, and .62 for flexibility of use, all comparing favourably to the shared variance of .20 between fluid ability and verbal comprehension, and .22 between verbal and flexibility of use, and .22 between fluid ability and flexibility of use.

To further assess the CFIT as a measure, a second confirmatory model was specified to determine to what extent the observed variable, CFIT score, loaded on a general cognitive factor. A higher order model was specified where a general ability factor predicts five lower order ability domains, that in turn determine scores on each of the sub-tests. The model fit well: $\chi^2 (50) = 53.69, p = .33$, RMSEA = .03 (90% CI: .00, .07), CFI = 1.00, TLI = 1.00, SRMR = .07. Letter Sets was the highest loading factor (.96), followed by CFIT (.95), and then Vocabulary (.48), and Different Uses (.52). The analyses of Study 2, overall, provided evidence for the psychometric validity of the CFIT as a measure of general fluid ability, for this cohort in Australia.
Figure 14. Confirmatory factor model of cognitive ability tests (Study 2, n = 106).

Cultural participation

To establish the observed variable, ‘cultural participation’ for the PAV model, PCA was applied to the full set of items on cultural participation from the Everyday Cultures Survey (Bennett et al., 1999). PCA provides insight on the dimensionality of
these items, and reduction of the data, to come to a unidimensional variable for inclusion in the hypothesised model. The original authors of the Everyday Cultures Survey (Bennett et al., 1999) also used PCA, but their research goals differed from the current research, as they conducted two PCAs on sub-sets of the items. The current study combined the set of items on cultural participation that Bennett et al. (1999) had used, as the aim was to identify an overall pattern in cultural participation. The set of items all describe attendance at what Bennett et al. (1999, p. 97) describe as “cultural venues”.

Descriptive statistics and inter-correlations for the set of items on cultural participation may be found in Appendix 31. Based on the means in Appendix 31, in general, participants reported a frequency of participation between “never” and “sometimes”. The KMO was .88 (a magnitude described as “meritorious” by Kaiser, 1970, p. 35) indicating that the data was suitable for PCA. The scree plot suggested between one and three components, the Eigenvalue-1 Rule suggested five components, three components on the Velicer Test, and MAP test, three components. Oblimin rotation was conducted on solutions ranging from three to five components, and for each solution the pattern matrix and item communalities were analysed. The three-component solution was the most interpretable and most conceptually sensible. The set of items was refined on the basis of the three-component solution. Through this process, the 21 items were reduced to 15.

Principal component loadings on the first three respective components of the final solution are presented in the Table 13. The first three components accounted for 58.2% of item variance. Communalities ranged from .39 to .76, and internal consistency
reliabilities (Cronbach α) ranged from .68 to .83. The most representative item for the first component was ‘visiting museums’. These activities are generally tied to what Chan and Goldthorpe (2007a, p. 375) call “popular cultural forms”. The first component was labelled “cultural participation”. Comparing recreational patterns captured by the second and third components, it is clear that both involved participation in events or activities tied to music. The second component captured attendance to what Bennett et al. (1999) describe as popular cultural venues. All three practices were night time events. The most representative type of participation for the second component was ‘pubs with live bands’. Overall, the second component was labelled “popular music”. Items for the third component all had in common attendance at events that involved classical music (orchestra, opera, chamber, and ballet). The most representative practice for the third component was ‘attending orchestra concerts’. The third component was defined as “classical music”, and represents a recreational pattern defined as “high culture” in cultural sociology (e.g. Chan & Goldthorpe, 2007a, p. 374).
Table 13. Results of principal component analysis of items on cultural participation, from the Everyday Cultures Questionnaire (Study 3, n = 217)

<table>
<thead>
<tr>
<th>Item:</th>
<th>PC1</th>
<th>PC2</th>
<th>PC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>visit museums</td>
<td>.79</td>
<td>-.14</td>
<td>.12</td>
</tr>
<tr>
<td>visit botanical gardens</td>
<td>.76</td>
<td>-.14</td>
<td>.10</td>
</tr>
<tr>
<td>art galleries</td>
<td>.73</td>
<td>-.13</td>
<td>.24</td>
</tr>
<tr>
<td>see movies</td>
<td>.65</td>
<td>.16</td>
<td>-.23</td>
</tr>
<tr>
<td>cultural festivals</td>
<td>.58</td>
<td>.14</td>
<td>.08</td>
</tr>
<tr>
<td>shows, exhibitions, fairs</td>
<td>.58</td>
<td>.15</td>
<td>-.04</td>
</tr>
<tr>
<td>visit theatre</td>
<td>.56</td>
<td>-.02</td>
<td>.23</td>
</tr>
<tr>
<td>pubs with live bands</td>
<td>-.04</td>
<td>.80</td>
<td>.21</td>
</tr>
<tr>
<td>night clubs</td>
<td>-.07</td>
<td>.75</td>
<td>.06</td>
</tr>
<tr>
<td>attend rock concerts</td>
<td>.22</td>
<td>.69</td>
<td>-.08</td>
</tr>
<tr>
<td>attend orchestra concerts</td>
<td>.11</td>
<td>-.01</td>
<td>.82</td>
</tr>
<tr>
<td>go to opera</td>
<td>-.01</td>
<td>.08</td>
<td>.82</td>
</tr>
<tr>
<td>attend chamber music concerts</td>
<td>.09</td>
<td>.02</td>
<td>.80</td>
</tr>
<tr>
<td>attend ballet</td>
<td>.03</td>
<td>.10</td>
<td>.64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Eigenvalue</th>
<th>% Variance</th>
<th>Cronbach reliability (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.11</td>
<td>36.49</td>
<td>.83</td>
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<td></td>
<td>1.65</td>
<td>16.77</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>1.39</td>
<td>9.92</td>
<td>.83</td>
</tr>
</tbody>
</table>

Note. * PC: Principal Component.
Structural Equation Models

Setting up of structural model

Preparation for testing of the full SEM involved ensuring that distributions of each manifest variable met statistical assumptions such as multivariate non-normality, checking for discriminant validity between the latent constructs (i.e. measurement model) and ensuring there were sufficient degrees of freedom in order to adequately test the model.

Although Study 2 did not include the key measure of cultural participation, involved a small sample, and was slightly biased (e.g. over-representative of people with ‘higher’ education), the data from this pilot study provided an opportunity to conduct a preliminary test of parts of the PAV model – namely paths specified to test hypotheses 1, 3, 5, 6 and 7b). This analysis helped to ascertain whether the empirical approach of SEM was feasible for the current research context. The results are presented in Appendix 32. As shown in Appendix 32 there was mixed support for the sub-parts of the PAV model that could be investigated through the pilot – a major hypothesis (H1) was not supported, while there was support for hypotheses 3, 5, 6 and 7b (that is, education → ability; age → ability; age → physical activity; and gender → physical activity variety, respectively). As modelling based on the data from Study 2 (Pilot2) was preliminary and tentative, the details of preparation of variables are not described in the thesis, but were very similar to how conducted for Study 3. The following section describes preparation of variables for the main study only (Study 3).
Preparation of latent constructs

Although the same size was large enough to meet the minimal requirement of five participants to each parameter was met, this ratio becomes less tenuous when the model is complex (Kline, 1998), which was the case here. There was also the issue of reducing non-normality in the data, as maximisation likelihood estimation for SEM is biased when data is multivariate non-normal (Byrne, 2012). To increase the participant to parameter ratio and meet the requirement for multivariate normality, the two latent variables in the model – self-regulation of physical activity, and social support elicitation – were modelled as single indicator latent variables. Setting latent variables as single indicators allows the summing of items comprising the indicator variable, which can increase the level of normality. Operationalisation of a single indicator latent variable takes into account measurement error, and can proceed so long as the observed variable (as a composite or ‘parcel’) demonstrates unidimensionality and good reliability, and the indicators that comprise the variable are found to be unique to the factor (Munck, 1979).

The specification of a latent variable with a single indicator is provided by Munck (1979) where the coefficient ($\lambda$) is equivalent to the cross-product of the standard deviation of the observed variable and the alpha reliability of the scale. In addition, Munck (1979, pp. 63-65) demonstrated that the variance of error may be calculated as:

$$\theta = \text{SD}(X)^2(1-\alpha)$$
On the basis of these formulae, the parameter specifications for the latent variables were set as in Figure 15, below.

Figure 15. Specification of single-indicator latent variables – self-regulation, and social support elicitation.

By setting self-regulation and social support elicitation as in Figure 15, the number of parameters in need of estimation was reduced from 56 to 29, and multivariate non-normality (Mardia’s coefficient) reduced from 18.39 ($z = 5.64$) to 0.34 ($z = 0.20$).
**Operationalisation of manifest variables**

**Education**

Education was operationalised as the combination of years of education and education level attained. Years and level attained are the two most common measures of education in public health, psychology and sociology (e.g. Clarkson-Smith & Hartley, 1990). Education attainment was scored in terms of levels provided by the Australian Standard Classification of Education (ABS, 2000).

For years of education there were 14 missing cases (6.4%) and for level of education there was one missing case (0.5%). EM estimation in SPSS was utilised to impute values for the very small proportion of missing cases. The imputed values were either for education years or education level. As there were no cases of full missing data for education (i.e. where both measures of education were missing cases for any one participant), it was possible to check the accuracy of the EM estimations. For instance, if years of education was missing, the imputed value for this case was compared to the reported level of education. Through this inspection, all cases of new values (from EM imputation) were found to be consistent with the other indicator. As a final procedure, an overall standardised score for formal education was derived by: (1) converting to z-scores each variable on education (years of education, and highest level of education attained), (2) summing the z-scores, and (3) dividing the summation by two.
Physical Activity Variety

Physical activity variety was operationalised as the level of variety of recreational physical activity, in the last three months. The variable, physical activity variety, was created by first identifying, for each participant, those types of physical activities reported to have been practiced for at least 20 minutes, on at least one occasion in the last three months. Candidate activities that could ‘count’ in the variety measure were walking, housework/gardening, any number of 37 mild activities, and any number of 87 moderate-vigorous activities. Then, an overall measure of variety was calculated by summing up types of activity. As an example of calculation of physical activity variety – if a participant, across the overall survey, indicated to have conducted at least once in the last three months (for at least 20 minutes in one go), aerobics, walking, netball and darts, the overall score on variety would be four.

The total possible range of variety was 0 to 126. Aggregating types of activity across the sample, there were 95 types of physical activities reported. For any one participant, the highest level of physical activity variety was 33 types and the lowest was one. The average level of physical activity variety was five.

As expected, the raw distribution for physical activity variety was skewed in a positive direction (i.e. lower frequencies of adults reporting a large number of activities; skewness $z = 17.93$). Non-normality included one extreme outlier – a participant reporting 33 types of activity. After close analysis of the pattern of responses by this participant it was deemed to be a ‘true’ outlier, in that the participant may have engaged in an exceptionally high range of activities. Therefore it was not deemed appropriate to remove this case. Instead, to address non-normality, the variable was log-transformed to
the base of 10. Transformation of variables on physical activity is common (e.g. Anderson et al., 2006; Heitzler et al., 2010; Mäkinen et al., 2010), as dimensions of physical activity are regularly found to be non-normal. The log transformation successfully corrected for non-normality (skewness $z = -.90$; kurtosis $z = .59$).

*Physical activity variety as an independent dimension of physical activity patterns.*

As physical activity variety is rarely directly investigated and may be assumed to already be ‘captured’ by the usual dimensions of physical activity (such as frequency, duration), correlations between physical activity variety and these other physical activity patterns were analysed. The relationships are reported in Appendix 33. Small to moderate and statistically significant zero-order correlations were found between physical activity variety and a range of physical activity variables measured in the main study (e.g. typical frequency per week, duration), thereby indicating that the main outcome variable cannot be equated with typical dimensions of physical activity.

*Measurement model, including Cultural Participation*

Cultural participation was derived as the items loading most on the first component from the PCA (see Table 13). Although, strictly speaking, in this study the construct ‘cultural participation’ did not constitute a latent variable, it was deemed nevertheless necessary to check that there was no overlap between this set of items, and those of the two latent variables in the model (self-regulation, and social support elicitation). Given this, a measurement model was tested to ascertain whether there was discriminant validity between items assumed for each of the three domains: cultural
participation, self-regulation and social support elicitation. As the discriminant validity between the latter two was already established in the previous confirmatory factor model (pictured in Figure 13) the focus of this test was on discriminant validity of the items on cultural participation from the items specified for self-regulation and social support elicitation.

A confirmatory factor model was conducted where items of self-regulation, social support elicitation and cultural participation were included in a single model. The model fit the data reasonably well: $\chi^2 (116) = 225.87, p = .00$, RMSEA = .07 (90%CI: .05, .08), CFI = .96, TLI = .95. The correlation coefficient between self-regulation and cultural participation was .22 ($p < .05$), and the coefficient between social support elicitation and cultural participation was .37 ($p < .05$). While these results indicate discriminant validity between cultural participation and the dimensions of self-regulation for physical activity, the MIs indicated that participation in cultural festivals cross-loaded with both self-regulation and social support elicitation. Although, conceptually, the occurrence of this local case of a lack of discriminant validity is unclear, it was deemed necessary to remove ‘cultural festivals’ in order to ensure discriminant validity, towards testing of the PAV model. The revised measurement model demonstrated good fit: $\chi^2 (101) = 163.44, p = .00$, RMSEA = .05 (90%CI: .04, .07), CFI = .97, TLI = .97.

In terms of discriminant validity there was clear separation of the items for the respective domains (self-regulation, social support elicitation and cultural participation). The correlation coefficients for cultural participation and self-regulation and social support elicitation were .22 and .37 respectively; and the AVE was higher than the SVE
(shared variance for social support and self-regulation was .41, for social support and cultural participation was .14, and for self-regulation and cultural participation was .05 – all lower than the AVE for cultural participation, self-regulation and social support elicitation of .51, .88 and .53 respectively).

In summary, the aim of this measurement model was to check whether there was discriminant validity between cultural participation, self-regulation and social support elicitation. While discriminant validity was evident, differentiation of cultural participation from the other two factors was improved by removal of one item. Given these results, the six remaining items representing cultural participation were summed and then averaged, to establish a single manifest variable to include in the SEMs.

**Interim analyses**

Before testing of SEMs, three interim analyses were conducted to: (1) examine validity of the data of the main study and verify assumptions of the thesis, (2) check whether there were any variables outside of the PAV model that would have a strong warrant for inclusion in the main analyses, and (3) descriptive statistics for the set of variables for the SEMs.

*(1) Validity of data and checking of assumptions*

A major purpose for covering a range of variables in the field research was to verify assumptions and ascertain the validity of the data by seeing whether typical relationships reported in the literature were observed in the current study. For instance, it was assumed that there is a positive association between education and health, and
this is an empirical regularity in the literature (e.g. Goesling, 2007; Miech et al., 2011).

These supplementary analyses are reported in Appendix 34. In general, anticipated relationships (e.g. between education and health) were observed in the main study.

(2) Analysis of variables outside of PAV model

Appendix 35 presents results for the association of physical activity variety with 14 candidate variables other than constructs in the PAV model. The Appendix shows that while there were some significant correlations between physical activity variety and other variables (e.g. perceived neighbourhood, self-rated health), none of these associations were so substantial as to demand an expansion of the PAV model (that in meeting the research aims, was already complex), nor were these observations inconsistent with the theoretical tenets of the model.

(3) Descriptive statistics for variables submitted to SEM

Table 14 below, presents the distributional properties for all variables for the SEMs, as well as inter-correlations. Table 14 shows that the zero-order correlation coefficients were small to medium in size. Although two variables approached non-normality (age and social support elicitation), multivariate non-normality was not encountered.
Table 14. Variables for SEM: descriptive statistics and zero-order correlations

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Education</th>
<th>Gender†</th>
<th>Cognitive ability</th>
<th>Cultural participation</th>
<th>Self-regulation</th>
<th>Social support</th>
<th>Physical activity variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<td>.05</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive ability</td>
<td></td>
<td>-.16</td>
<td>.32</td>
<td>-.10</td>
<td>.32</td>
<td>-.10</td>
<td>.21</td>
<td>.16</td>
</tr>
<tr>
<td>Cultural participation</td>
<td>.08</td>
<td>.37</td>
<td>.16</td>
<td>.09</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td></td>
<td>.08</td>
<td>.21</td>
<td>-.01</td>
<td>-.11</td>
<td>.16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>-.11</td>
<td>.27</td>
<td>.09</td>
<td>.12</td>
<td>.30</td>
<td>.46</td>
<td>1</td>
</tr>
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<td>elicitation</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
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<td>-.24</td>
<td>.24</td>
<td>-.09</td>
<td>.13</td>
<td>.35</td>
<td>.23</td>
<td>.37</td>
</tr>
<tr>
<td>variety</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observed range 38 - 62 -1.99 - 3.11 0 - 1 10 - 42 1 - 4.29 0 - 4 0 - 4 0 - 1.52
Mean (SD) 48.56 (7.12) 0.00 (0.92) n/a 27.34 (6.27) 2.51 (0.64) 1.72 (0.87) 1.17 (0.83) 0.62 (0.27)
Skewness* 1.58 1.05 n/a -1.65 1.99 0.66 2.06 -0.90
Kurtosis* 3.39 0.51 n/a -0.41 0.37 -1.57 -0.65 0.59

Note. * Standardised values. † Coded male = 1, female = 2.
Overview of series of SEMs

A competing models approach was adopted in order to ascertain the relative validity of plausible models to capture the relationships between the current variables as precursors to physical activity variety. Three of the SEMs were planned (a priori) specifications. The first (Model 1a) represented the initial hypothesised model (PAV model) proposed in Chapter 1. Model 1b, considered social support elicitation as a precursor to self-regulation rather than as an outcome of self-regulation (H1c, see Appendix 9). Model 1c posited an additional path from cultural participation to self-regulation (H1Ad, see Appendix 9). Models 3a and 3b tested the assertion that it is cognitive ability that shapes the immediate dynamics of physical activity variety rather than education (or with an equal role to play as education; see description of H2c and H3c respectively, in Appendix 10). Two further SEMs were conducted in order to take account of significant paths identified in the first three Models, and so represented more exploratory and post hoc analyses. This was defensible given (1) this type of model has never been investigated; (2) the aim of the analyses was to not only test hypotheses but converge on a PAV model that best represented relationships between variables in the cohort, and (3) the added paths were conceptually sound.

Before describing results for these models, and temporarily putting aside the range of variables, by applying a simple regression, it was found that education was a statistically significant predictor of physical activity variety: $F(1, 214) = 12.91, \beta = .24, t = 3.59, p < .05$. However, in line with the general anticipation that education plays an indirect role in effecting physical activity variety, the SEMs to follow indicated that
education no longer served as a direct path when the hypothesised intervening variables were included.

**Results for hypothesised PAV model (Model 1a)**

A reminder of the hypothesised PAV model introduced in Chapter 1 is provided here. The dependent (endogenous) variable was physical activity variety, and the independent variables were education, age, and gender, cognitive ability, cultural participation, self-regulation, and social support elicitation. Education, gender and age were exogenous variables. Cognitive ability was set as exogenous to self-regulation and social support elicitation, and as endogenous to age, gender and education. Similarly, cultural participation was specified as an intervening variable, endogenous to education and gender, and exogenous to physical activity variety. Social support elicitation was endogenous to all variables except physical activity variety.

The hypothesised model (Model 1a), as for all other SEMs reported below, were tested with maximum likelihood estimation. There were mixed results in terms of fit of the overall data to the model: $\chi^2 (14) = 37.91, p < .00$, $\chi^2/df$ ratio = 2.71, RMSEA = .09 (90%CI: .06, .12), CFI = .89, TLI = .81, SRMR = .06. Around 30% of physical activity variety was explained by the model. It was also noted that, while there was lack of fit for the full model, the two main hypotheses failed to be rejected. The three-step pathway from education to physical activity variety via self-regulation and social support elicitation ($H1$) could be assessed through Sobel’s test. This indirect pathway was statistically significant ($\beta_{\text{indirect}} = .06, \text{Sobel } t = 2.95, p < .05$). In addition the hypothesised indirect pathway from education to physical activity variety via cultural participation ($H2$) was significant ($\beta_{\text{indirect}} = .12, \text{Sobel } t = 4.00, p < .05$). Briefly put,
based on Model 1a, there was also support for hypotheses 3, 5, 6 and 7, and hypothesis 4 was rejected. As standardised path coefficients and other parameter estimates for Model 1a were only marginally different to that of the final model (Model 4), for brevity, results specific to each hypothesis are reported later in the Chapter (specifically, estimates for Model 4).

Test of alternative or competing models

Table 15 presents the model fit statistics for the SEMs. All models were recursive. Table 15 begins with Model 1a (hypothesised model). To reiterate, Models 1b and 1c represent evaluations of variations on Model 1a that take into account the additional hypotheses in Appendix 9. Models 2a and 2b are concerned with the notion of a more central role of cognitive ability (relative to education) in self-agency and physical activity variety (see Appendix 10). As described shortly, Models 3 and 4 take into account additional pathways that were identified through SEMs for the preceding models.

There was no significant change in model fit between Model 1a and Model 1b. The key difference between Model 1a and Model 1b was the ordering of self-regulation and social support elicitation between education and physical activity variety. The pathway unique to Model 1a (H1c: education → social support elicitation → self-regulation → physical activity variety) failed to be rejected ($\beta_{\text{indirect}} = .06$, Sobel $t = 2.92$, $p < .05$). Model 1c also did not demonstrate improvement in fit, and the additional
hypothesis contained in this model \((H1_{a0})\) was not supported (cultural participation → self-regulation, \(\beta_{\text{indirect}} = .13, p > .05\)).

The first SEM specifying a more central role of cognitive ability (Model 2a) demonstrated an improved fit to Model 1a. However, inspection of pathways for this Model demonstrated that direct effects of ability on the key constructs \((H2_c)\) were minimal: ability → cultural participation \((\beta_{\text{indirect}} = -.00, p > .05)\), ability → physical activity variety \((\beta_{\text{indirect}} = -.02, p > .05)\); and ability → social support elicitation \((\beta_{\text{indirect}} = .17, p < .05)\). The latter pathway was retained for reanalysis (Model 3 and Model 4). As shown by the indices in Table 15, the SEM assuming a ‘strong’ role of cognitive ability in agency and physical activity variety (Model 2b, \(H3_c\)) did not demonstrate model fit.
Table 15. Fit indices for hypothesised model and alternative models (Study 3)

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$p$-value</th>
<th>$\chi^2$/df</th>
<th>RMSEA (90%CI)</th>
<th>CFI</th>
<th>TLI</th>
<th>SRMR</th>
<th>AIC</th>
<th>Model comparison</th>
<th>$\chi^2$ difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1a</td>
<td>Hypothesised model</td>
<td>37.91</td>
<td>14</td>
<td>.00</td>
<td>2.71</td>
<td>.09 (.06, .12)</td>
<td>.89</td>
<td>.81</td>
<td>.06</td>
<td>2735.00</td>
<td>-</td>
</tr>
<tr>
<td>Model 1b</td>
<td>Social support precedes self-regulation</td>
<td>37.83</td>
<td>14</td>
<td>.00</td>
<td>2.70</td>
<td>.09 (.05, .12)</td>
<td>.89</td>
<td>.81</td>
<td>.06</td>
<td>2734.92</td>
<td>Model 1b – Model 1a</td>
</tr>
<tr>
<td>Model 1c</td>
<td>Cultural participation effects self-regulation</td>
<td>35.16</td>
<td>13</td>
<td>.00</td>
<td>2.70</td>
<td>.09 (.05, .12)</td>
<td>.90</td>
<td>.81</td>
<td>.06</td>
<td>2734.25</td>
<td>Model 1c – Model 1a</td>
</tr>
<tr>
<td>Model 2a</td>
<td>Education &amp; ability jointly involved in self-regulation and everyday practice</td>
<td>27.15</td>
<td>10</td>
<td>.00</td>
<td>2.71</td>
<td>.09 (.05, .13)</td>
<td>.92</td>
<td>.81</td>
<td>.05</td>
<td>2732.24</td>
<td>Model 2a – Model 1a</td>
</tr>
<tr>
<td>Model 2b</td>
<td>Ability as central to self-regulation &amp; everyday practice</td>
<td>75.25</td>
<td>13</td>
<td>.00</td>
<td>5.79</td>
<td>.15 (.12, .18)</td>
<td>.72</td>
<td>.46</td>
<td>.10</td>
<td>2774.33</td>
<td>Model 2a – Model 2b</td>
</tr>
<tr>
<td>Model 3</td>
<td>Cultural participation affecting social support elicitation</td>
<td>18.00</td>
<td>12</td>
<td>.11</td>
<td>1.5</td>
<td>.05 (.00, .09)</td>
<td>.97</td>
<td>.94</td>
<td>.04</td>
<td>2719.09</td>
<td>Model 1a – Model 3</td>
</tr>
<tr>
<td>Model 4</td>
<td>Age affecting social support elicitation (final model)</td>
<td>12.20</td>
<td>11</td>
<td>.35</td>
<td>1.11</td>
<td>.02 (.00, .08)</td>
<td>.99</td>
<td>.99</td>
<td>.03</td>
<td>2715.29</td>
<td>Model 3 – Model 4</td>
</tr>
</tbody>
</table>

Note. * $p < .05$; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardised Root Mean Square Residual; AIC = Akaike Information Criterion. Model 1a: Hypothesised model (see Chapter 1, Figure 5, p. 77); Model 1b: Social support elicitation as immediate precursor to physical activity variety, rather than self-regulation; Model 1c: Same as Model 1a, but including a direct path from cultural participation to self-regulation; Model 2a: Added paths from ability to social support elicitation, to cultural participation, and to physical activity variety; Model 2b: Removal of direct paths from education to endogenous variables, and retention of paths (from Model 2a) from ability to all endogenous variables; Model 3: Added path from cultural participation to social support elicitation, and retaining path from ability to social support elicitation (from Model 2a); Model 4: added path from age to social support elicitation, and retaining path from ability to social support elicitation (from Model 2a), and path from cultural participation to social support elicitation (from Model 3).
**Specification of additional pathways**

For the initial hypothesised model (Model 1a), a MI signalled that the parameter from cultural participation to social support elicitation be freely estimated. Although not anticipated, it was plausible that cultural participation may exert an effect on social support elicitation. As cultural participation involves visiting interpersonal environments such as public venues and cultural events (Warde & Tampubolon, 2002), this pathway may reflect a process by which people who are outgoing in their recreation (as manifested in cultural participation) build larger and more complex social networks, whereby more opportunities arise for social support elicitation for physical activity. In other words, the social network of a person expands as a result of traversing social circles specific to each area, and these ties then become sources or options for support seeking. As Table 15 shows, when this path was added (Model 3), there was a significant improvement in model fit (relative to Model 1a), and absolute model fit was observed.

For Model 3, the largest MI was for age → social support elicitation, and the expected parameter change was negative. The notion of a negative effect of age on social support elicitation can be interpreted in terms of lifecourse and social psychology, and in particular, socio-emotional selectivity theory (Cartensen, Isaachowitz, & Charles, 1999; Löckenhoff & Cartensen, 2004), where it is found that older adults tend to have smaller social networks and turn to emotional rather than informational relations with others. As social support elicitation is likely to represent an instrumentalist orientation, and not so much concerned with relations at the level of emotion, this general trend with age may generalise to social support seeking for physical activity. Also, it was found in
Study 2 (Pilot 2) that age was a significant predictor of less social support elicitation (Appendix 32). Although this pathway was interpreted to be a sample specific event, the repeat of this result in the main study suggests that it was important to consider as a ‘true’ relationship. Given the theoretical and empirical basis for inclusion of a pathway from age and social support elicitation, Model 4 was defined by this additional specification. Model 4 fit the data well: $\chi^2 (11) = 12.20, p > .05, \chi^2/df$ ratio = 1.11, RMSEA = .02 (90%CI: .00, .08), CFI = .99, TLI = .99, SRMR = .03. The $\chi^2$ difference test between Models 3 and 4 indicated a significant improvement in model fit: $\Delta \chi^2 (1) = 5.80, p < .05$. Model 4 was retained as the final model to represent baby boomer agency in physical activity variety (i.e. a refined PAV model).

**Results for final SEM (Model 4)**

For the final SEM, 33 parameters were estimated. The model had 14 structural paths, with a participant-to-parameter ratio of 6.54, which was above the absolute minimum proposed by Kline (1998) of five. The coefficients of determination ($R^2$) for the endogenous variables were as follows – cognitive ability (.12), cultural participation (.16), self-regulation (.80), social support elicitation (.75) and physical activity variety (.33). That is, variance explained for endogenous variables, ranged from 12% (cognitive ability) to 80% (self-regulation).
Figure 16. Final SEM (Model 4). Standardised path coefficient estimates shown (all $p < .05$). For simplicity, model specification of latent variables (self-regulation and social support elicitation) are not shown. Pathways not specified in initial Hypothesised model (Model 1a) are included as dashed lines.
Overview of direct, indirect and total effects

Indirect, direct and total paths are calculated in the following ways. The indirect effect is calculated by multiplying the direct effects between the exogenous and middle variable, and the middle variable and endogenous variable. For instance, the indirect effect of education on physical activity variety through cultural participation was .10, as the cross-product of .37 (the direct effect of education on cultural participation) and .28 (the direct effect of cultural participation on physical activity variety).

Table 16 indicates the types of effect (direct, indirect and total) for Model 4. Effects were small to moderate in magnitude. In the table, dashed lines indicate parameters that were fixed to zero. Table 16 shows that education had the most consistent breadth of positive direct effects on cognitive ability, cultural participation, and self-regulation, and a positive indirect effect on social support elicitation. There were also indirect positive effects on physical activity variety by way of education, gender, cultural participation and self-regulation.

Results for hypothesised paths

Positive indirect effects of education on physical activity variety via self-regulation and social support elicitation (Hypothesis 1)

In support of hypothesis 1, the overall pathway from education to physical activity variety, with self-regulation and social support elicitation as intervening variables, was significant ($\beta_{\text{indirect}} = .06$, Sobel $t = 2.92$, $p < .01$). The direct effects within this three-step pathway were as follows: a positive direct pathway from
education to self-regulation ($\beta_{\text{direct}} = .32$), a positive direct pathway from self-regulation to social support elicitation ($\beta_{\text{direct}} = .60$), and a positive direct pathway from social support elicitation to physical activity variety ($\beta_{\text{direct}} = .32$).

In terms of sub-parts of the three-step pathway, further analysis, keeping in mind criteria for indirect effects (Baron & Kenny, 1986; Holmbeck, 1997), revealed a complex picture: self-regulation partially mediated the effect of education on social support elicitation, and social support elicitation fully mediated the effect of self-regulation on physical activity variety. For instance, it was earlier noted that if education and physical activity variety are investigated in isolation through a simple regression, there is a significant pathway between them ($\beta_{\text{direct}} = .24$). When the above candidate mediators were included, the path from education to physical activity variety was no longer statistically significant, suggesting full mediation across the three-step pathway.

Positive indirect effects of education on physical activity variety via cultural participation (Hypothesis 2)

The regression coefficient for the overall indirect effect of education on physical activity variety via cultural participation was .10 (standard error of .03). Consistent with $H2$, Sobel’s test indicated that this indirect effect was statistically significant ($t = 3.61, p < .001$). The direct effects within this two-step pathway were as follows: a positive direct pathway from education to cultural participation ($\beta_{\text{direct}} = .37$), and a positive direct pathway from cultural participation to physical activity variety ($\beta_{\text{direct}} = .28$). Furthermore, this indirect effect was a fully mediated one, as sub-tests of the configuration of the three variables showed that a significant direct effect of education
on physical activity variety no longer applied when cultural participation was included as an intervening variable.

*Direct positive effect of education on cognitive ability (Hypothesis 3)*

In support of $H3$, education was directly associated with cognitive ability ($\beta_{\text{direct}} = .31$).

*Direct positive effect of cognitive ability on self-regulation (Hypothesis 4)*

There was a negative and significant direct path between cognitive ability and self-regulation ($\beta_{\text{direct}} = -.23$), which was the opposite sign to that predicted ($H4$).

*Negative effect of age on cognitive ability (Hypothesis 5)*

The regression coefficient from age to cognitive ability had a non-zero and negative magnitude ($\beta_{\text{direct}} = -.13$), as predicted ($H5$).

*Direct negative effect of age on physical activity variety (Hypothesis 6)*

Supportive of $H6$, age had a direct and negative effect on physical activity variety ($\beta_{\text{direct}} = -.23$).

*Differential effects of gender on cultural participation and physical activity variety (Hypothesis 7)*

As predicted ($H7$), women were more likely to take part in cultural participation as shown by a positive direct path ($\beta_{\text{direct}} = .14$), and less likely to participate in physical activity variety ($\beta_{\text{direct}} = -.17$).
Table 16. Direct, indirect and total effects in the final structural model (Model 4)

<table>
<thead>
<tr>
<th>Endogenous variable:</th>
<th>Type of effect</th>
<th>Education</th>
<th>Age</th>
<th>Gender</th>
<th>Cognitive ability</th>
<th>Cultural participation</th>
<th>Self-regulation</th>
<th>Social support elicitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive ability</td>
<td>Direct</td>
<td>.31***</td>
<td>-.13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indirect</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>.31***</td>
<td>-.13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural participation</td>
<td>Direct</td>
<td>.37***</td>
<td></td>
<td>.14*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indirect</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>.37***</td>
<td>-</td>
<td>.14*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td>Direct</td>
<td>.25**</td>
<td></td>
<td></td>
<td>-.23**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indirect</td>
<td>-.07*</td>
<td>.03</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>Total</td>
<td>.32***</td>
<td>.03</td>
<td>-</td>
<td>-.23**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support elicitation</td>
<td>Direct</td>
<td>.29***</td>
<td>-.16*</td>
<td></td>
<td>.17*</td>
<td>.25***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indirect</td>
<td>-.00</td>
<td>.03</td>
<td>-.13**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>.29***</td>
<td>-.16*</td>
<td>.03</td>
<td>.03</td>
<td>.25***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity variety</td>
<td>Direct</td>
<td>-</td>
<td>-.23***</td>
<td>-.17***</td>
<td></td>
<td>.28***</td>
<td>-</td>
<td>.32***</td>
</tr>
<tr>
<td></td>
<td>Indirect</td>
<td>.20***</td>
<td>-.05*</td>
<td>.05*</td>
<td>.01</td>
<td>.08**</td>
<td>.19***</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>.20***</td>
<td>-.28***</td>
<td>-.12</td>
<td>.01</td>
<td>.36***</td>
<td>.19***</td>
<td>.32***</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01, *** p < .001
Post hoc pathways in Model 4

Additional effects that were flagged by MIs in the previous models, and included in Model 4 (final PAV model) were age as having a significant direct effect on social support elicitation ($\beta_{\text{direct}} = -.16$), and a direct positive pathway between cognitive ability and social support elicitation ($\beta_{\text{direct}} = .17$).

Other significant effects in final model

It should be noted that Table 16 does not show details of all specific indirect pathways of the exogenous variables on physical activity variety. For details on all pathways in Model 4 (indirect, direct, and total) see Appendix 36. Overall, there were five indirect pathways (all of small magnitude) from education to physical activity variety: (1) via cultural participation ($\beta_{\text{indirect}} = .10$), (2) via cognitive ability and social support elicitation ($\beta_{\text{indirect}} = .05$), (3) via cultural participation, and social support elicitation ($\beta_{\text{indirect}} = .09$), (4) via self-regulation, and social support elicitation ($\beta_{\text{indirect}} = .06$), and (5) via cognitive ability, self-regulation, and social support elicitation ($\beta_{\text{indirect}} = -.04$).

Summary of model testing

The hypothesised SEM (Model 1a) predicted a significant amount of variance in physical activity variety (33.2%, $p < .001$), and was consistent with the main hypotheses that: education is indirectly and positively effects physical activity variety via two primary pathways: (a) self-regulation, and social support elicitation ($H1$), and (b)
cultural participation \((H2)\). The initial model also failed to reject hypotheses 3, 5, 6 and 7. However, this initial model did not achieve global fit to the data. A set of alternative models were tested (Models 1b, 2a and 2b), as well as models specifying additional paths to social support elicitation (Models 2b and 3). Model 4 was found to demonstrate the best model fit among the series of models. Overall, there were five significant and positive indirect effects of education on physical activity variety. As anticipated, age and gender also predicted physical activity variety. Table 17 (overleaf) summarises results in terms of whether each of the hypotheses proposed in Chapter 1 were supported.
Table 17. Overview of findings for main hypotheses

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Support for hypothesis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1. Controlling for age, gender and ability, education will be a positive and indirect determinant of physical activity variety, where (a) education has a direct positive effect on self-regulation, (b) self-regulation has a direct positive effect on social support elicitation, and (c) social support elicitation has a direct positive effect on physical activity variety.

2. Controlling for age, gender, ability, self-regulation and social support elicitation, education will indirectly and positively determine physical activity variety, where (a) education directly effects cultural participation, (b) cultural participation directly effects physical activity variety.

3. Education will have a direct and positive effect on level of cognitive ability

4. Cognitive ability will have a direct and positive effect on self-regulation

5. Age will have a direct negative effect on cognitive ability

6. Age will have a direct negative effect on physical activity variety

7. The relationship between gender and recreational participation will depend on the nature of participation: a: Females (relative to males) will report a higher level of cultural participation, and b: Females (relative to males) will report less physical activity variety.
Chapter 4: Discussion

Physical activity is integral to health and well-being, yet physical activity has been ‘designed out’ of contemporary environments, for instance through car travel and the mechanisation of work (Brownson, Boehmer, & Luke, 2005; Sturm, 2004). There are numerous initiatives to promote physical activity such as changing environments and fostering self-agency (Heath et al., 2012; Pratt et al., 2012). However, current approaches have not secured sustained physical activity. In Australia, physical activity levels have increased, but not by much (e.g. Vandelanotte et al., 2010; Victorian Department of Human Services, 2008). As a result, the baby boomer generation, similar to other sub-populations, are not sufficiently active in recreation time (Australian Institute of Health and Welfare, 2011). This is a challenge for research to address: working out ways to support the baby boomers to have physically active lives.

There is a voluminous body of research on physical activity in a health context, including public health, health psychology, and the exercise and sports sciences. Health psychology has provided the most extensive analysis of individual agency for physical activity, by offering a multitude of theories and constructs. However, in endeavouring to devise feasible ways to sustain activity for baby boomers, there is significant need for a model of ‘everyday agency’ and practices that takes into account context – such as the multidimensionality of physical activity (e.g. physical activity variety), the connection
of physical activity with other practices (e.g. cultural participation), the concrete skills
and strategies people may apply with physical activity in mind (e.g. self-regulation, and
seeking social support), and the broad significance of formal education and other life
experiences.

Cultural research shows that in the second half of the 20th century (i.e. the ‘baby
boomer age’) there was a broadening of repertoires of recreational practices, and that
those exhibiting more variety had higher levels of education (Bennett et al., 2009; van
Eijck, 1999). There were also differences in variety as a function of age and gender
(Sintas & Alvarez, 2002). Given that the ‘boomers’ are the largest cohort during this
time, it is important to find out whether education is linked to physical activity variety,
and whether forms of agency such as self-regulation and cultural participation are
intervening processes. If the ‘boomers’ have a tendency for engaging in variety, and
precursors to variety are known, programs designed in light of these factors may better
support adults in sustaining physical activity – an important health, social and economic
goal. Furthermore, some scholars assert that any rigorous investigation of the role of
education in lifestyles and health needs to take into account differences in cognitive
ability, as a potential confound or co-determinant (Deary, 2009; Gottfredson, 2004), yet
investigations have not considered the combined effect of education and ability in
predicting physical activity variety.

From the foregoing then, there is a need to address the following research
questions (RQs): does education determine physical activity variety? (RQ1); is any
effect of education mediated by proximal agency, such as self-regulation, social support
elicitation, and cultural participation? (RQ2); does cognitive ability play a role in
proximal agency, and physical activity variety? (RQ3); and – what is the role of age and
gender in adult agency and physical activity variety? (RQ4).

The current thesis aimed to identify the effects of education and proximal
agency on physical activity variety of the baby boomer generation through a field study
of 217 adults in the general Melbourne community, in the State of Victoria, Australia.
Specifically, the aims were to establish whether: (a) education determines physical
activity variety, (b) education effects physical activity variety via self-regulation and
social support, (c) cultural participation mediates the effect of education on activity
variety, and (d) if effects of education on self-agency and physical activity variety take
place, whether they do so independently of cognitive ability.

The Framework of Mutual Constitution (FMC) from social-cultural psychology
(Markus & Kitayama, 2010) was drawn upon as a theoretical perspective, as source
material for developing a new integrated model for the current research. Adapting the
FMC enabled the construction of a new model which integrated three fields for
illuminating the role of baby boomer education in self-agency and physical activity:
health psychology, public health, and sociology. The new synthesis culminated in a
constructed model of Physical Activity Variety (for brevity, called the “PAV model”)
which posited processes in how education translates into physical activity variety, via
forms of proximal agency. Through the main field study (Study 3, n = 217), the PAV
model was evaluated against alternative models.
The major finding was that education has indirect, multiple, and positive effects on physical activity variety, and primarily via (1) self-regulation for physical activity and eliciting social support, and (2) cultural participation, such as visiting museums and going to the cinema.

The psychological measures and other survey questions were found to be useful in the current empirical inquiry. In the main study, participant response rates to the survey were high (i.e. over 95%). The measures of self-regulation and social support elicitation were both primarily comprised of new items, and demonstrated good construct validity and internal reliability. The sound ‘performance’ of these measures in the main study may be largely attributed to trialling and revision of the scales in the two pilot studies. Through the second study (pilot2) the Cultural Fair Intelligence Test (Cattell & Cattell, 1960) was found to have good construct validity as a measure of fluid cognitive ability, and demonstrated fair reliability in the main study. Finally, although the set of items for cultural participation were not previously intended as a scale by the creators of the Everyday Cultures Survey (Bennett et al., 1999) – the current analysis established that it served well as a unidimensional observed variable, with good reliability.

The PAV model was found to be empirically robust. Given this, the FMC, as a theoretical perspective to guide development of the PAV model, demonstrated to be a useful approach to integrating strands of research. Additionally, the sociological concept of ‘habitus’ facilitated a bridging of insights in the literature, and particularly in theorising on what tendencies in psychology and practices the baby boomers would develop in light of the social-cultural ‘habitat’ they experienced, including formal
education. With respect to the field of health psychology, this thesis demonstrates that it is feasible to develop and empirically test new models of everyday practice, that foreground the social-cultural and everyday context – in this case, that of the baby boomer generation. However, as indicated in the next section, there were areas where the current research could be strengthened.

**Study limitations**

While establishing that formal education has indirect positive effects on physical activity variety of the baby boomer generation, the thesis had a number of limitations:

1. Due to the cross-sectional design, directionality of effects in the model could not be established definitively, nor could it be determined if the pathways represent causative relationships. At best, the variables in the supported model suggest plausible determinants of physical activity variety.
2. Most data was based on self-report, raising issues of social desirability effects, and lack of precision in construct measurement. Great care was taken to account for measurement error (e.g. latent variable modelling), minimise social desirability (e.g. by having indirect survey questions on activity variety), and establish and refine the surveys through two pilot studies (e.g. the scale for self-regulation). Nevertheless, potential limitations that may be intrinsic to self-report data (Schwarz, 1999) could not be ruled out.
3. The generalisability of the current sample to the larger Melbournian and Australian population of baby boomers is unclear. Generalisability was limited by small sample size and non-random recruitment. For instance,
there was an under-representation of men and people in full-time employment. Similar to other studies that draw upon volunteers from the general community (Korkeila et al., 2002; Lorant et al., 2007), the current sample, to a modest degree, was (by chance) over-representative of people with higher education, which may have led to a slight over-estimation of activity variety and self-regulation. As population studies indicate an inter-connection between employment status, education and gender (e.g. Bennett et al., 1999, pp. 88-90), ascertaining the generalisability of the current main sample is difficult. However, at least in terms of physical activity, comparisons of the current data to population studies suggest that the sample could be generalised to the wider population (Appendices 23 and 34). It is also acknowledged that the generalisability of a structural model reduces with model modification (Byrne, 2012; Kline, 1998). In the main field study there were two modifications by way of added pathways. Later on in this chapter, research directions are proposed to strengthen the model developed in the current thesis, such as an evaluation of model generalisability.

**Discussion of the PAV model**

In this section, current observations on physical activity variety as an outcome variable will be discussed. Then discussion will turn to the two sets of precursors to physical activity variety that were argued to arise from formal education – (1) self-regulation and social support elicitation, and (2) cultural participation. Finally, a
discussion of the role of age and gender is provided, as well as a summary of the findings.

Findings for the main dependent variable: Physical activity variety

The main variable of interest in the current thesis was physical activity variety, defined as the range of types of recreational physical activity. It is important to reiterate that neglect of physical activity variety in past research is highly problematic, as this dimension of physical activity patterns may serve people well in sustaining an active lifestyle (Sherwood & Jeffery, 2000), be directly beneficial to well-being (Bond et al., 2012), and is more in keeping with people’s own perspectives of ‘health’ (Jansen, Druga, & Sauve, 2011). Moreover, as earlier illustrated in Appendix 3, current health guidelines ‘task’ adults to live a physically active life by embracing variety in physical activity.

In the current research, baby boomers were asked about their participation in physical activity variety in the previous three months. The sample reported a wide range of physical activities, 95 types in all, illustrating that there is much variety in the everydayness of recreational physical activity. On average, participants reported five types of activity, and the median response was four types. The most common activities in any repertoire of physical activity were cycling, running, dancing, aerobics, swimming, pilates, tennis, and football – as well as ‘milder’ forms, such as walking, billiards, trampolining, and fishing. The ordering of commonality of single types of activity were generally similar to that of the wider population, where direct comparisons were possible (see Appendix 23). However, it is unclear how much the observed variety
in physical activity compares to previous studies, as the few studies on physical activity variety all differed in operationalisation of the variable (Bond et al., 2012; Dafna et al., 2012; Lefevre & Ohl, 2012; Onge & Krueger, 2011). Clearly more research on the population parameters of physical activity variety is required, including consistency in measurement of this important dimension of active living.

Findings for sub-sections of the PAV model

There were some interesting parallels of the current findings with other empirical studies of predictors of physical activity. From the literature review, it appears that there is no previous research on education and psychological constructs of self-agency as precursors to physical activity variety. Given this, the discussion will compare the current findings to literature on other dimensions of physical activity, such as frequency.

Education, proximal agency and physical activity variety

It was predicted that education would indirectly determine physical activity variety: (a) via self-regulation and social support elicitation, and (b) via level of cultural participation.

a) Education, self-regulation and social support elicitation

Those with more formal education were more likely to apply self-regulatory skills in physical activity, and this form of agency seemed to increase social-support elicitation, which in turn, promoted more physical activity variety. This finding confirms evidence in the literature, of an enduring role of education in current agency
and practices (see Mirowsky & Ross, 2003), and also extends it by showing that
education is an indirect determinant of physical activity variety, by positively shaping
processes of self-agency (self-regulation and social support elicitation).

Self-regulation has been widely investigated as a direct determinant of physical
activity (Anderson et al., 2006; Ayotte, Margrett, & Hicks-Patrick, 2010; Dombrowski
& Luszczenska, 2009; Karoly et al., 2005; Umbstattd et al., 2009), but the role of self-
regulation as precursor to physical activity variety has not received direct investigation.
This study establishes that self-regulation is linked to physical activity variety
indirectly, where social support elicitation is a critical juncture between these forms of
agency. As self-regulation included engagement in problem solving and monitoring
levels of physical activity, social support elicitation may represent an implementation of
these skills.

It is important to note that the final operationalisation of self-regulation that was
included in the results just described, was partly different to the initial conceptualisation
at the beginning of the empirical research. It will be recalled that two pilot studies took
place, and one of the aims of these studies was to investigate a pool of self-regulation
skills and strategies, towards establishing the construct of self-regulation that was
ecologically valid to the baby boomer generation. In this process, the factor models in
Study 2 (Pilot2) demonstrated empirical support for self-regulation as comprising not
only classical forms of self-regulation in the literature, such as problem solving and
monitoring (Karoly, 1993), but also attention to building and strengthening routines.
The confirmatory factor models for the main study (Study 3) verified that the skill sets
of self-regulation and routine formation comprised a common factor. As the question
posed to participants was about maintaining regular physical activity, it appears that, at least at a psychometric level, there is a close connection between skills ‘typical’ of self-regulation in the literature (e.g. Annesi, 2011) and building and securing routines of physical activity. Significantly then, developing routines and habits is a major part of baby boomer attention to sustaining activity, thereby justifying recent physical activity research on “habit formation” (e.g. Lally et al., 2010). But just as importantly, the findings suggest that developing and tracking routines of physical activity may be conducive to participation in multiple activities – as self-regulation was found to be an indirect precursor to physical activity variety.

While social support is a major theme in physical activity research (Cerin & Leslie, 2008, p. 2598), there is little investigation of this type of initiative by people in day-to-day living. This study addressed this gap by providing some evidence that (1) social support elicitation is associated with physical activity variety in natural settings, (2) this relationship takes place within the baby boomer generation in Australia, and (3) education may effect variety through social support elicitation.

Social support elicitation was the most ‘significant’ variable in the PAV model. Not only did social support elicitation have four direct antecedents (age, ability, self-regulation, and cultural participation), it was also the strongest determinant of physical activity variety, accounting for 11% of variance. Overall, seeking support for physical activity seems to be an important general strategy of the boomer generation. Concrete steps such as arranging a get together, and asking friends how they keep active, are important features of baby boomer sociality that underpin an active lifestyle.
b) Education and cultural participation

There was also statistical support for the pathway: education → cultural participation → physical activity variety. This process matches what was inferred from the current literature review of the broad social-cultural environment of the boomer generation. Education, such as schooling, is a national practice of ‘training’ in the norms of a society and capacities for general participation (Durkheim, 1938 [1895]). During the era of the boomers, and especially from the 1960s, there was an increasing imperative, issued from many sources, to embrace diversity, mobility, and choice. Those with more formal education would become more attuned to this broad solicitation, and the associated ambiguities (i.e. conformism by engaging in diversity), where the particularities of what to do to be ‘good’ and ‘well’, remained vague. Physical activity variety would lie at the intersection of both normativity (i.e. there was clarity, in the message to be physically active) and its unlikely coupling with diversity (the message to be mobile and flexible), and so those with more education would gravitate to variety in recreation in general (i.e. cultural participation), as well as variety in physical activity. Such a trajectory from education to physical activity variety would be partly supported, if education determined cultural participation, and this effect would ‘carry over’ to physical activity variety. The current results provide some evidence for this indirect effect.

It was argued in the Introduction that the path from education to cultural participation, and then to physical activity variety, takes place at an implicit level, as a bodily orientation for variety and mobility, consistent with the notion of ‘habitus’ in sociology. That this pathway ‘held’ when controlling for self-regulation of physical
activity (i.e. conscious processes) is consistent with this account, although it could not be ruled out that mindfulness takes place in other ways (for instance, deliberation to live ‘a life of variety’).

This thesis sought to address the neglect of context in psychological research on physical activity. Part of this research gap is that in health psychology (and to a lesser extent, in public health), physical activity tends to be regarded exclusively as a health-related behaviour, and so does not consider other recreational practices, such as cultural participation, as having a bearing on physical activity. The current finding confirms that taking a broader and more contextual view of practices, as called for by scholars (e.g. Karoly et al., 2005; Koski, 2008) can progress an understanding of physical activity. Identification of the indirect effect of education on physical activity variety is an advance on health psychology and public health, as it combines two domains of recreational patterns (cultural participation and physical activities) within a single psychological model of everyday practice. The current research also contributes to cultural research by establishing that the link between education and recreational variety (Bennett et al., 2009) generalises to physical activity patterns. Finally, it is reiterated that the pathway from education to physical activity variety via cultural participation, is not suggested here to be a universal one; rather it derives from the social-cultural environment that the baby boomers experienced.
Summary

With respect to RQ1, the overall finding was that education was an indirect determinant of physical activity variety. In considering RQ2, the current investigation found that the ‘boomers’ do not merely engage in physical activity variety because of more education – but rather, education determines two processes that promote variety – (1) applying skills of self-regulation and gaining social support, and (2) participation in a range of cultural venues and events.

The role of cognitive ability in proximal agency of physical activity variety

To rigorously test whether education is a unique determinant of physical activity variety and agency for physical activity, this research took into account the recurrent claim that cognitive abilities may be one of the ways education enforces an effect on health-related behaviour and health, or may even mask (or explain) why there are educational differences in health-related lifestyle patterns and health (e.g. Deary, 2009; Gottfredson, 2004). Accordingly, RQ3 was: Does cognitive ability play a role in proximal agency, and physical activity variety?

Cognitive ability was not associated with physical activity variety, and was a determinant of less use of self-regulatory skills. Also, there was less support for models positing a central role of ability in agency and physical activity variety. This pattern of findings is at odds with the argument that ability is associated positively with interest in health, self-regulation and engaging in health-related behaviour (e.g. Batty et al., 2006; Gottfredson, 2004). However, it is difficult to compare these findings to the literature,
as no previous research examined variety in physical activity, and studies of the nature of the relationship between cognitive capacities and physical activity are inconclusive overall (e.g. see Anstey et al., 2009; Batty et al., 2007; Ciarrochi, Heaven, & Skinner, 2012; Junger & van Kampen, 2010; Pesta et al., 2012).

While cognitive ability did not predict self-regulation, this variable did have a direct, small and positive effect on social support elicitation. Although the relationship between cognitive ability and social support elicitation for physical activity has not been investigated in past research, this identified pathway is consistent with literature reporting that ability is connected to ‘complex’ sociality and social adjustment (e.g. Austin et al., 2002; Judge, Colbert, & Ilies, 2004). Overall, the total indirect effect of ability on physical activity variety was not statistically significant, as the positive direct effect of ability via social-support elicitation, was countered by the negative-valence pathway between ability and self-regulation.

Returning to the finding of a negative direct effect of ability on self-regulation, there are three potential explanations. First, this result could be due to a suppressor effect. Second, it may be that those with a higher level of cognitive ability are more likely to pursue lifestyles and goals that divert from physical activity and other health-related practices. It has been long established that cognitive ability is connected to socio-economic mobility (Jensen, 1998), and such trajectories may lead to less self-regulation of health (e.g. see Lutfrey & Freese, 2005). It is also worthy to note that in the supplementary analyses (Appendix 34), most zero-order correlations between ability and health-related variables were not statistically significant.
Third, if ability is taken to be reflective of a capacity to be flexible, adaptive and confident with choice-making (Jensen, 1998; Lubinsky, 2004) – the negative effect of ability on self-regulation may be due to a proclivity of those with more ability to veer away from practices of routinisation – one of the skill domains that comprised self-regulation. Strategies and skills of building routines of physical activity, such as creating stability and predictability, contrasts with the cognitive dimensions argued to be connected with fluid cognitive ability, such as cognitive complexity and fluidity (e.g. Gottfredson, 1997; Lubinsky, 2004). Therefore, the negative relationship between ability and self-regulation may be due to a lesser cognitive need of those with ‘higher’ ability to adopt routines or stable patterns of practice, or may reflect an aversion to minimising complexity. However, these differences may not be due to cognitive ability per se, but stem from more general qualitative differences (or modalities) in being or agency, where there are differences in preference for choices or routines, that arise from divergent conditioning by socio-economic position (e.g. see Lindbladh & Lyttkens, 2002, 2003) – precisely the kind of differences posited by a fully-fledged FMC (e.g. Stephens, Markus, & Fryberg, 2012). These reasons are speculative and prompt a return to considering the meaning of scores derived from measures of cognitive ability (Richardson, 2002), a research pathway that requires going beyond cognitive reductionism and psychometrics.

Overall, in addressing RQ3 it was found that education does appear to effect physical activity variety independently of cognitive ability, and there was a negative direct effect of cognitive ability on self-regulation. In addition, the ambiguous role of ability in self-regulation of physical activity may be resolved by revisiting what
cognitive ability tests are measures of, by asserting a more social-cultural and structural perspective.

Age and gender

RQ4 was concerned with the role of age and gender in baby boomer agency and physical activity. As predicted, there were negative direct effects of age on cognitive ability and physical activity variety. The finding of a direct negative effect of age on cognitive ability is consistent with the wider literature on lifecourse changes in general fluid ability (Salthouse, 2004; Salthouse et al., 2008). The finding that age may be a determinant of lower physical activity variety aligns with evidence that age in middle adulthood is associated with lower levels of physical activity (Anderson-Bill et al., 2011; Shaw & Spokane, 2008; Sisson et al., 2012), and advances research on the role of age by showing that the effects of age, at least for the baby boomer cohort, extends to physical activity variety. As indicated in the Introduction, the association of age with lower cognitive ability and physical activity variety are likely due to an interaction of social, cultural and biological factors.

As anticipated, whether females took part in more variety during recreation than males depended on the domain of practice: women reported more cultural participation, while men reported more physical activity variety. Higher cultural participation amongst females in the current research confirms findings in the sociology of culture (e.g. Bennett et al., 2009) and is consistent with population data for Australia (ABS, 2010). In contrast, men seemed to engage in more physical activity variety than women. This is consistent with evidence from the overall literature that while cultural norms on
gender and physical activity have changed a lot in the second half of the 20th century, this has not occurred across the full realm of recreational physical activities (Bennett et al., 1999; Chalabaev et al., 2013; Washington & Karen, 2001). The implications with respect to RQ4 were that gender may directly determine cultural participation (where females had higher levels than males), and physical activity variety (where males had higher levels than females).

**Summary of findings**

The effect of education on physical activity variety was multiple, indirect, and small to moderate in magnitude. The first major indirect effect of education on physical activity variety took place via self-regulation and eliciting social support. The second indirect pathway took place via cultural participation. Age had a negative direct effect on social support elicitation and on physical activity variety. Men engaged in less cultural participation and more physical activity variety than women. The final model demonstrated very good fit to the data, based on a range of criteria for assessing structural equation models, and accounted for 33% variance in physical activity variety. As far as can be ascertained, this is the first study to have investigated the relationships between education, self-agency, cultural participation, and physical activity variety, as well as to investigate these relationships with ‘baby boomer’ adults in Australia.
Implications

The current findings that there does appear to be a gravitation by boomers to variety in physical activity and that there are multiple precursors to this variety, raises new directions in policy and programs geared to sustaining physically active lives. Current initiatives could be fine-tuned by aligning them with the PAV model or by developing programs that have physical activity variety as their main objective. The PAV model suggests that programs could increase physical activity variety if they are: (1) tailored to education level, (2) directly foster self-regulation and social support elicitation, and (3) encourage cultural participation. Initiatives are likely to be more effective if these multiple forms of agency are supported simultaneously. Furthermore, programs based on the PAV model may especially benefit older baby boomers. As indicated by the theoretical perspective of this thesis, while the boomer generation may have a proclivity for variety in practice, whether this proclivity will translate into physical activity variety depends on the external social-cultural environment. For instance, policy and applied work in developing and sustaining multi-activity spaces (e.g. Hester, 2006), would be conducive to physical activity variety.

Alongside the implications just stated, in endeavouring to promote overall well-being, governments and other organisations (e.g. businesses), should consider five broader recommendations. First, there should be more focus on physical activity variety relative to frequency, volume, or a singular activity (e.g. cycling), when considering physical activity promotion. Although there is much reference to ‘active living’, variety needs to be set as a stated goal of a program. Second, efforts to promote physical activity
need to consider other forms of recreation as potentially fostering that activity. In this case, cultural participation was found to be a facilitator of physical activities. Thus far, cultural participation is rarely considered in a public health context (for an exception, see Johansson, Konlaan, & Bygren, 2001). Third, when considering a population (such as the boomers) in relation to physical activity and health, it is important to consider whether that population has a potential inclination for particular styles or forms of physical activity by considering in depth the social-cultural environment that they have experienced over the long term. More generally, any health-related program should consider the individual and environment jointly (cf. Stephens et al., 2012). Fourth, this thesis reinforces the importance of earlier life formal education to people’s agency and health, stressing the need for universal access to education. There is much to do here as inequalities across the globe, in access to formal and long-term education, continue to be significant (Nussbaum, 2011). And as a cautionary note, although the current findings may prompt health promoters to take into account differences in education level, care must be taken to ensure this focus reduces rather than increases inequalities in physical activity and health. Fifth, governments and other organisations should focus on physical activity variety and sustained physical activity as these practices provide a range of health benefits, that become increasingly important with age.

**Future research directions**

Seven research avenues are suggested to further ascertain the ecological validity of the PAV model and explore its potential for promoting boomer well-being. First, the plausibility and generalisability of the PAV model needs to be verified through a follow...
up study with a larger, randomly selected sample of the baby boomer generation. For instance, such a study would increase capacity to utilise the strengths of structural equation modelling, such as permitting free estimation of all items specified for the latent variables (Hair et al., 2006).

Second, applied research on the PAV model would be fruitful. There needs to be more direct research on physical activity variety as a strategy for physical activity promotion (Sherwood & Jeffery, 2000). Current initiatives could be fine-tuned by aligning them with the PAV model. Specifically, the PAV model suggests that programs could increase physical activity variety if they are: (1) tailored to education level, (2) directly foster self-regulation and social support elicitation, and (3) encourage cultural participation. Furthermore, initiatives based on the PAV model may especially benefit older baby boomers. Repeated measures evaluation of a program designed to ‘target’ all intervening constructs in the PAV model would robustly indicate if they are true mediators (cf. MacKinnon, Krull, & Lockwood, 2000), and whether pathways represent causative relationships.

Third, longitudinal research can establish what are likely to be bi-directional relationships between constructs in the PAV model – a research direction consistent with the underlying theoretical perspective of mutual constitution. While there is currently much investigation of lifecourse dynamics (e.g. between education, ability and health; Deary, 2012; Mirowsky, 2011), the set of constructs in the PAV model have not been investigated in this way.
Fourth, additional factors can be considered to address variance in physical activity variety that is currently unaccounted for in the PAV model, such as: exposure to health campaigns (Cavill & Bauman, 2004), proximity to ‘activity friendly’ environments (Ding et al., 2012), occupation level (Emmison, 2003), and efficacy and other control beliefs (Bandura, 1997; Mirowsky & Ross, 2003). Personality traits such as conscientiousness and openness, correlate with education, cognitive ability, physical activity and self-regulation (e.g. Bogg & Roberts, 2004; Deary et al., 2010; DeYoung, Peterson, & Higgins, 2005; Lochbaum, Karoly, & Landers, 2002), and so represent potential spurious variables and a competing account of everyday practices (e.g. see Cross & Markus, 1999).

Fifth, the notion that mutual constitution is primarily implicit (Markus & Kityama, 2010) should be explored in relation to the PAV model. A point of consensus across disciplines is that there is a tacit nature to interactions between environments, cognitive systems and practices (Bourdieu, 2005 [1979]; Lizardo & Skiles, 2012; Markus & Hamedani, 2007; Wood & Neal, 2007). Congruent with this research development, it was proposed that the second major pathway (education → cultural participation → physical activity variety) may occur in an implicit way. A more direct investigation could involve measuring cultural features of everyday objects (e.g. Morling & Lamoreaux, 2008; Snibbe & Markus, 2005), and regress those parameters onto constructs in the PAV model. Furthermore, methodologies from social psychology on priming and automaticity (e.g. Bargh et al., 2001) may help determine if external objects (e.g. messages on “active living”) activate variety at a non-conscious level.
Sixth, research can consider how the PAV model connects with a major theory tied to the FMC – the distinction between independent and interdependent (or ‘disjoint’ and ‘conjoint’) modalities of culture, agency and being (e.g. Markus & Kitayama, 2010). It is yet to be determined whether the social-cultural and material environment of Australia varies to such an extent as to lead to separate forms of agency and being. If it is the case, physical activity could plausibly be the outcome of both modalities of culture and agency. Given that the perspective of mutual constitution has recently been applied to theorising directly on health-related behaviours – called the “social-cultural model of self” (see Stephens et al., 2012), exploration of this work in an Australian context would be timely, including whether group-level differences in adoption of independent and interdependent modalities of agency (if present), moderate the individual differences in self-agency and physical activity variety identified in the current research.

Seventh, the current thesis did not look at the other major process of the cycle of mutual constitution in the FMC – how persons shape the social-cultural environment – in this case, boomer strivings to improve well-being in the community and mould what is taken to constitute “well-being” (cf. Markus & Kitayama, 2010). Research should turn to qualitative approaches (e.g. Archer, 2003; Sayer, 2011; Wacquant, 2009; Yancher, 2011) on reflexivity, personal narratives, moral reasoning, and the nuance of meanings attached to the lived experience of physical activity variety, and being a ‘baby boomer’. These aspects of agency may play an important role in the PAV model, or challenge it as an ecological account of agency.
Concluding comment

Contextual views of agency prompt a return to Aristotle (e.g. Sayer, 2011), and, “the golden mean” – that is, to come to a balance of practices in life that fits the context (see Warne, 2006). In current times, ‘physical activity variety’, isolated in this thesis to be an important mainstay for the baby boomers, may result from a general aspiration to achieve something akin to the Aristotelian principle of virtue and well-being.
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