# IMAGERY USE IN OLDER ADULTS

By

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## Abstract

Underpinned by Bandura's social-cognitive theory (SCT), this thesis examined the perceptions of physical activity (PA) in healthy and unhealthy older adults, and examined imagery as a potential strategy to promote PA. Chapter 2 and 4 were informed by the same sample of healthy older adults who took part in the Study 1. Specifically, 37 older adults (*M*age = 64.3, *SD* = 5.2; 16 females) representing a range of PA levels participated in one of seven focus groups. While Chapter 2 examined how PA is incorporated into daily living, and the barriers and enablers of PA in older adults, Chapter 4 examined the role of imagery as a strategy to increase PA. Using the revised applied model of deliberate imagery as a framework, Chapter 4 explored where, when, what, and why older adults image PA. In a subsequent study (Chapter 3), 26 individuals diagnosed with chronic obstructive pulmonary disease (COPD), between the ages of 50-89 years (*M*age = 69.50, *SD* = 27.57; males = 15), participated in one of four focus groups and gave insights on their unique barriers and enablers of PA. Based on the finding that older adults use a range of imagery types and functions (Chapter 4), and the importance of self-regulation (Chapter 2 & 3), in the final study (Chapter 5) older adults (*N* = 299; *M*age = 59.73 years, *SD* = 7.73, range = 50 to 80) completed self-report measures, to investigate how self-regulatory imagery (i.e., images of goals and planning) relates with social-cognitive variables, enjoyment, and PA. Overall, the thesis recognises the importance of SCT in explaining the unique challenges older adults face in relation to PA while accounting for contextual factors including PA level, disease severity, and employment status. The thesis also demonstrates imagery as a potential strategy for promoting PA in older adults and indicates its effectiveness as a public health intervention.

## Dedication

This thesis is dedicated to my mother who has spent endless hours on my education to help me become who I am today.

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Firstly I would like to thank my supervisors Jennifer Cumming and Sarah Williams. They have been instrumental in getting me not just over the line but guiding me throughout my PhD over the last three years. Your knowledge, patience and guiding skills have been very much appreciated. It may have taken me a while to transform but you managed to get me out of that cocoon. I cannot thank you enough for believing in me and for pushing me to reach my potential.

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*“It is the mark of an educated mind to be able to entertain a thought without accepting it”*

*Aristotle*

## Publications and conference presentations produced during the PhD

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## List of Abbreviations

### Frequently Used Terms

| | |
|---|---|
| BLISS | Birmingham lung improvement studies |
| COPD | Chronic obstructive pulmonary disease |
| CVD | Cardiovascular disease |
| GOLD | Global initiative for chronic obstructive lung disease |
| NICE | National institute for clinical excellence guidelines |
| PA | Physical activity |

### Questionnaires

| | |
|---|---|
| BSSES | Barriers Specific Self-Efficacy Scale |
| EGS | Exercise Goal-Setting Scale |
| EII-R | Exercise Imagery Inventory-Revised |
| EPS | Exercise Planning and Scheduling Scale |
| IES | Interest-Enjoyment Subscale |
| IPAQ | International Physical Activity Questionnaire |
| MRC | Medical Research Council Dyspnoea Scale |
| OEES | Outcome Expectations for Exercise Scale |
| PBE | Perceived Barriers to Exercise |

### Theories

| | |
|---|---|
| RAMDIU | Revised applied model of deliberate imagery use |
| SCT | Social cognitive theory |

### Analysis Terms

| | |
|---|---|
| CFA | Confirmatory Factor Analysis |
| RMSEA | Root Mean Square Error of Approximation |
| SEM | Structural Equation Modelling |
| SRMR | Standardised Root Mean Square Residual |
| TLI | Tucker Lewis Index |

# Chapter 1

General Introduction

# Imagery Use in Older Adults

It is estimated that life expectancy has increased by about 30 years since 1900 (World Health Organisation, 2011). By 2020 it is expected that more than half of adults in the UK will be over 50 years of age (ageuk.org.uk, 2015). At a global level it is estimated that by 2050 more than 1.5 billion of the world's population will be over 65 years of age (World Health Organisation, 2011). Because of the tremendous growth of the elderly population in modern society and the constantly increasing life expectancy of older people, a better understanding of the complex process of ageing and how it is influenced by internal and external factors is warranted (ageuk.org.uk, 2015).

Based on past research that has established a relationship between physical activity (PA) and healthy ageing (e.g., Chodzko-Zajko, 2014), increasing efforts are being made to identify effective ways to improve health and prolong independence among older adults. PA is a cost-effective strategy that can prevent chronic diseases and conditions, boost independent living and improve the quality of life for older adults (Andrews, 2001). Nevertheless, to enable older adults to self-regulate their PA behaviour there is a need for effective behavioural strategies such as exercise imagery.

This chapter will first provide an overview of the literature highlighting the importance of PA in healthy and unhealthy older adults. In a separate section, chronic obstructive pulmonary disease (COPD) will be later introduced to emphasise the specific determinants of PA in this population. Next, the theoretical underpinnings of the research are introduced. Using social-cognitive theory (SCT; Bandura, 1997) as a framework, this thesis focusses on the social-cognitive determinants of PA with an emphasis on barriers, facilitators and outcome expectations of PA. Finally, exercise imagery is introduced as a potential

strategy to improve the inactivity problem of older adults before summarising the overall aims of the thesis and its intended contribution to the literature.

## Physical Activity and Older Adults

### Benefits of Physical Activity

PA is associated with significant physical and psychological benefits (Blair & Connelly, 1996), and can lead to a better quality of life for older adults by preventing many of the negative physical outcomes that come along with increased age such as hypertension and heart disease (McAuley & Elavsky, 2005; Shephard, 1997). PA engagement has been consistently associated with reduced mortality and morbidity from cardiovascular disease (CVD) as well as all-cause mortality (Andersen, Schnohr, Schroll, & Hein, 2000; Gregg et al., 2003). For instance, according to the British Heart Foundation (2013), PA can decrease the risk of CVD by 33%. The beneficial role of PA engagement has also been reported for a variety of chronic conditions such as arthritis, diabetes, cancer, osteoporosis, and COPD (Garcia-Aymerich, Lange, Benet, Schnohr, & Antó, 2007; Kruk, 2007). As the lack of regular PA is one of the most prevalent reasons for chronic diseases, an effort is being made to prevent these conditions in primary health settings by prescribing PA (Booth, Roberts, & Laye, 2012). Specifically, Kruk (2007) found that for chronic diseases the risk reduction because of PA engagement is 75% for breast cancer, 49% for cardiovascular and heart diseases, 35% for diabetes, and 22% for colorectal cancer.

PA can also slow down the development of functional limitations associated with increased age, such as reduced muscle strength (Miller, Rejeski, Reboussin, Ten Have, & Ettinger, 2000). According to the Health Survey for England (2015), older adults over 65 years old particularly benefit from PA for decreasing risk of falls and enabling them carry on their daily living activities. Furthermore, PA is important in the adjustment of older adults

with pain. In a review paper, chronic pain improved and became more manageable with exercise training (Koltyn, 2002). Similarly, in a study with individuals who sustained chronic spinal cord injury, higher levels of PA were associated with lower levels of pain and fatigue (Tawashy, Eng, Lin, Tang, & Hung, 2009).

There are cognitive benefits of PA as well as functional benefits. Larson et al. (2006) found that older adults above 65 years of age who exercised less than three times a week were more at risk for developing dementia. On the other hand, PA is associated with lower risks of cognitive impairment, Alzheimer disease, and any other kind of dementia, as well as increased cognitive function in individuals with dementia and other related cognitive impairments. Thus, PA can be a protective factor for this population and can slow down age-related cognitive decline (Heyn, Abreu, & Ottenbacher, 2004; Laurin, Verreault, Lindsay, MacPherson, & Rockwood, 2001; Wang, Luo, Barnes, Sano, & Yaffe, 2014; World Health Organisation, 1996a).

To add to the long list of benefits, PA is also related to several psychological outcomes such as increased self-esteem (Sonstroem, Harlow, & Josephs, 1994), reduced stress and depression (Gauvin & Spence, 1996), and elevated mood (Edwards, 2006). Furthermore, being physically active can have a positive impact on older adults' physical self-worth by boosting their confidence in their exercise abilities and at the same time increasing their satisfaction with their appearance (Dionigi & Cannon, 2009). Moreover, PA is associated with social health benefits as it can motivate older adults to expand their social networks, initiate friendships, and better adjust to changing roles associated with ageing such as retirement (Chodzko-Zajko, 2005; World Health Organisation, 1996b).

**Recommended Levels of Physical Activity & Current Levels**

Recommendations for how much PA is required to achieve health benefits have undergone changes in the last few years. According to World Health Organisation (2013) and the Department of Health (2011), younger and older adults over 65 years old should engage in at least 150 minutes of moderate-intensity aerobic PA in bouts of 10 minutes duration, or accumulate at least 75 minutes of vigorous-intensity aerobic PA, or an equivalent combination of moderate and vigorous intensity activity throughout the week. These levels of PA can be accumulated by engaging in moderate PA for 30 minutes five days a week or by engaging in short 10-minute bouts. It is also recognised that performing 8–12 repetitions of muscle strengthening activities for at least two days per week can have significant health benefits for older adults. The guidelines are much lower for older adults with chronic conditions due to the associated physical limitations that make it harder to be active. For instance, it is suggested that individuals with COPD should engage in moderate PA three days per week for at least 15 minutes (Dressendorfer, Haykowsky, & Eves, 2015).

Although PA can have a positive impact on older adults' health and wellbeing, the majority of older adults are not sufficiently active and do not systematically engage in PA (Cameron, Craig, Stephens, & Ready, 2002; Prohaska et al., 2006). It seems that the significant health benefits are not a sufficient reason to engage in PA. As a result, PA levels typically decline with age and there is a tendency for increasing levels of inactivity in older adults (Besson et al., 2009; Health Survey for England, 2008; Smith, Gardner, Fisher, & Hamer, 2015). Overall, only 31% of men and 22% of women meet the recommended levels of PA (Health Survey for England, 2012).

Low levels of PA are more evident in unhealthy older adults. For instance, in a literature review of 13 studies conducted by Vorrink, Kort, Troosters, and Lammers (2011) it

was found that COPD patients engage in only 56% of total activity count compared to healthy adults. Furthermore, COPD patients engaged in 57% of the duration and 75% of the intensity that healthy individuals engage in. The lower duration and intensity of PA in COPD patients is likely due to loss a of functional capacity, which can in turn lead to a downward cycle of deconditioning and sedentary behaviour (Durstine, Gordon, Wang, & Luo, 2013). Troosters et al. (2010) reported that COPD patients engage in 46% of the amount of daily PA engaged in by a healthy older adult. These results suggest that COPD patients might encounter greater challenges that prevent them from being active. To account for the low levels of PA in both healthy and unhealthy older adults, the following section refers to the main reasons why the majority of older adults are not sufficiently active.

**Barriers to Physical Activity**

Past research has investigated factors that prevent older adults from being physically active (Newson & Kemps, 2007). Some of the most common barriers reported by older adults involve; poor weather (Bjornsdottir, Arnadottir, & Halldorsdottir, 2012; Lim & Taylor, 2005; Stutts, 2002), unpleasant sensations associated with exercise (Resnick & Spellbring, 2000), lack of interest/amotivation (Barnett, Ogilvie, & Guell, 2011; Cohen-Mansfield, Marx, & Guralnik, 2003; Kowal & Fortier, 2007), lack of transport (Crombie, Irvine, Williams, McGinnis, Slane, Alder, & McMurdo, 2004), attributing low value to PA (Barnett, Guell, Ogilvie, 2012; Crombie et al., 2004), and lack of exercise facilities (Netz, Zeev, Arnon, & Tenenbaum, 2008; Stutts, 2002).

In a study by O'Neill and Reid (1990), it was demonstrated that the number of barriers reported were significantly related to illness or disability, rendering health as a major determinant of PA. Health issues (e.g., comorbidities, physical injury, illness, shortness of breath) are among the most frequently reported barriers in older adults (Booth, Bauman,

Owen, & Gore, 1997; Cohen-Mansfield, Marx, & Guralnik, 2003; Lim & Taylor, 2005; Schutzer & Graves, 2004). More recently, Moschny, Platen, Klaaßen-Mielke, Trampisch, and Hinrichs (2011) found that 58% of the older adults participants reported poor health as their primary barrier. Similarly, in a systematic review of 44 studies examining older adults' perceived barriers to PA, 59 barriers were identified, with poor health seen as one of the most predominant (Baert, Gorus, Mets, Geerts, & Bautmans, 2011). Gellert et al. (2015) examined a group of older adults aged between 65-100 years and found that perceived poor health was one of the best predictors of PA. Sometimes, older adults avoid exercise and to justify their behaviour they claim poor health as a barrier to PA (Netz et al., 2008). However, the perception of having good health can also become a barrier that demotivates older adults from exercising, as they usually see no purpose for engaging in PA when they are healthy (Cornell, Davies, Rosenberg, & Fisher, 1988).

Health concerns can be even more apparent in populations with chronic conditions such as those diagnosed with COPD. The barriers that individuals with COPD face will be explored in a subsequent chapter. However, it is important to point out that individuals with chronic health conditions do not always see their health as a barrier to PA, suggesting that the underlying health conditions are not always to blame for the lack participation in PA (Smith et al., 2012). As Smith et al. (2012) suggested, it could be that these individuals have adjusted to their chronic issues and, as a result, they do not perceive them as an impediment. Thus it is important to be aware of the separation between self-reported health status and actual health status, and account for both of these when examining barriers to PA as well as other social cognitive determinants that might influence the perceptions of older adults.

Another factor that could also deter older adults from PA participation is lack of time (Lim & Taylor, 2005). Lack of time is commonly reported among individuals who are

insufficiently active and might reflect lack of motivation, laziness, or lack of interest and commitment to PA (Bowles, Morrow, Leonard, Hawkins, & Couzelis, 2002; Booth, Bauman, Owen, & Gore, 1997; Netz et al., 2008; Stutts, 2002). It is possible that lack of time depends on what priorities individuals have and might represent the notion of 'There are other things I would rather be doing'. However, lack of time is reported as a reason for inactivity regardless of the physical activity level of the individual (Lian, Gan, Pin, Wee, & Ye, 1999). For instance, King et al. (2000) demonstrated that both active and insufficiently active individuals reported not having sufficient time to be physically active, further suggesting the idea that time perception is a significant barrier, whether this is real or just perceived.

Another widely reported barrier that can prevent older adults from being physically active is lack of company (Crombie et al., 2004; Moschny, Platen, Klaaßen-Mielke, Trampisch, & Hinrichs, 2011). Thus, exercising alone without an exercise partner can discourage older adults from engaging in PA (Kowal & Fortier, 2007). A number of studies in the field regarding barriers of PA in healthy older adults are presented in Table 1. It is important to note that this is not a systematic review of the literature but a representation of some of the most frequently occurring barriers in the older adult population. The criteria that were used for the selection of the studies below were based on the title of the study, including certain keywords (e.g., barriers of PA) and the age group (e.g., adults above 50 years old).

Table 1

*Barriers to Physical Activity in Older Adults*

| REFERENCE | BARRIERS |
|---|---|
| Barnett, I., Guell, C., & Ogilvie, D. (2012) | 1) Lack of time<br>2) Low value on engaging in PA (especially those retired from manual occupations) |
| Barnett, I., Ogilvie, D., & Guell, C. (2011). | 1) Lack of motivation<br>2) Health problems<br>3) Costs<br>4) Caregiving responsibilities<br>5) Perceived inappropriateness of physical activity in |

| | |
|---|---|
| | older age |
| Booth, M.L., Bauman, A., Owen, N., & Gore, C.J. (1997). | 1) Health problems (Most common barrier)<br>2) Having an injury & disability<br>3) Not having sufficient time |
| Bjornsdottir, G., Arnadottir, S. A., & Halldorsdottir, S. (2012) | 1) Worsening health<br>2) Colder climate with ice and wind<br>3) Lack of PA culture within the retirement community |
| Cohen-Mansfield, J., Marx, M. S., & Guralnik, J. M. (2003). | 1) Health problems and pain (Most common barrier)<br>2) Lack of interest/ Unmotivated<br>3) Lack of time |
| Crombie, I. K., Irvine, L., Williams, B., McGinnis, A. R., Slane, P. W., Alder, E. M., & McMurdo, M. E. (2004) | 1) Lack of interest<br>2) Lack of transportation<br>3) Pain<br>4) Lack of energy<br>5) Doubting that PA can lengthen life<br>6) Going out alone |
| Kowal, J., & Fortier, M. S. (2007). | 1) Daily activities<br>2) Being too busy<br>3) Feeling tired<br>4) Feeling lazy<br>5) Health problems<br>6) Time-management<br>7) Exercising alone |
| Lian, W. M., Gan, G. L., Pin, C. H., Wee, S., & Ye, H. C. (1999). | 1) Lack of time<br>2) Poor health (most strongly correlated with leisure-time PA) |
| Lim, K. & Taylor, L. (2005) | 1) Health problems were reported to be by far the most common barrier to increasing physical activity.<br>2) Lack of time<br>3) Pain<br>4) Cannot be bothered<br>5) Weather |
| McDonald, S., O'Brien, N., White, M., & Sniehotta, F. F. (2015) | 1) Loss of daily structure<br>2) Social context (fit in around other people's routines after retirement)<br>3) Financial changes<br>4) Pick up other interests not related to PA after retirement<br>5) Transitional PA phases after retirement (settling into retirement patterns) |

| | |
|---|---|
| Moschny, A., Platen, P., Klaaßen-Mielke, R., Trampisch, U., & Hinrichs, T. (2011) | 1) Poor health (especially for the older participants)<br>2) Lack of company<br>3) Lack of interest<br>4) Lack of opportunities<br>5) Lack of transport |
| Netz, Y., Zeev, A., Arnon, M., & Tenenbaum, G. (2008). | Insufficiently active:<br>1) Fewer external-environmental reasons<br>2) More Internal-trait reasons (I am not the sporty type)<br>Sufficiently active:<br>1) Lack of company<br>2) Lack of suitable facilities<br><br>Older adults: Health related issues (socially acceptable excuse)<br>➢ More trait attributes (not the sporty type) |
| Resnick, B. (2000) | 1) Unpleasant sensations associated with exercise (pain, shortness of breath, discomfort, fear of falling) |
| Schutzer, K. A., & Graves, B. S. (2004) | 1) Poor health<br>2) Environment (safety & access to exercise facilities)<br>3) Lack of knowledge in exercise benefits<br>4) Exercise patterns in childhood |
| Stutts, W. (2002) | 1) Internal barriers<br>➢ Lack of time (primary barrier)<br>➢ Lack of motivation<br>➢ Boredom<br>2) Environmental barriers<br>➢ Lack of exercise facilities<br>➢ Weather<br>3) Barriers caused by significant others<br>➢ Lack of encouragement<br>➢ Social support<br>4) Physical limitations<br>➢ Health |

Although there is plenty of research on the factors that prevent engagement in PA in healthy older adults, the majority of these studies are quantitative in nature (Clark, 1999; Schutzer & Graves, 2004). As Smith et al. (2012) proposed there are many factors (e.g., level of mobility, current exercise status, past experiences, race, ethnicity) that might influence what is perceived as a barrier or enabler. Due to the complexity of these issues a qualitative

approach may be helpful in further describing these issues in richer detail. This thesis will therefore take a qualitative approach to provide greater insight into the barriers older adults face. Furthermore, the majority of past research has focussed on older adults past retirement age (Jancey, Clarke, Howat, Maycock, & Lee, 2009; Newson & Kemps, 2007). There are just a few studies that have investigated the barriers that people face during the transition into retirement.

Retirement from work is a major life transition that influences PA levels in older adults (Arkenford, 2006; Beck, Gillison & Standage, 2010; Scanlon-Mogel & Roberto, 2004; Strobl, Brehm, & Tittlbach, 2010; Witcher, Holt, Spence, & Cousins, 2007). A systematic review of 19 quantitative studies and 5 qualitative studies found that even though recreational PA increased, overall PA decreased following retirement (Barnett et al., 2011). These findings were also consistent with a recent longitudinal study indicating that vigorous PA reduces with age (Smith, Gardner, Fisher, & Hamer, 2015).

According to Barnett et al. (2011), individuals who are transitioning into retirement are often not sufficiently active due to lack of motivation and a perception that they are too old to exercise. Some further changes that occur during retirement may affect their motivation to engage in PA (e.g., lack of daily structure, financial changes, adjusting to a new social setting, desire to enjoy their freedom) (McDonald, O'Brien, White, & Sniehotta, 2015; Laverty & Flint, 2014). The majority of retired people also report lack of exercise partners and financial constraints as major barriers to exercising (Cohen-Mansfiled, Marx, & Guralni, 2003; Godin, Desharnais, Valois, Jobim, & Bradet, 1994). PA levels are also influenced by the demands of the occupation held by individuals before retirement (Touvier et al., 2010). Specifically, PA decreases substantially for people who retire from physically demanding jobs since they lose a significant amount of their PA on retirement (Chung, Domino, Stears, &

Popkin, 2009). In summary, although retired individuals intuitively have more free time available to incorporate PA into their daily routine, studies have found that retirement can negatively impact upon activity levels.

In contrast, some studies indicate that retirement can have a beneficial effect on PA (Wang, 2007). For instance, Lahti, Laaksonen, Lahelma, and Rahkonen (2011) found that engagement in moderate-intensity leisure-time PA increases following retirement. Older adults who are about to retire or who have recently retired are expected to have more time to exercise, which enables them to incorporate PA into their daily schedules and make it part of a new routine to facilitate healthy ageing (Barnett et al., 2012). In support, a review conducted by Barnett, van Sluijs, and Ogilvie (2012) concluded that retirement led to an increase in leisure-time PA and particularly those who retire from sedentary jobs.

The inconsistent findings among studies on the impact of retirement on PA level could be due to the varying operationalisation of PA. Although some studies define PA as leisure time activity or recreational (Stephens & Caspersen, 1994), other studies perceive PA as a global construct including activity in many settings such as work, home and leisure. The lack of a common definition can result in differential results. In the present thesis, to capture all possible manifestations, PA is defined more broadly as overall PA accumulated from different sectors of life including structured activities (e.g., going to the gym) as well as other lifestyle activities (e.g., gardening, playing with grandchildren).

Another reason that could explain the equivocal evidence for the impact of retirement on PA is measurement issues. Shephard (2003) proposed that most questionnaires focus on the intensity, frequency, duration, and total amount of PA while other important concepts are regularly omitted from PA questionnaires. For instance, most questionnaires fail to distinguish between aerobic and resistance activity while the environmental context (indoors

or outdoors, weather conditions) is ignored completely. Getting a better understanding on how PA is measured across the different studies is important as it can explain why retirement is both a determinant and a barrier to PA.

Research is warranted to investigate further the transition to retirement and how it affects PA levels. Similar to healthy older adult retirees, it is likely that individuals who retire with health problems face their own set of difficulties that determine their engagement in PA. Although the majority of past research has focussed on the barriers of people with chronic diseases (Thorpe, Johnston, & Kumar, 2012), to date there has been very little qualitative research on the barriers that prevent people with COPD from initiating and maintaining PA. Thus the following section focusses on people with COPD, the importance of PA for this population as a self-management technique, and the barriers they face.

**Chronic Obstructive Pulmonary Disease**

As a progressive disease, COPD is characterised by reduced airflow in the lungs, limited lung capacity, symptoms of breathlessness and increased risk of infection. Disease progression is associated with repeated infections and hospital admissions placing a considerable burden on healthcare resources (Global initiative for chronic obstructive lung disease; GOLD, 2015). Although more than 65 million people are estimated to suffer from moderate to severe COPD worldwide (World Health Organisation, 2015), there is still a considerable amount of people who remain undiagnosed (Bednarek, Maciejewski, Wozniak, Kuca, & Zielinski, 2008) or poorly diagnosed (Fromer, 2011). Work loss or premature retirement is also associated with COPD (Fletcher et al., 2011), which can in turn have a huge financial impact on the health care system (Nowak et al., 2005). Due to the high mortality rates associated with this disease, COPD is a major public health concern (Soriano et al., 2000). According to World Health Organisation (2015) more than 3 million people died of

COPD worldwide in 2012. It is estimated that in the next five years COPD will be one of the top causes of death (Patel & Hurst, 2011) and this pattern is going to increase even more as the years pass by (GOLD, 2015).

Because of the complexity and the seriousness of COPD, it is important to equip individuals with COPD with the skills to manage their symptoms effectively. A major component of most self-management programmes is the promotion of free-living participation in PA as a way to improve health outcomes. Previous research on individuals with COPD has shown that there is enormous benefit being derived from the physical exercise component of pulmonary rehabilitation, an organised psycho-educational programme (Casaburi et al., 1997). Specifically, exercise is related to increased physical capacity, improved oxygen consumption, reduced heart rate, better ventilation, higher tolerance for exercise, improved exercise capacity and muscle function, and decreased feelings of fatigue and dyspnoea. (Kaplan, Atkins, & Reinsch, 1984; Pedersen & Saltin, 2006). Moreover, engagement in regular PA can lead to less hospital admissions and readmissions, and decreased morbidity and mortality (Garcia-Aymerich et al., 2006; Waschki et al., 2011). On the other hand, physical inactivity can accelerate COPD progression and is associated with lung function decline, higher levels of dyspnoea, limited exercise capacity, and more hospital admissions (Hartman, Boezen, De Greef, Bossenbroek, & ten Hacken, 2010).

As with healthy older adults, it seems like individuals with COPD face their own type of barriers that prevent them from engaging with PA and can explain the low levels of PA in this population. Past research has shown that individuals with COPD encounter physical limitations such as shortness of breath, or dyspnoea that might prevent them from engaging in PA (Thorpe, Kumar, & Johnston, 2014). Due to the fact that dyspnoea mostly occurs during exertion, it is possible that individuals with COPD participate in limited PA in an effort to

avoid these symptoms (Hartman et al., 2010). Many individuals with moderate to severe COPD might have difficulty engaging even in basic daily activities, as it makes them fatigued and short of breath (Belfer & Reardon, 2009). In a previous study with COPD patients, those who were too breathless to leave the house had a low PA level score similar to the one from a completely sedentary patient bound in a chair or bed (Watz, Waschki, Meyer, & Magnussen, 2009).

In a mixed-methods study with older adults with varying degrees of COPD severity (Hartman, ten Hacken, Boezen, & de Greef, 2013), four major barriers were identified including the weather, COPD-related health problems, financial constraints, and shame. Participants also perceived certain factors to facilitate engagement in PA such as health benefits, enjoyment, continuation of an active lifestyle, and functional purposes like gardening or travelling to another location. The large heterogeneous sample allowed for a robust set of data for analysis. However, it should be noted that the interviews were not audiotaped and transcribed verbatim, which could limit the trustworthiness and accuracy of the interview data collected. Therefore, some caution should be taken when interpreting the results of this study.

Similarly, Thorpe et al. (2014) examined the barriers of PA that older adults with COPD faced two months after a hospital admission. This population reported primarily health-related barriers (e.g., breathlessness, other co-occurring diseases, injury and sickness) and environmental barriers (e.g., weather and transportation issues). Although this study focussed on PA as part of pulmonary rehabilitation, an extension to the broader definition of PA seems necessary. Despite the reported barriers, a more comprehensive review of the factors that influence individuals with COPD is needed. The next section focuses on a major

theoretical framework that has been used to explain the determinants of PA in healthy and unhealthy older adults; social-cognitive theory (SCT; Bandura, 1982).

## Social Cognitive Theory and Physical Activity Behaviour

Bandura's SCT (1977) is a widely applied theory that has been used to explain PA behaviour. It refers to the social and cognitive factors that can determine motivation and behaviour (Young et al., 2014). The social factors refer to learning that happens because individuals are part of a society, while the cognitive factors refer to the thought processes involved in decision making that influence human motivation and behaviour (Stajkovic & Luthans, 1998). Although the literature on SCT is broad, the following section focusses on the major components of SCT as they relate to this PhD for healthy and unhealthy older adults. Finally, an overview of the past studies that have used SCT to explain PA is provided.

### Components of Social Cognitive Theory

The major SCT components that are investigated throughout this thesis are: self-efficacy, perceived barriers, outcome expectations, and self-regulatory behaviour. A more detailed review of the different social-cognitive components in relation to healthy adults and those with COPD then follows.

**Self-efficacy.** Self-efficacy is a pivotal construct in SCT, as it can directly influence motivation and behaviour (Bandura, 1998). Self-efficacy refers to the belief people have in their ability to engage in a particular behaviour that will lead to a successful outcome (Bandura, 1998). The current exercise psychology research has focussed on three distinct types of self-efficacy; task, scheduling, and barrier/coping self-efficacy (DuCharme & Brawley, 1995; Duncan et al., 2011; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002; Rodgers & Sullivan, 2001). Task-efficacy refers to the confidence in one's ability to perform crucial aspects of an exercise task in a specific setting, scheduling efficacy refers to the

confidence in one's ability to set plans and goals to exercise on a regular basis and barrier/coping efficacy refers to the confidence in one's ability to deal with challenges and overcome barriers that get in the way (Rodgers & Sullivan, 2001). Barrier self-efficacy, also known as self-regulatory self-efficacy, is particularly relevant for older adults (Woodgate, Brawley, & Weston, 2005).

Research with older adults has indicated that barrier self-efficacy can be crucial for PA participation as it can predict both the frequency and the intensity of exercise (McAuley, 1992; McAuley & Blissmer, 2000; McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; Rodgers et al., 2002). For instance, older adults who feel confident in their ability to exercise despite the adverse weather conditions (e.g., high barrier self-efficacy) are more likely to persist, put in effort to overcome barriers, and engage in more exercise. Those who regularly exercise are expected to be more confident in their ability to overcome exercise-related barriers (Simonavice & Wiggins, 2008). Consequently, self-efficacy can be both a determinant and an outcome of PA (McAuley & Blissmer, 2000). On the other hand, older adults with low barrier self-efficacy are more likely to quit or disengage from exercise (Bandura, 1986; 1997). Consequently, barrier self-efficacy should be targeted in intervention programmes designed to help older adults overcome psychological barriers and increase their PA levels (Lee, Arthur, & Avis, 2008).

Overall, past research on self-efficacy has shown a strong relationship between self-efficacy and health behaviour changes such as smoking cessation, lower alcohol consumption, exercise and weight control (Strecher, DeVellis, Becker, & Rosenstock, 1986), with stronger self-efficacy beliefs associated with more positive health behaviour changes. One of the most characteristic health behaviours where self-efficacy can play an influential role is the adoption and maintenance of PA (Conn, 1998; Anderson et al., 2006; Luszczynska & Schwarzer, 2005;

McAuley, 1992). Specifically, there is a strong positive association between self-efficacy, exercise behaviour, and exercise adherence (McAuley et al., 2003), with higher levels of self-efficacy associated with more regular exercise (Conn, 1998).

Self-efficacy is equally important to healthy as well as unhealthy individuals with a chronic disease (e.g., COPD). Past research has suggested that it is common for individuals with COPD to have low levels of self-efficacy because of feeling lack of self-control over their disease and their lives in general (Bentsen, Wentzel-Larsen, Henriksen, Rokne, & Wahl, 2010). Kaplan, Atkins, and Reinsch (1984) found that when individuals with COPD believed that their behaviour could have an impact on their health, this behaviour was more likely to change. Similarly, Lemmens, Nieboer, and Huijsman (2008) found that self-efficacy along with other social-cognitive variables positively predicted COPD outcomes. That is, belief in their ability to make health changes positively influenced health behaviours in individuals with COPD, and this led to more positive outcomes such as quality of life, health status, dyspnoea, and lung function via its association with PA behaviour. These results suggest that self-efficacy can play an important role in the kind of health related choices people with COPD make. In the past, the majority of studies have focussed on self-efficacy as a predictor of positive outcomes after adhering to pulmonary rehabilitation. However, studies on the importance of self-efficacy in relation to lifestyle PA are lacking in the literature.

***Sources of self-efficacy.*** According to Bandura (1997) the major sources of self-efficacy are performance accomplishment, vicarious experience, verbal persuasion, and emotional arousal. While performance accomplishment is recognised as the most influential source of self-efficacy, vicarious experience can still have a great influence on the cognitions of an individual although not as powerful as direct experience. Finally, social persuasion and

emotional arousal are additional sources of personal efficacy in older adults, even though they are harder to instill. A more detailed description of the major sources follows below.

*Performance accomplishment.* It has been suggested that when people experience success, this can raise their personal mastery experience (Bandura, 1997, p.80). On the other hand negative experiences can lower self-efficacy beliefs. Performance accomplishment is considered the most significant source of self-efficacy as it is tied to personal experience and is based on actual skill mastery. When the success is attributed to one's skill and ability, rather than chance or situational factors, self-efficacy will be elevated (Strecher, DeVellis, Becker, & Rosenstock, 1986). It has been suggested that older adults should set realistic and achievable goals to avoid disappointment when initiating PA and ensure successful experiences (McAuley, Szabo, Gothe, & Olson, 2011).

*Vicarious experience.* Seeing other people's accomplishments and successes can be a source of confidence to anyone observing the behaviour (Bandura, 1997, p.87). These findings corroborate past results of a systematic review that indicate a strong association between vicarious experience and self-efficacy effects (Ashford, Edmunds, & French, 2010). Thus, observing someone performing successfully can boost self-efficacy by providing not only information on how to perform a task but also the perception that the observer is equally capable of performing a similar course of action. The greater the similarity between the role model and the observer, the more likely a successful outcome will occur (Bandura, 1995). For instance, older adults who observe similar age people being physically active and experiencing positive physical and psychological outcomes, are likely to become motivated to engage in PA through social comparison (Bandura & Jourden, 1991). This is based on the idea that observing the consequences of one's behaviour and comparing yourself to similar others can motivate other people to do the same. However, for older adults it might be

challenging to find similar age role models (Lee et al., 2008). Moreover, if older adults compare themselves to younger exercisers, it is possible that they might get discouraged and think that exercise is irrelevant to them.

*Verbal persuasion.* Positive feedback from significant others in regards to a certain behaviour is the third source of self-efficacy (Bandura, 1997). When significant others express faith in one's capabilities to be successful, this can positively influence their self-confidence (Lee et al., 2008). Although, this source of self-efficacy is not considered as influential as direct experience and vicarious experience, verbal persuasion alone can still produce long-lasting changes in self-efficacy (Ashford et al., 2010). Previous research with older adults has indicated that one of the most influential sources of verbal encouragement is the physician or family doctor, who can encourage older adults to initiate and maintain PA (Schutzer & Graves, 2004).

*Emotional arousal.* Sometimes, individuals judge their capabilities based on their perceptions of somatic and emotional states (Bandura, 1999). For instance, in the case of older adults it is possible that some somatic sensations such as pain and fatigue, when interpreted as debilitative, can negatively influence their self-efficacy beliefs. However, older adults who perceive physiological responses as facilitative are more likely to have high levels of self-efficacy. To improve the self-efficacy beliefs of older adults, it is important to reduce stress and help them interpret certain physiological and psychological signs in a positive way (Resnick, 2002).

**Perceived Barriers.** A second component of SCT relates to barriers, which refer to the obstacles that prevent individuals from engaging in PA. These are classified as personal barriers, which are under an individual's volitional control, such as low motivation, or situational barriers, which are beyond one's direct control, such as poor weather (Bandura,

1995). Similarly, Jackson (1988) classified barriers as internally perceived barriers, referring to barriers related to personal attributes such as poor health, low motivation, pain, fatigue, and not enjoying exercise, or externally perceived barriers, referring to environmental-situational barriers such as bad weather, and lack of time because of other obligations (Jackson, 1988). Past research has found an association between the number of perceived barriers and the levels of PA, with lower PA levels associated with more perceived personal and environmental barriers (Reichert, Barros, Domingues, & Hallal, 2007; Trost, Owen, Bauman, Sallis, & Brown, 2002). However, personal barriers are more consistently related to PA than environmental barriers (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Furthermore, insufficiently active people perceive more barriers to exercise than regular exercisers (Simonavice & Wiggins, 2008). Finally, as it has been mentioned in an earlier section, individuals with COPD face their own barriers, which are related to the disease itself.

**Outcome Expectations.** A third component of SCT is outcome expectations, which refers to the benefits people expect from participation to PA (Bandura, 1997). According to Bandura (2004), there are three distinct types of outcomes: (1) physical; (2) social; and (3) self-evaluative. Physical outcomes refer to the changes in the appearance an individual expects as a result of exercise, whereas social outcomes refer to the opportunities for socialisation that are associated with exercise, and self-evaluative outcomes refer to feelings of accomplishment and satisfaction received from participating in PA. In the case of unhealthy older adults (e.g., individuals with COPD), outcome expectations could include all the positive health outcomes that these individuals expect as a result of participating in PA such as improvement in heart and lung function, stronger muscles, and strong bones.

Previous research has indicated that age can have an impact on outcome expectations, with increasing age associated with lower outcome expectations (Conn, 1998). Older adults

are more likely to report social outcome expectations representing outcomes such as making new friends and having an exercise companion (Wójcicki, White, & McAuley, 2009). On the other hand, younger people seem to have higher physical outcome expectations related to exercise than older people (Resnick, Palmer, & Jenkins, 2000; Wójcicki et al., 2009). Furthermore, in line with SCT, more active individuals and those with higher self-efficacy are more likely to have more positive outcome expectations in relation to exercise participation (Ayotte, Margrett, & Hicks-Patrick, 2010; Wójcicki et al., 2009). Outcome expectations can be predictive of exercise behaviour, with positive outcome expectations (e.g., expecting health benefits) associated to higher levels of PA (Mathews et al., 2010; Schwarzer & Fuchs, 1995).

Although outcome expectations might be a powerful motivator for participation in PA, this effect is not always consistent and its contribution might reduce when self-efficacy is accounted within a social-cognitive model (Wójcicki et al., 2009). For instance, in the case of individuals with COPD, the physician's warnings for the negative outcomes of a sedentary life might not be enough to persuade them engage in PA. If the individual is lacking confidence in their ability to initiate and sustain PA, outcome expectations might not be sufficient to cause change. This might explain why in some cases outcome expectations did not have a great influence on the exercise behaviour of older adults (Conn, 1998; Rovniak, Anderson, Winett, & Stephens, 2002). However, even though the strength of outcome expectations might reduce in the presence of self-efficacy, this does not mean that outcome expectations is not an important social-cognitive predictor of PA. Further research is needed to examine outcome expectations in combination with a wide range of social-cognitive variables.

**Self-regulatory Behaviour.** Self-regulation is another major component of SCT. There are varying definitions of self-regulation, but it commonly refers to the plans and goals

individuals set when it comes to PA (Rovniak et al., 2002). Maes and Karoly (2005) equated self-regulation to a goal-selection, goal-setting and goal-attainment process. However, self-regulation can also be conceptualised as self-monitoring and self-rewarding. According to Bandura (2005), individuals use self-regulatory strategies to manage their motivation to engage in and maintain, a behaviour (Bandura, 2005). Thus, self-regulatory skills seem to be one of the most important predictors of PA (Anderson et al., 2006). In Anderson's et al. (2006) study, individuals who allocated time for exercise and made plans were more physically active. Respectively, older adults who are more physically active report greater use of self-regulatory skills (Umstattd, Saunders, Wilcox, Valois, & Dowda, 2006). The importance of self-regulatory strategies was also demonstrated in a study by Hallam and Petosa (2004), who found self-regulation to significantly mediate PA changes in middle-aged adults beyond and above self-efficacy (Hallam & Petosa, 2004). Overall, older adults with high levels of self-efficacy appear to have greater use of self-regulatory strategies and as a result they are more active (Dishman et al., 2005). Even though self-efficacy is always a precursor to self-regulation, it is these self-regulation strategies that will serve to help individuals to engage in PA and persevere in this activity when faced with difficulties (Rovniak et al., 2002).

**Enjoyment**

Enjoyment is a core aspect of intrinsic motivation. According to Ryan and Deci (2000), behaviour is intrinsically motivated when it is freely initiated because of being pleasurable and to provide satisfaction. It has been demonstrated that individuals who enjoy PA and are intrinsically motivated are more likely to persist in the behaviour and feel better about themselves (Grant, 2008; Wilson, Rogers, Rodgers, & Wild, 2006). Although not a social-cognitive construct itself, enjoyment is an affective state that directly and indirectly

predicts PA and relates to other determinants of PA (King et al., 1992). Enjoyment, as a psychological outcome of exercise participation, has long been acknowledged to be associated with higher levels of PA (Dishman et al., 2005; Salmon et al., 2003). For instance, in Salmon's et al. (2003) study, those who reported great levels of enjoyment were at least three times for likely to report walking during the week. If PA is not enjoyable, no matter the positive outcomes, it is unlikely to lead to subsequent PA.

In a review with healthy adults it was found that perceived exercise enjoyment predicts higher PA levels (King et al., 1992). Furthermore, it has been shown that enjoyment does not only explain whether older adults participate in PA, but it can also influence the type of activity they choose (White, Randsdell, Vener, & Flohr, 2005). Given the importance of enjoyment as a determinant of PA, it is not surprising that many PA interventions are targeting enjoyment and that practitioners constantly aim at identifying strategies to enhance exercise enjoyment. Enjoyment seems to be equally important for older adults with chronic conditions. In a study with individuals with COPD, enjoyment was related with higher levels of PA and was reported as the second most important reason to engage in PA after health benefits (Hartman et al., 2013). Stevens, Lemmink, van Heuvelen, de Jong, and Rispens (2003) proposed that enjoyment mediates the relationship among a few social-cognitive variables (e.g., self-efficacy, social support) and long-term maintenance of PA. Similarly, increasing exercise self-efficacy has been associated with higher levels of enjoyment of PA (Hu, Motl, McAuley, & Konopack, 2007). A better understanding of how enjoyment fits within SCT may be helpful in explaining PA behaviour in older adults. In other words getting an insight on which social-cognitive factors are directly related to enjoyment can inform the design of interventions aiming to increase PA.

**Relationship of Social-Cognitive Constructs and Physical activity**

Previous research has attempted to understand how different social-cognitive determinants influence PA. For instance, in a sample of retired older adults, Resnick (2001b) demonstrated that social-cognitive variables accounted for at least 40% of the variance in PA behaviour with self-efficacy and outcome expectations both directly related to PA. However, in this model, social support and self-regulation were not included. Anderson, Wojcik, Winett, and Williams (2006) examined a different set of social-cognitive variables consisting of social support, self-efficacy, outcome expectations and self-regulation and found that these constructs explained 46% of the variance in PA in a diverse group of adults. Similarly, Schuster, Petosa, and Petosa (1995) tested a social-cognitive model consisting of barriers to exercise, social support to exercise, exercise self-efficacy, benefits of exercise and enjoyment and found that it explains 52.3% of the variance in exercise in post-retirement adults. Because of the large percentage of variance that is explained by these social-cognitive factors, it appears that one possible way to understand PA behaviour in older adults would be to explore the inter-relationships among the different components of SCT. Each component of SCT is somehow related to increased engagement in PA. Thus, including more social-cognitive variables in a model will likely provide more information about what motivates older adults to engage in PA.

SCT (Bandura, 1977) supports that individuals who believe in their ability to engage in a certain behaviour are more likely to expect positive outcomes from PA, perceive less impediments and more facilitators, set more goals and as a result they will be physically active. (for Bandura's model see Figure 1)

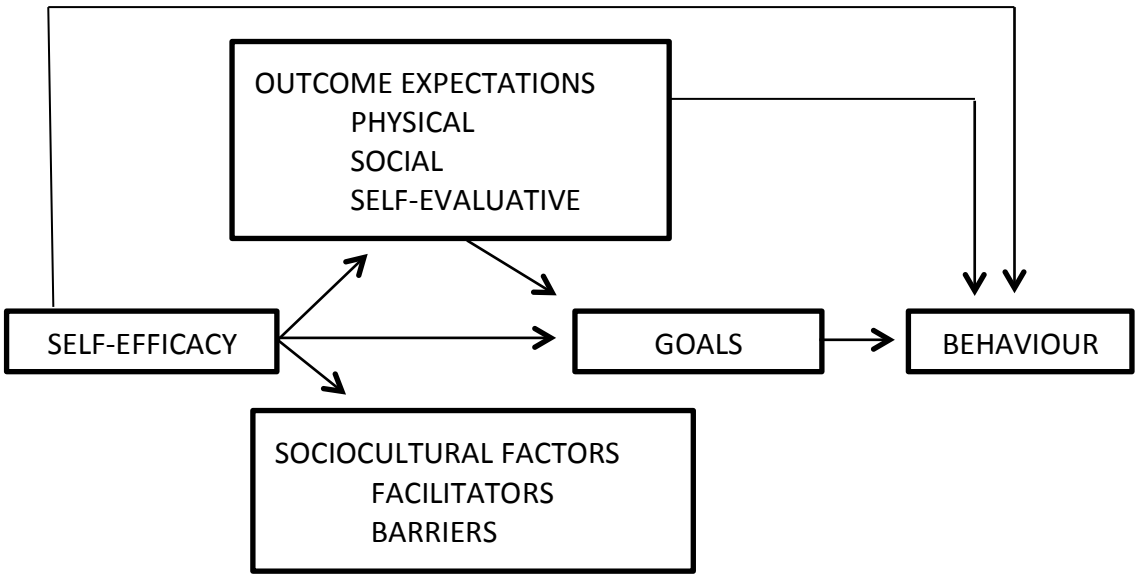


*Figure 1*. Bandura's socio-cognitive causal model

Within the literature, self-efficacy has been shown to be the strongest predictor of PA (White, Wójcicki, & McAuley, 2011), with both direct and indirect relationships found (McAuley & Blissmer, 2000). Self-efficacy expectations can indirectly influence PA through outcome expectations and perceived barriers (White et al., 2011). However, outcome expectations seem to have a small effect on PA (Rovniak et al., 2002). Furthermore, Umstattd, Wilcox, Saunders, Watkins, and Dowda (2008) supported that self-regulation partially mediated the relationship between self-efficacy and PA, with self-regulation as the strongest predictor of PA (Anderson et al., 2006). The above findings highlight the importance of SCT in explaining PA behaviour and indicate that the different social-cognitive constructs are inter-related in a complex way with each other and are associated with increased levels of PA.

One of the most comprehensive studies that has examined the full social cognitive model in relation to PA and has shed light on the inter-relationships among social-cognitive

variables in middle-aged and young-old adults was conducted by Ayotte, Margrett, and Hicks-Patrick (2010; also see Anderson et al., 2006). The relationships proposed by Ayotte et al. (2010) are consistent with the original SCT model developed by Bandura (1997) and presented earlier in this section. Specifically, Ayotte et al. (2010) found that self-efficacy predicted PA directly and indirectly through outcome expectancies, perceived barriers, and self-regulatory behaviour. Furthermore, self-efficacy directly predicted self-regulation. That is, people who believed they could produce desired outcomes by their actions, set exercise related goals and make plans. Self-regulation in turn directly predicted higher levels of PA. Finally social support directly predicted self-efficacy and self-regulatory behaviour. The results from this study are portrayed in Figure 2.

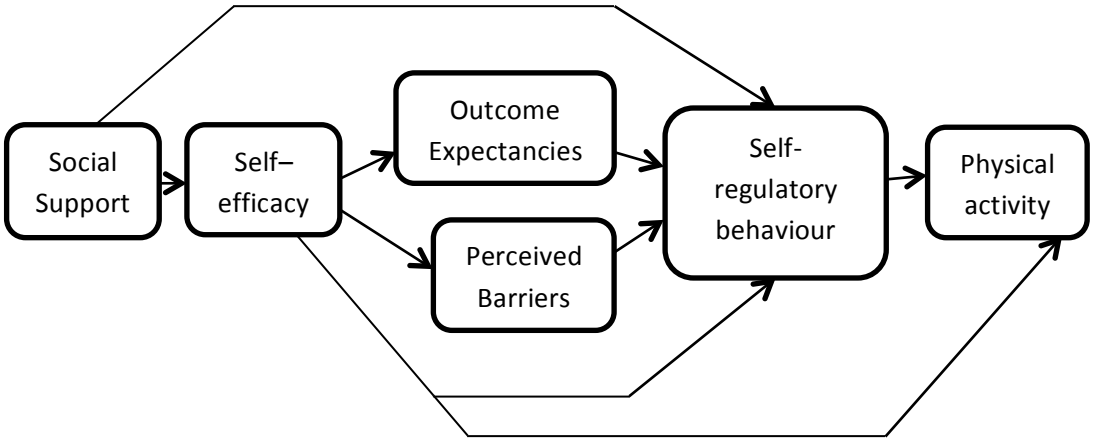


*Figure 2.* Inter-relationships of social-cognitive variables of physical activity reported by Ayotte et al. (2010)

Given that older adults face many challenges related to PA engagement and that these challenges can be even greater during the transition to retirement and especially for certain groups of people such as unhealthy older adults, it would be useful to explore what kind of interventions could address the different social-cognitive components of the model. As a way

to tackle inactivity and help older adults become more active, imagery has been suggested as an effective intervention strategy.

## Imagery

This section focusses on a definition of imagery and its effectiveness in promoting PA. A historical overview of different imagery models and theoretical frameworks is provided and different types of exercise imagery are defined. Finally, the section culminates in an overview of exercise imagery measurements.

Imagery, also known as visualisation, mental practice, or mental rehearsal is an effective technique that has been widely used in a variety of settings (e.g., sport, dance, exercise, rehabilitation) (for a review, see Cumming & Ramsey, 2009; Kossert & Munroe-Chandler, 2007; Taylor & Wilson, 2005; Weinberg, 2008). It is used to replicate an experience from memory or create a new one with aims of enhancing learning and development of certain skills and optimising performance (Simons, 2000). As a widely applied mental technique in sport settings, it is also used by athletes to boost confidence, control arousal and anxiety, and motivate athletes towards achieving goals (Cumming & Williams, 2012).

Although imagery has been proven to be a popular performance enhancement technique for athletes (Weinberg, 2008), it is also an effective tool in exercise settings. Hall (1995) was the first advocate of exercise imagery suggesting that exercisers may be able to see themselves completing a workout, enjoying it, and accomplishing their goals. Imagery can be used as a way to increase or maintain exercise/PA levels (Giacobbi, Hausenblas, Fallon, & Hall, 2003). Gammage, Hall, and Rodgers (2000) proposed that exercise imagery can be an effective strategy to learn certain exercise tasks, feel invigorated and energised, set appearance goals, and overcome exercise barriers. Additional research has demonstrated that

exercise imagery can also be used to achieve a variety of outcomes such as improvements to subjective vitality, physical self-worth, and enhancements to self-confidence and self-efficacy (Ryan & Frederick, 1997). Thus, imagery can lead participants not only to engage in PA more but to also experience positive physiological and psychological states as well (Cumming, Olphin, & Law, 2007). As enhanced psychological wellbeing is associated with regular PA (Hassmen, Koivula, & Uutela, 2000), the positive psychological states induced by imagery can further lead to increased levels of PA and overall a better quality of life. In the section below more information about how imagery can be an effective intervention strategy for the promotion of PA is given.

**Effectiveness of Imagery in Exercise Settings**

Chan and Cameron (2012) conducted a randomised control trial to investigate the effect of imagery on the promotion of PA in adults who do not exercise. The participants attended an imagery session and were randomly assigned to one of the four treatment groups, including a neutral imagery group, which acted as a control group. The researchers found that those who imaged themselves being physically active, becoming their favourable self and achieving their future goals by exercising presented greater intention to become physically active and increased their PA levels. Similarly, Duncan, Hall, Wilson, and Rodgers (2012), demonstrated the effectiveness of imagery in a group of insufficiently active women who internalised PA behaviour at the end of the imagery intervention. In this study, participants were randomly assigned to the task self-efficacy imagery group (imagine conducting the exercises correctly), the coping self-efficacy imagery group (imagine adhering to exercise despite challenges), the scheduling self-efficacy imagery group (imagine scheduling exercise into a week) or the control group (get information about nutrition). The researchers found that imagery had an impact in all groups who practiced imagery. In another randomised

controlled trial by Andersson and Moss (2011), participants ranging in age between 19 and 56 years old were randomly assigned to an intervention group or control group. The intervention group was trained in guided imagery or relaxation imagery and as a result their exercise levels improved significantly at the end of the intervention. These findings agree with other research that has shown that exercise imagery is significantly correlated to level of PA and can be useful in promoting PA in insufficiently active or sedentary individuals (Cumming, 2008; Kok, Omar-Fauzee, & Rosli, 2010). The above studies were chosen based on their methodological strengths (e.g., inclusion of control group), which provide more certainty about the effectiveness of imagery interventions. For instance, in the study by Cumming (2008), imagery ability was assessed and seemed to have an effect on the relationship between imagery and exercise behaviour.

A proposed mechanism by which imagery leads to higher levels of PA is self-efficacy (Hall, 1995). Hall (1995) was one of the first advocates of exercise imagery by suggesting that it can boost self-confidence by acting as a source of performance accomplishment and providing individuals a sense that they can be successful (Williams & Cumming, 2012). Thus imagery can enhance one's belief in the ability to exercise and this can in turn lead to higher levels of PA (Cumming, 2008; Luszczynska & Schwarzer, 2005; McAuley & Blissmer, 2000). Duncan et al. (2011) indicated that imagery could have an impact on all types of self-efficacy, which further supports the idea that imagery can act as a source of self-efficacy (Bandura, 1997). Overall, these results suggest the importance of encouraging older adults to imagine themselves feeling confident in their ability to exercise.

**Development of Imagery**

After gaining an understanding of how useful imagery can be in exercise settings and how it impacts on self-efficacy beliefs, it would be worthwhile to turn our attention to how

exercise imagery has evolved as a concept since Hall's seminal paper in 1995. This section gives an overview of the different imagery models that were created to explain the reasons why imagery is employed. Some of these models were designed with the aim to be used in a sport setting while others were designed for exercise settings. In spite of sharing some similarities, each model is unique and focusses on different imagery components (see Table 2).

Table 2. *Historical Overview of Imagery Development*

| **Date** | **Model** | **Characteristics-Components of the model** | **By who** |
|---|---|---|---|
| 1985 | 2 x 2 model | 4 imagery functions<br>• Cognitive specific (CS)<br>• Cognitive general (CG)<br>• Motivational specific (MS)<br>• Motivational general (MG) | Paivio |
| 1995 | A model of participation motivation for exercise | Imagery can influence exercise through:<br>• Self-confidence<br>• Outcome expectancy | Hall |
| 1998 | Development of Sport Imagery Questionnaire | • Extension of Paivio's 2 x 2 model<br>• 5 imagery functions<br>• Motivational general function divided into motivational general arousal (MG-A) & the motivational general mastery (MG-M) | Hall, Mack, Paivio, and Hausenblas |
| 1999 | Applied model of imagery use in sport | • Situation (Where & When)<br>• Function (Why)<br>• Imagery ability<br>• Outcome | Martin, Moritz, and Hall |
| 2005 | Applied model of imagery use in exercise | • Antecedents<br>• Imagery functions<br>• Outcomes<br>• Efficacy beliefs<br>• Moderating factors | Munroe-Chandler and Gammage |
| 2012 | Revised applied model of deliberate imagery use | • Extension of Martin's et al. (1999) model<br>• Deliberate imagery<br>• Applied to exercise settings as well | Cumming and Williams |

- Who (Personal meaning)
- Content (What)

≠

Function (Why)

**The 2 x 2 framework**. The 2 x 2 conceptual framework of imagery developed by Paivio (1985) as the first to introduce the notion that imagery serves both cognitive and motivational functions, and each can operate in specific and general levels. Thus, imagery can be divided in cognitive specific (CS), which involves imaging to improve certain skills, cognitive general (CG), which involves improving strategies, techniques and routines, motivational specific (MS), which involves imaging to achieve goals, and motivational general (MG). Hall, Mack, Paivio, and Hausenblas (1998) further divided the MG function into motivational general arousal (MG-A), which involves imaging to regulate emotions such as reducing tension and stress, and the motivational general mastery (MG-M), which involves imaging to boost confidence (See Figure 3).

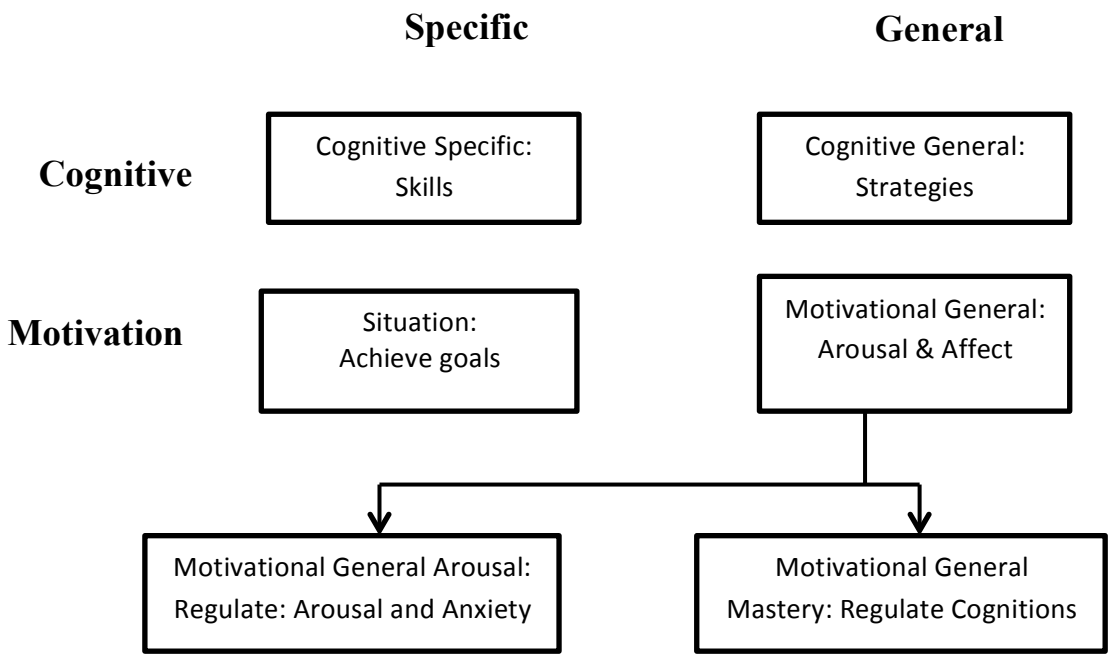


*Figure 3*. Paivio's 2 x 2 framework

**Hall's model of participation motivation for exercise.** Hall's (1995) model was the first imagery model to explain exercise participation. This model was based on Bandura's SCT (1986) and underpins much of the current thesis. It proposes that imagery can increase self-efficacy beliefs and boost positive outcome expectations, which can in turn promote exercise activity levels. In other words, exercisers who imagine themselves performing in a desired way in an exercise setting, managing their anxiety levels, and achieving desired fitness outcomes are more likely to become self-confident and to believe they can achieve all the desired outcomes (see Figure 4).

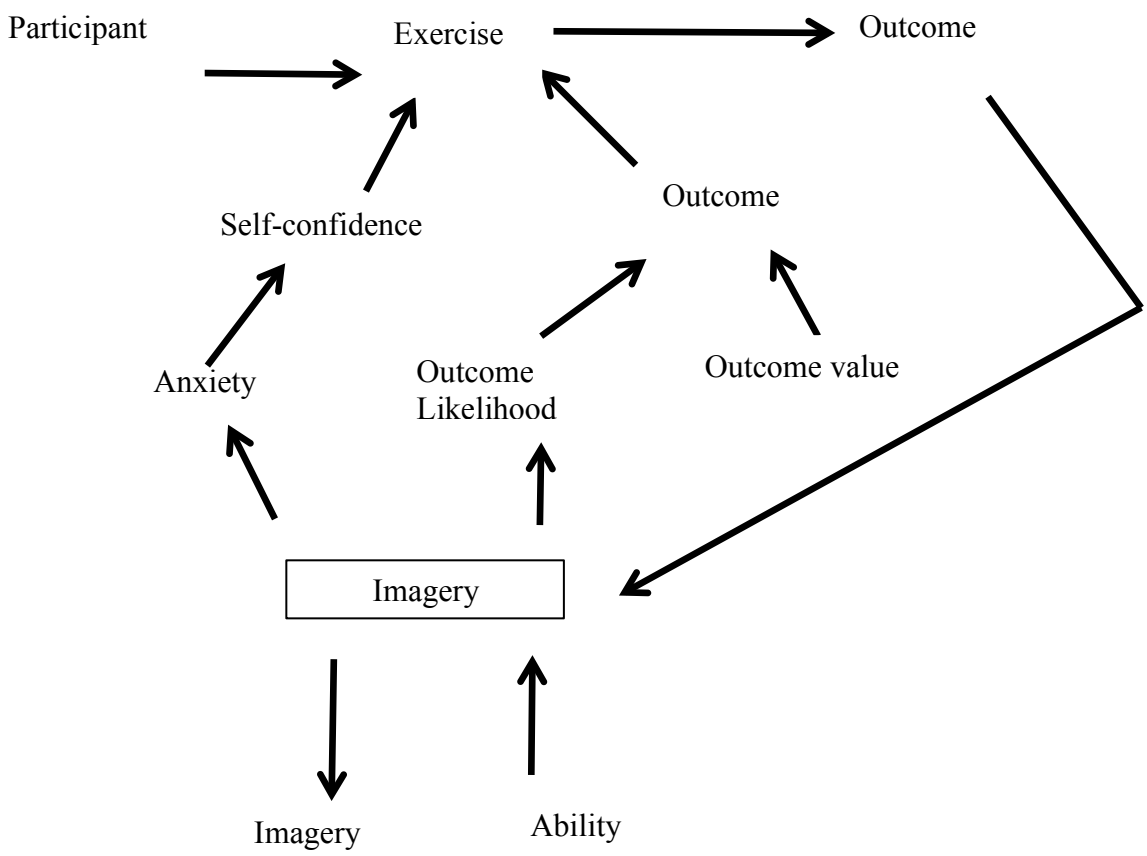


*Figure 4*. Hall's (1995) imagery model for participation in exercise

**Applied model of imagery**. Martin, Moritz, and Hall (1999) focussed on the application of imagery in sport settings and suggested a theoretical model that has been used to guide research and practice, named the applied model of imagery use. This model recognises the importance of the specific situation ("where" and "when") and supports that, imagery can be used in a variety of times and places, with the most effective imagery taking place in the actual environment of the behaviour (Cumming & Williams, 2012; Nordin & Cumming, 2005). The model also refers to "why" individuals use imagery and supports that individuals use the most appropriate type of imagery (CS, CG, MS, MG-A, and MG-M) to achieve a certain outcome. That is, what is being imaged (content) should match the reason why the image is employed (function). Thus, content and function coincide (Martin et al., 1999). Finally, another important component of the applied model of imagery is imagery ability, which is supported to influence the outcome of imagery. Imagery ability is related to the vividness of the image, the controllability, the ease to form the image, the duration and the accuracy of the image (Martin, Moritz, & Hall, 1999). As imagery ability is not among the components explored in any of the studies that form this PhD, it is not going to be further analysed (for a review see Williams & Cumming, 2012). Figure 5 below outlines the different components of the applied model and how they relate to each other.

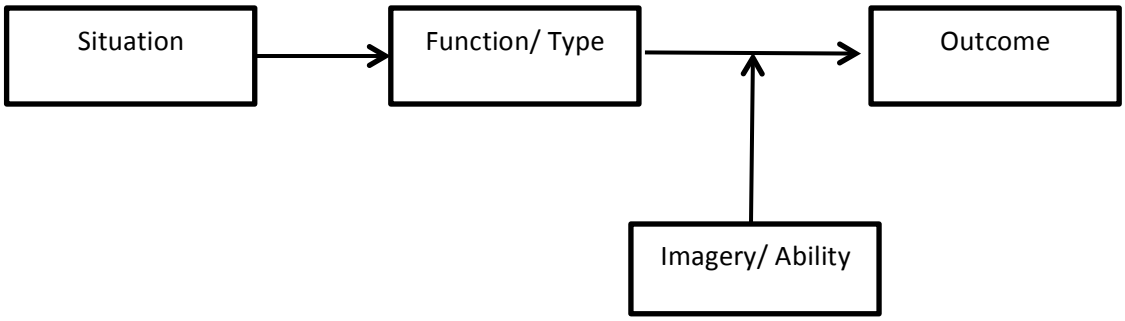


*Figure 5*. Martin et al. applied model of imagery use

**Applied model of imagery use in exercise.** This model was proposed by Munroe-Chandler and Gammage (2005), and is based on the original applied model by Martin et al. (1999) for use within an exercise setting. This model similarly proposes that the type of imagery used will impact specific affective, cognitive and behavioural outcomes. Specific relationships among its five components (the antecedents, the five functions of imagery, the outcomes of imagery, the efficacy beliefs, and other moderating factors) are hypothesised. The antecedents refer to the factors that precede imagery and can influence the reasons why exercisers use it. For instance, the location where imagery takes place, the level of exercise, the goals and motivation of the exerciser can all influence the imagery functions. Consistent with Hall's (1995) imagery model for exercise, Munroe-Chandler and Gammage (2005) supported that self-efficacy beliefs along with outcome expectations can have an impact on cognitions and behaviours. Some of the moderating factors that might affect the outcomes of imagery refer to gender, activity type, exercise frequency, imagery ability, age, physical health status, and personality. In the present thesis, of particular importance is the exercise frequency of older adults. As Munroe-Chandler and Gammage (2005) have pointed out, sedentary individuals might use imagery for different reasons compared to frequent exercisers.

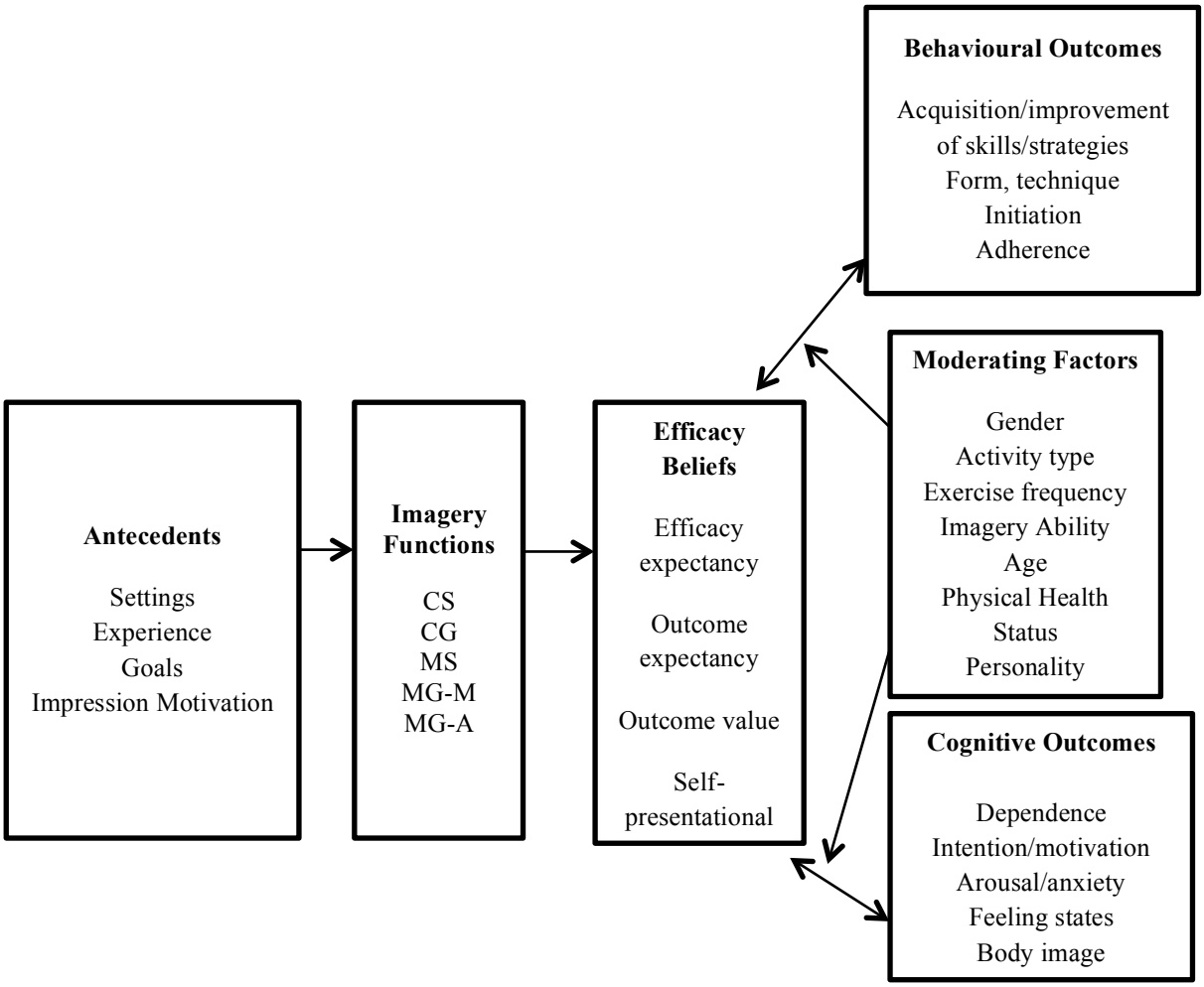


*Figure 6*. Munroe-Chandler & Gammage (2005) applied model of imagery use in exercise

**Revised applied model of deliberate imagery use**. The revised model (RAMDIU; Cumming & Williams, 2012, 2013) is one of the most comprehensive models to date and is useful in predicting the outcome of imagery based on the relationships among its constructs. RAMDIU is based on Martin et al.'s (1999) applied model of imagery use, but also accounts for some additional factors that might affect the outcome of imagery. RAMDIU retains the concepts of "where", "when" and "why" individuals use imagery, it has been expanded by adding "who", "what" and "how" components. Furthermore, the revised model refers to

deliberate imagery use and is applicable to a wider audience including athletes, dancers, and exercisers. An explanation of the relevant components of RAMDIU to the present thesis follows below.

***What.*** The "what" component of the model refers to the content of images. Previous research has shown that there are many different types of exercise imagery. However, the majority of research has been conducted with younger exercisers and has focussed on three distinct types of exercise imagery: 1) appearance imagery, which focuses on physical outcomes of exercise such as a lean, fit, and healthy body; 2) energy imagery, which focuses on feelings of increased energy and relief from stress; and 3) technique imagery, which focuses on the performance of correct exercise movements (Hausenblas, Hall, Rodgers, & Munroe, 1999). Appearance and energy imagery are considered to serve motivational functions, while technique imagery serves a cognitive function. From these three types of imagery, appearance imagery is used the most, followed by technique imagery and energy imagery (Gammage et al., 2000; Hausenblas et al., 1999).

More recent research suggests that exercisers use additional types of images to motivate themselves to exercise (Thøgersen-Ntoumani, Cumming, Ntoumanis, & Nikitaras, 2012). Kim and Giacobbi (2009) indicated that middle-aged exercisers might imagine health outcomes, plan/strategy images, stress level/emotion images, and confidence enhancing images. Another recently identified type of imagery that has been previously used as a strategy to promote PA is enjoyment imagery, which refers to images of enjoying the workout, and has been demonstrated to have a positive impact on affect (Stanley & Cumming, 2010a; Stanley, Cumming, Standage, & Duda, 2012). Despite the already known types of imagery, to date there is a need to get an insight into the imagery use of older adults as it has

not been previously explored whether they use the same types of imagery as their young counterparts.

***The relationship between what & why individuals image.*** One of the most unique elements of the revised model is the concept of personal meaning of the imagery experience. Different individuals can attach different meaning to the same image and use it for different purposes. This idea suggests that the "who" component of the model may interact with the "what" and "why" components. It is possible that the imagery content does not reflect a specific function but a combination of functions. Thus, "what" is imaged does not always correspond to the "why". For instance, imaging yourself executing a skill, can serve two functions; to improve the skill and to boost confidence. Similarly, "why" an individual is using imagery does not necessarily associate with a specific type of imagery content. For instance, if the aim is to achieve a certain outcome such as improving a technique, a variety of imagery types can be used. When designing imagery interventions, it is important to personalise them by identifying content that is meaningful for the individuals. To achieve this purpose, the function(s) of imagery should be identified first before determining what content will effectively serve this function (or functions) (Cumming & Williams, 2012).

***Who.*** The "who" component refers to the personal characteristics of the individual that are antecedents to the imagery process. For instance, age, gender, experience, personality, and imagery ability can define the types of images used and the reasons why imagery is employed. Of particular interest is the research on the impact of age on imagery use. Research indicates that imagery ability declines with age (Campos, Pérez-Fabello & Gómez-Juncal, 2004). Older adults seem to spend more time to generate, maintain, scan, and rotate mental images while they experience less vivid movement imagery compared to younger individuals (Craik & Dirkx, 1992; Isaac & Marks, 1994; Kemps & Newson, 2005).

Furthermore, Mulder, Hochstenbach, Van Heuvelen, and Den Otter (2007) found that older people presented a greater ability to image movements when they imaged through somebody else's eyes (third person perspective). These results suggest that in order for imagery interventions to be more effective, it is important to account for how older adults image, their ability to generate images, and their preferred visual perspective and agency of the image. Figure 7 below outlines the different components and how they relate to each other.

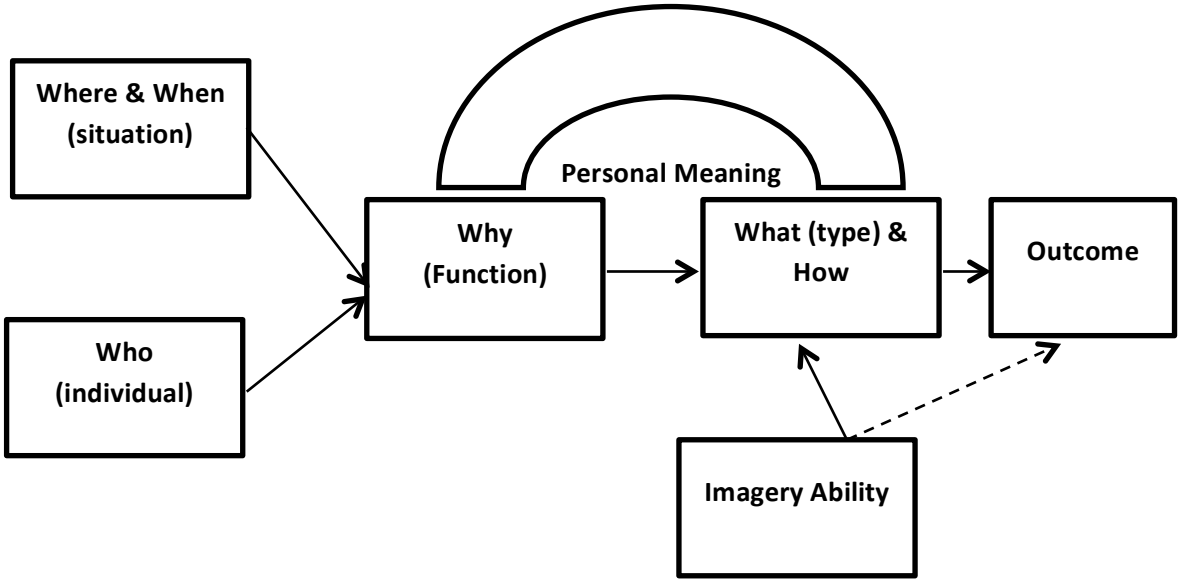


*Figure 7*. Revised applied model of deliberate imagery use by Cumming and Williams (2012)

**Measurement of Exercise Imagery (Qualitative vs Quantitative Approaches)**

The majority of past exercise imagery research has relied on questionnaires to assess imagery use (Gammage, Hall, & Ginis, 2004). Exercise imagery was originally measured by the Exercise Imagery Questionnaire-Aerobic Version (EIQ-AV; Hausenblas, Hall, Rodgers, & Munroe, 1999) and consists of two motivational subscales (appearance & energy) and one cognitive subscale (technique). This questionnaire was reduced from a 23-item to 9-item scale and re-named the Exercise Imagery Questionnaire (EIQ; Hausenblas et al., 1999), to

reflect its applicability to a broader population and not just aerobic exercisers. Due to the fact that the scope of this questionnaire was restricted to only three types of images, a new questionnaire was then developed to capture additional types of images including self-efficacy, fitness, and health. Referred to as the Exercise Imagery Inventory (EII), this measure is composed of 19 items representing four subscales: appearance/healthy imagery, technique, self-efficacy, and feelings imagery (Giacobbi, Hausenblas, & Penfield, 2005). Giacobbi et al. (2005) later included 3 further items to create a subscale representing routine imagery, referred to as the Exercise Imagery Inventory-Revised or EII-R. More recently, Stanley and Cumming (2010b) reported that it is not unusual for regular exercisers to experience images of enjoying their workout. Thus, the authors developed a 3-item subscale to measure enjoyment imagery that can be used with the EIQ or EII-R (see Table 3 for a description of exercise imagery measures).

Table 3

*Development of Exercise Imagery Questionnaires*

| **Author** | **Imagery Measure** | | **Revised Imagery Measure** | |
|---|---|---|---|---|
| Hausenblas, Hall, Rodgers, & Munroe, 1999 | Exercise Imagery Questionnaire-Aerobic Version (EIQ-AV)<br>23 items | **Imagery Functions**<br>1. Appearance<br>2. Energy<br>3. Technique | Exercise Imagery Questionnaire (EIQ)<br>9 items | **Imagery Functions**<br>1. Appearance<br>2. Energy<br>3. Technique |
| Giacobbi, Hausenblas, & Penfield, 2005 | Exercise Imagery Inventory (EII)<br>19 items | **Imagery Functions**<br>1. Appearance /health<br>2. Technique<br>3. Self-efficacy<br>4. Feelings | Exercise Imagery Inventory-Revised (EII-R)<br>22 items | **Imagery Functions**<br>1. Appearance-health<br>2. Technique<br>3. Self-efficacy<br>4. Feelings<br>5. Routines |
| Stanley & Cumming, 2010 | Enjoyment Imagery | 1. Enjoyment | | |

Despite the recent developments and the expansion of exercise imagery as a construct, existing exercise imagery questionnaires do not seem to measure all the types of images exercisers engage in. Qualitative research, as a more in-depth approach, is an appropriate way to reveal some unique types of images. To date, qualitative research with exercisers is scarce (Giacobbi et al., 2003) and primarily focusses on female young exercisers (Hausenblas et al., 1999). Kim and Giacobbi (2009) were the first to qualitatively examine the imagery use in a group of middle-aged adults. Due to the lack of in-depth descriptions of exercise imagery in older adults and the need to get more a comprehensive understanding about the use of imagery in exercise settings, the present thesis will focus on older adults between 50-80 years old (for a review of the existing qualitative research see Table 4).

Table 4

*Qualitative Research in Exercise Imagery*

| Author | Qualitative methods | Methods | Population studied |
|---|---|---|---|
| Hausenblas, Hall, Rodgers, & Munroe (1999). | Responses organised into categories- labelled- count total responses in each category | Open-ended approach (3 questions) | Female college students (M age = 23) |
| Giacobbi, Hausenblas, Fallon, & Hall (2003) | Grounded Theory | Semi-structured interviews | Female adults between 18-39 years |
| Kim & Giacobbi (2009) | Grounded theory | Interviews | Middle-aged adults 35-65 years |

## Summary and Rationale for Research

Despite previous scientific evidence supporting the beneficial effects of engaging in PA, there is still a large proportion of older adults who are insufficiently active. These percentages are even lower for people with chronic diseases, including people with COPD. In

an attempt to enhance exercise adherence in older adults, the majority of past research has put a great emphasis on understanding why some individuals are physically active while others are not. Despite the extensive literature review on the barriers and enablers of PA in older adults, there is very little information regarding the factors that influence the perceptions of PA in older adults. For instance, what is it about the transition to retirement that prevents older adults from being physically active? Are there any unique characteristics about this population that differentiates them from older adults in general? These were all questions that were addressed in the present thesis. Similarly, an interesting question that this thesis tried to respond to is whether healthy older adults differ from older adults with chronic conditions in the barriers and enablers they perceive? Because of the benefits associated with engagement in PA in individuals with COPD, exploring how the COPD symptoms interfere with PA would be helpful. In the literature, there are several theoretical frameworks and models that try to explain the PA behaviour in healthy and unhealthy older adults. One of the most popular frameworks is Bandura's SCT, which has been used to explain how social and cognitive factors interact, and lead to PA behaviour. However, SCT has not been used in the context of older adults to explain the barriers they face.

Based on the low PA levels in healthy and unhealthy older adults, it seems that there is need for interventions. An innovative intervention that could improve log-term exercise adherence in older adults is imagery. Despite the fact that the past 20 years the exercise imagery research has developed quite a lot, it has mainly focussed on the use of questionnaires while qualitative research is scarce. There are only three qualitative studies on exercise imagery use (Hausenblas et al., 1999; Giacobbi et al., 2003; Kim & Giacobbi, 2009). What is even more surprising is the fact that qualitative research has mainly focussed on younger adults with little reference to how these findings can be applied to older adults.

Thus, a major aim of the present research was to get a more complete picture of exercise imagery in older adults and determine if imagery is used for different purposes in this population compared to younger people. This knowledge will inform the development of effective imagery interventions with content appropriate for older adults to enhance PA engagement in this population.

## Outline of Research Programme

The overall aim of this thesis was to examine the inactivity problem in healthy and unhealthy older adults under a social-cognitive perspective and the unique factors that are associated with low levels of PA in certain groups of older adults. A second major aim was to explore whether imagery could be used as a potential intervention strategy to increase the PA levels in this population. This research may have significant public health implications, as it will give us a broad understanding of what the targets of future interventions should be and it will also serve as a source of how to improve the content of imagery interventions. The specific aims of the thesis are listed below and were addressed through the four empirical chapters,

a. The first aim of this thesis was to examine the perceptions of PA in healthy (Chapter 2) and unhealthy (Chapter 3) older adults and determine their specific barriers and enablers to their engagement in PA. To get more in depth information about the nature of the barriers and enablers in healthy and unhealthy older adults, focus groups were conducted.
b. A secondary aim of this thesis was to examine how different contextual factors (transition to retirement, PA level, prevalence of disease) can influence the perceptions of older adults in regards to PA (Chapters 2 and 3). Specifically, one of the novel

aspects of the thesis and a major aim of Chapter 2 was to examine how individuals from different stages in retirement and different PA levels experience PA. Another goal was to explore whether COPD relates to PA involvement and describe the barriers and enablers individuals with COPD face (Chapter 3).

c. A third aim was to describe the imagery use in healthy older adults by exploring some of the main components of the RAMDIU model within this population and how they interact with each other (Chapter 4). For this purpose, older adults will participate in focus groups to provide information on the content and function of the images they use as well as where, when, and how they image in relation to PA.
d. The final aim of this thesis was to examine how imagery relates to PA through social-cognitive variables and enjoyment (Chapter 5). Specifically, the aim was to investigate whether imagery relates to higher PA by increasing self-efficacy, outcome expectations, self-regulatory behaviour and enjoyment while reducing perceived barriers.

The empirical thesis chapters are presented mostly in the same format as would be expected for publication (i.e., a journal article style thesis) with two exceptions. Firstly, to simplify, tables and figures have been inserted into the text of each chapter. Finally, the references for every chapter have been presented in a single list following Chapter 5. It must be pointed out the same data were simultaneously collected for the studies in Chapter 2 and 4, and this overlap is presented in Figure 8 below. Specifically, the focus groups with healthy older adults were conducted once and the findings contributed to Chapters 2 and 4. However, the same data were not presented more than once.

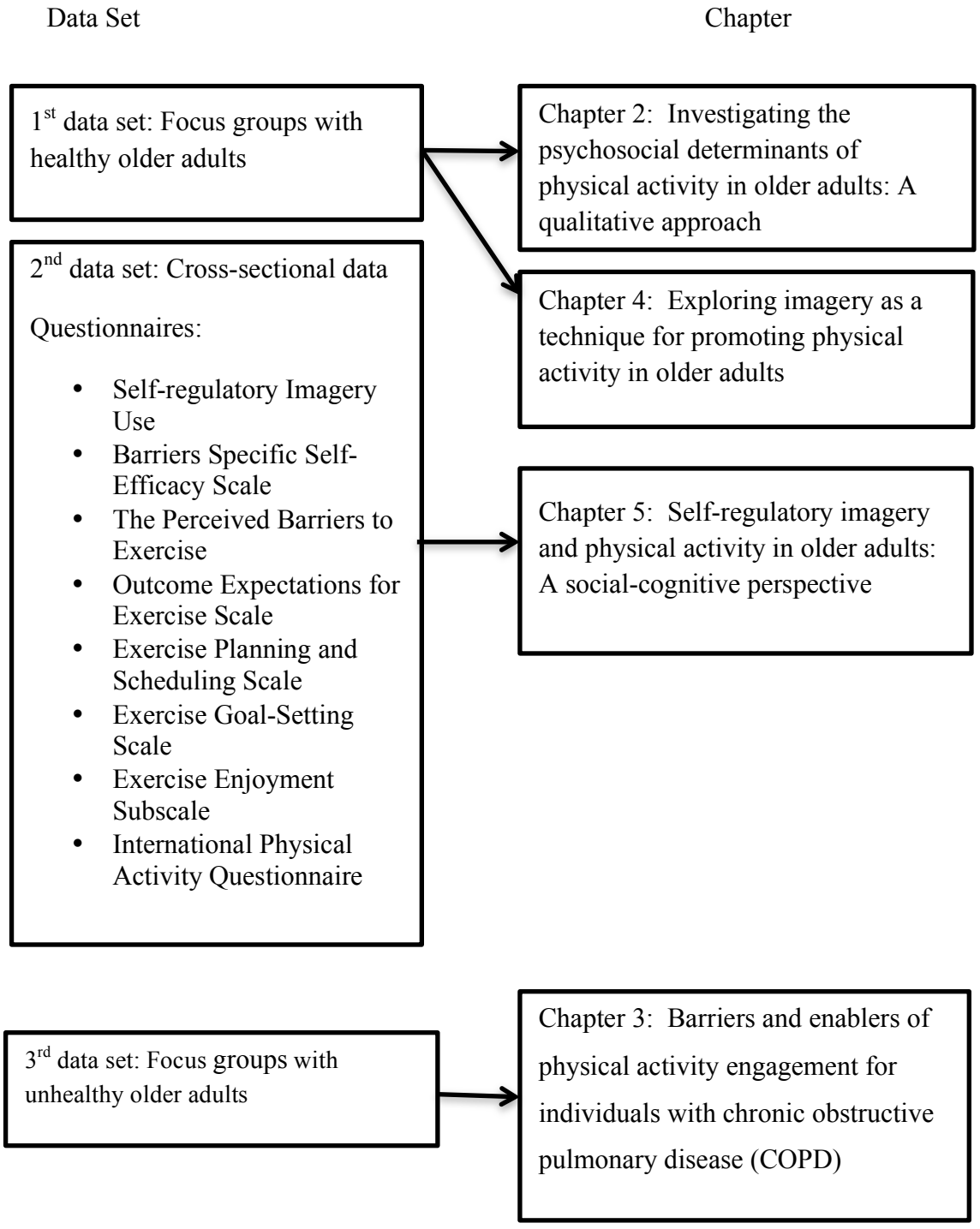


*Figure 8*. The overlap between data sets and empirical chapters

# Chapter 2

## Investigating the Psychosocial Determinants of Physical Activity in Older Adults: A Qualitative Approach

This chapter has been accepted published under the following reference:
Kosteli, M. C., Williams, S. E., & Cumming, J. (2016). Investigating the psychosocial determinants of physical activity in older adults: A qualitative approach. *Journal of Psychology and Health.* doi: 10.1080/08870446.2016.1143943

# Investigating the Psychosocial Determinants of Physical Activity in Older Adults: A Qualitative Approach

Physical activity (PA) contributes to healthy ageing through prevention of chronic age associated illnesses and disabilities (Peel, McClure, & Bartlett, 2005). The biological and psychological benefits of PA include, but are not limited to, reduced risk of cardiovascular disease, hypertension, osteoporosis, and depression (Taylor et al., 2004). Despite the many benefits, the majority of older adults do not engage in regular PA or exercise (Prohaska et al., 2006). The Department of Health (2013) recommends that older adults participate in moderate PA for at least 150 minutes a week, but only 58% of men and 52% of women between 65-74 years achieve these guidelines. Percentages can be even lower in times of transition such as retirement (Laverty & Flint, 2014), making this a particularly important stage of life to investigate.

Retirement can be experienced either as a beginning of a new phase in life or as an imposed disruption of life patterns (Hornstein & Wapner, 1985). Because of the numerous changes associated with this transition (e.g., decreased income, reduced social contact, loss of daily routine), retirement can be important in determining PA behaviour. Despite retired individuals seemingly having more free time to incorporate PA into their lives, a systematic review of 19 quantitative studies and 5 qualitative studies indicated that while recreational PA can increase, overall PA generally decreases following retirement (Barnett, Ogilvie, & Guell, 2011). However, there is still equivocal evidence for the impact of retirement on overall PA levels (Barnett, van Sluijs, & Ogilvie, 2012). Factors thought to influence lower PA during retirement include loss of daily structure, lack of exercise partners, adjustment to retirement patterns, and financial constraints (McDonald, O'Brien, White, & Sniehotta, 2015).

In the process of understanding the PA behaviour of individuals entering retirement, the relevant psychosocial factors must also be determined. Social cognitive theory (SCT; Bandura, 1997) has been shown to explain 52% of exercise behaviour in post-retired individuals (Schuster, Petosa, & Petosa, 1995). The theory refers to the societal influences on human thought and behaviour, and the subsequent impact of these thoughts on one's motivation, attitudes, and action (Stajkovic & Luthans, 1998). SCT proposes a set of psychosocial constructs (i.e., self-efficacy, outcome expectations, barriers, and self-regulatory strategies) that determine health behaviours such as PA.

A major premise of SCT is that belief in one's ability to successfully perform the desired behaviour (i.e., self-efficacy) is a primary determinant of the adoption of PA (Bandura, 1997), particularly in older adults (Conn, 1998). Of the different types of self-efficacy (e.g., task efficacy), the majority of older adult PA research (e.g., McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003) has focussed on barrier efficacy (i.e., belief in one's capability to engage in PA under challenging conditions such as bad weather and boredom; Bandura, 1997). Irrespective of self-efficacy type, individuals with higher self-efficacy are more likely to engage in the PA behaviour, put forth more effort, and persist in the face of difficulties (Bandura, 1986). Therefore, it is a key construct to target when developing PA interventions.

The second important variable in SCT is outcome expectations, defined as "the perception that a certain behaviour will bring out specific outcomes" (Bandura, 1977, p.193). Individuals are more likely to engage in PA when they perceive these efforts will lead to important positive outcomes such as better health (Resnick, 2001a). People who expect positive health benefits as a result of PA are more likely to set goals and plans related to PA (Ayotte, Margarett, & Hicks-Patrick, 2010). However, it is also important to account for the

degree to which these outcome expectations are met over time (Wilcox, Castro, & King, 2006).

Regardless of an individual's beliefs in the benefits of PA, real and perceived barriers to PA can determine whether or not individuals engage in PA (Bandura, 1997). Barriers can be internal (e.g., lack of motivation) or external (e.g., adverse weather conditions). Health concerns are one of the most frequently reported barriers to exercise in older adults (Crombie et al., 2004), and the more perceived barriers to PA for an individual, the less likely they are to regulate their behaviour to engage in PA (Ayotte et al., 2010).

Self-regulation strategies enable individuals to cope with perceived barriers to PA and include goal setting, planning, problem solving, and self-monitoring (Bandura, 1997). Self-regulation is among the most influential social-cognitive variables for changing health behaviour because it guides behaviour towards a directed aim or goal (Anderson, Wojcik, Winett, & Williams, 2006). Thus, it can play a key role in the adoption of PA in older adults with more frequent use of self-regulatory strategies relating to greater self-efficacy and PA engagement (Umstattd, Wilcox, Saunders, Watkins, & Dowda, 2008). SCT proposes that self-efficacy acts through self-regulation to influence behaviour (Bandura, 1986). Indeed, previous research with older adults indicates that self-regulation mediates the relationship between self-efficacy and PA (Umstattd et al., 2008). However, few studies have examined the role of self-regulation strategies in helping adults to be physically active post-retirement. Better understanding of the relationship between self-regulation and other SCT constructs may prove helpful in explaining PA behaviour in older adults.

Despite the aforementioned associations between SCT constructs, these relationships are far from simple and the different constructs can interact in complex ways. Ayotte et al. (2010) examined several predictions of SCT with older adults and found that higher self-

efficacy both directly and indirectly related to greater PA through fewer perceived barriers, more positive outcome expectancies, and higher self-regulatory behaviour. These findings demonstrate the importance of including all these constructs to more fully understand the PA patterns of older adults.

Most studies investigating how SCT relates to the PA patterns of older adults have used a quantitative approach. To gain a more complete picture, a qualitative approach would further our understanding of how social-cognitive factors act to promote and impede PA in retirement. Understanding how older adults experience retirement, and perceive PA, may shed light on the reasons behind variations in post-retirement activity levels. This understanding could then inform the development of theory-based interventions to help older adults overcome the barriers associated with PA.

Using focus groups, the purpose of the present study was to gain a more in-depth understanding of the reasons and motives for why some retired individuals are sufficiently active whereas others are insufficiently active. To date, only six qualitative studies have examined PA in retirement (for a review, see Barnett et al., 2011; also see McDonald et al., 2015). Unlike these previous qualitative studies, the present one was guided by SCT. To gain a range of perspectives, another novel aspect of the study was the inclusion of both pre-retired and retired individuals of varying lengths who also varied in their physical activity behaviour.

## Method

### Participants

Thirty-seven (male = 20) older adults from West Midlands, UK between 54 and 79 years old ($M$ = 64, $SD$ = 5.20) were invited to participate in focus groups stratified by self-reported levels of PA and retirement length. Twenty-six participants reported engaging in

moderate/vigorous PA for more than 2.5 hours per week while 11 reported being insufficiently active due to engaging in less than 2.5 hours of PA per week (Department of Health, 2013). Eighteen participants reported retiring between 2-5 years ago, six retired more than 10 years ago, and thirteen either planned to retire within the next two to three years or were within their first year of retirement. Most participants ($n$ = 36) were of white British origin, and one was of mixed origin.

**Procedure**

Following ethical approval, participants were recruited from the local community through flyers and were invited to participate in one of seven focus groups. Purposeful sampling was used to recruit individuals varying in PA levels and retirement length to allow for a range of different perspectives to emerge in the discussions. Sampling reached completion when data saturation was achieved (Francis et al., 2010). Thus, the participants were classified in one of the following distinct focus groups: active and 1$^{st}$ year retired, insufficiently active and 1$^{st}$ year retired, active and retired for 2-5 years, insufficiently active and retired for 2-5 years, active and retired for longer than 10 years. These relatively homogenous focus groups were formed with the aim of providing a trusting environment composed of "similar others". Such an environment would allow opinions to unfold freely through the interaction of participants with similar characteristics. As explained by Smithson (2000), the interactive nature of the focus groups is a major benefit of qualitative research. Focus groups ranged in size from 3 to 6 individuals. The primary author served as the focus group moderator and led the discussion while an observer took notes and kept track of the time. Each discussion was audio recorded and lasted between 48 to 89 minutes.

Participants were informed about the purpose of the study and how confidentiality would be maintained. They then provided written consent by completing a consent form

(Appendix 2) and provided their age, gender, employment status, ethnicity, and PA level (Appendix 3). Participants were then informed about the format of the group discussion and asked to introduce themselves and tell a little about themselves such as when they retired, and the way they travelled to the university. These introductory questions were used to establish trust and rapport with the participants (Stewart & Shamdasani, 2014).

**Interview Guide**

Focus groups followed a semi-structured interview guide, initially pilot tested with a group of researchers experienced in qualitative and/or older adult research. The interview guide included open-ended questions, drawn from social cognitive theory, related to participants' perceptions about PA. Questions included the benefits, thoughts and feelings, barriers, and enablers of PA, and participant's confidence they will become or remain active after retirement (Appendix 4). Questions were adapted to be relevant for the different PA levels and retirement length focus groups. As participants shared their experiences, probes were used to retrieve more in-depth information about their thoughts and feelings.

**Analysis**

Focus groups were transcribed verbatim resulting in 340 pages of double-spaced transcripts. Data was analysed using thematic analysis (Frith & Gleeson, 2004) aligned to the critical realist and post-positivist standards of rigor, which recognises that the accounts from participants are subjective and represent their own lived 'reality', holding a personal meaning for them, influenced by sociocultural factors (Willig, 1999). Although research bias is difficult to avoid, an effort is made to approach the truth by being critical of knowing the reality with certainty and by accepting multiple fallible perspectives (Groff, 2004). Based on the recommendations of Braun and Clarke (2006), the following steps were followed during the thematic analysis: (1) data familiarisation; (2) initial coding; (3) sort codes into themes;

(4) refine themes; (5) define and label the themes; (6) devil's advocate meeting; and (7) thematic structure finalised.

Initial codes were generated with an open coding process (Strauss & Corbin, 2008). An inductive analysis allowed for exploration of unanticipated findings not accounted for in previous research, which might not have otherwise emerged using a deductive approach to examine the data within SCT (Braun & Clarke 2006). The themes were reviewed and further organised in hierarchical structures called categories (Strauss & Corbin, 2008). Data were reanalysed with a deductive approach to determine the utility of SCT to explain PA pre- and post-retirement. This ensured a better understanding of the emergent themes based on SCT and checked if any themes could be generalised (Burns & Grove 2005). Second, comparisons were made between the inductively derived data and deductively created categories. Themes emerging inductively that did not fit the social-cognitive framework were retained if they were considered to be important to the description of the phenomenon.

**Issues of Trustworthiness**

To establish an accurate, valid, and reliable representation of the participants' PA perceptions, several procedures were followed. First, the authors had regular meetings to discuss the findings throughout the data analysis. During the initial stages multiple coders compared codes and reached an agreement. In later stages, the interpretation of findings was compared among the researchers until a consensus was reached. This was to challenge the interpretation of the overall findings and serve as a method of triangulation of evidence by multiple investigators (Creswell & Miller, 2000). Second, the higher-order themes were presented to a group of researchers unaffiliated with the present study. In these meetings, a 'devil's advocate' approach was followed (MacDougall & Baum, 1997). Random quotes

representing each higher-ordered theme were presented to the group and agreement among the members was established.

Thick description (Tracy, 2010) also established trustworthiness. This included providing a very detailed description of the participants, environment, and specific situation. A better understanding of the context enables readers to make judgments regarding the applicability of the findings. Researcher reflexivity was another strategy used to ensure credibility and allowed the researchers to express their beliefs and biases (Thomas & Magilvy, 2011). For this purpose a self-reflective journal was kept where the primary researcher expressed her feelings, biases, and assumptions she made during this research. Discussions with the other authors made sure that the researchers' assumptions were not reflected in the interpretations. Finally, extensive quotes from the participants were included in the results section as a way to let readers judge the accuracy of the authors' conclusions.

## Results

Participants were offered a broad definition of PA, which allowed for a wide range of perceptions of PA to emerge. Specifically, PA was defined as any structured activity with the goal of fitness and health but it also involves other lifestyle activities. Some participants associated PA with playing sports or going to the gym, whereas others referred to walking, gardening, and housework. Thus, the personal meaning of PA varied and influenced perceptions of how physically active they considered themselves to be. The analysis identified three higher-order themes associated with PA: (1) determinants of PA; (2) outcomes of PA; and (3) perceived barriers and enablers. Quotations from the participants are presented to illustrate themes and sub-themes and ensure that findings represent the participants' voices. Activity level, gender, and retirement length are provided to give context to each quote.

**Determinants of Physical Activity**

Determinants of PA referred to the motives and reasons why older adults engaged in PA. Five subthemes emerged: (1) physical well-being; (2) psychological well-being; (3) socialising; (4) health perceptions; and (5) physical demand of previous occupation. Figure 1 represents a conceptual framework of the determinants of PA higher-older theme.

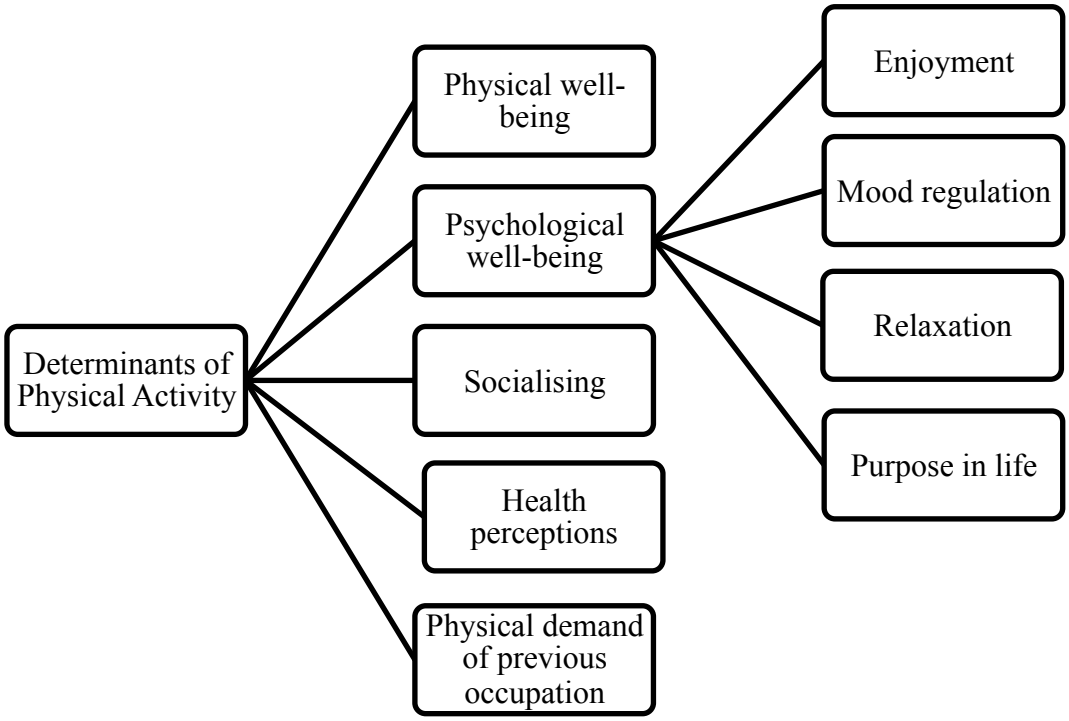


*Figure 1.* A conceptual framework of the determinants of physical activity

**Physical well-being.** Older adults referred to exercising for the purpose of remaining healthy and in a good physical condition. Health was the most cited reason for engaging in PA amongst participants. PA was either prescribed to them by a physician or was identified as necessary by the participants themselves. As described by one participant**,** "For health reasons it's been advised I did Pilates for my back" (Active female/2-5 years retired). Similarly, a recently retired individual said, "Walking is good for the heart, blood pressure, and cholesterol levels" (Active female/1$^{st}$ year retired).

**Psychological well-being.** Older adults regularly and frequently talked about experiencing positive psychological outcomes or avoiding negative psychological outcomes as a result of being active. Generally, the participants described four reasons for engaging in PA: enjoyment, mood regulation, relaxation, and purpose in life.

***Enjoyment.*** Most participants referred to pleasure as the main reason for engaging in PA. For example, "Well I do walking, not fast walking; just moderate walking just because I enjoy it that's it, it's not because I think of any depth benefit, I just enjoy it" (Active female/2-5 years retired). Enjoyment was equally important to individuals who were about to retire. For instance, a participant reported, "If I'm out in the rain I don't mind. The weather doesn't really bother me. So with me it's mainly enjoyment from actually doing whatever I'm doing" (Active male/pre-retiree). However, unenjoyable exercise activity could lead to a lack of motivation as explained by another participant, "I don't go to the gym because I don't enjoy gyms" (Active male/2-5 years retired).

***Mood regulation.*** Avoiding negative psychological outcomes such as depression was frequently highlighted as a reason for PA participation. One participant said, "I think I would be quite depressed if I didn't do physical exercise of some manner" (Active male/1$^{st}$ year retired). However, PA was also a way for older adults to generally feel better and experience feelings of happiness. As explained by one participant, "If I'm not active psychologically it affects me and it makes me feel that I ought to be out doing something. I don't feel as well as if I have been out doing physical activities" (Active male/2-5 years retired).

***Relaxation.*** Experiencing a feeling of calm was a commonly identified reason for PA engagement, as shown by the following statement, "After doing a good walk for about an

hour or two I feel a lot looser in my body and more relaxed after it" (Active female/pre-retiree).

***Purpose in life.*** A few participants reported that PA gave them something to look forward to following retirement along the lines of, "I think even more so now that I'm retired and you need purpose in your life and you think yes I've done something worthwhile and so on" (Active female/Retired for 2-5 years).

**Socialising.** Most participants acknowledged PA was a key part of their social life, such as to meet and interact with people. The social side of PA seems to be as important as the PA for older adults. One participant stated, "So that's why I do it, it's the social effect of meeting people" (Active female/>10 years retired).

**Health perceptions.** Some participants talked about being satisfied with their health and thus not finding PA necessary. In other words, holding positive health perceptions could deter older adults from engaging in PA. Having a reason to engage in PA appeared to be an important PA determinant for older adults, "If it's for a purpose I'm fine, but I don't see a point in going to a gym for the sake of it , if you're fit and healthy anyway" (Insufficiently active male/2-5 years retired).

**Physical demand of previous occupation.** A final factor that determined PA levels in older adults was the physically demanding nature of their previous occupation. Some participants who retired from sedentary occupations reported being more physically active in retirement as a result of previously having jobs that did not require a high level of PA. For example, a participant said, "I'm a lot more active since I retired because my job was sitting in an office easy access to facilities" (Active male/2-5 years retired). However, other

participants described being less physically active in retirement as a result of retiring from an occupation that involved high levels of PA. One insufficiently active participant explained,

> I was very active at work. I was a removal man for 10 years. Then I got off the road and into sewer maintenance. So I was always active. When I retired I think I just couldn't be bothered to get off my ass. (Insufficiently active male/2-5 years retired)

Recently retired individuals also expressed lower PA levels due to physically demanding occupation. One individual reported, "I was a carer, so that's physical activity. If you work for 40 hours doing it and you're not working now, you do a lot less now" (Active female/1st year retired).

**Outcomes of Physical Activity**

The outcomes of PA referred to the benefits older adults experienced as a direct result of being active. Two themes emerged that were termed: (1) physical outcomes; and (2) psychological outcomes. Figure 2 represents a conceptual framework of the outcomes of PA.

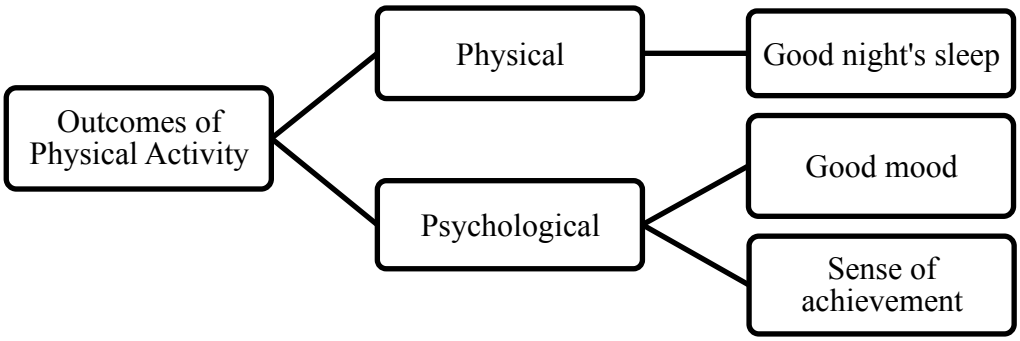


*Figure 2*. A conceptual framework of the outcomes of physical activity

**Physical outcomes.** There were very few physical outcomes mentioned by participants, and of these, it all pertained to a good night's sleep.

***Good night's sleep.*** A few of the participants referred to sleeping better as a result of PA. For example, a participant said, "The day I did yoga I slept much more relaxed than the days I didn't do yoga" (Active female/2-5 years retired).

**Psychological outcomes.** Psychological outcomes referred to by a few participants were related to good mood and a sense of achievement/satisfaction.

***Good mood.*** Most participants mentioned being in a good mood and experiencing positive feelings as a result of PA. According to a recently retired participant, "It's a happy mood you would be in yes; feeling a lot better that you did than dossing around doing nothing" (Active female/1st year retired).

***Sense of achievement/satisfaction*.** Many participants referred to a feeling of accomplishment when completing a physically demanding task. Feeling able to do what they wanted to do seemed to be an important outcome of PA. Older adults described PA as a rewarding experience that makes them feel satisfied once they overcome the challenge and accomplish their goal. For example,

> It's so nice to feel that you've still got that ability to do that and I think that's partly why I keep doing it for the satisfaction of getting that feeling of pleasure from the fact I can still run round for a couple of hours. (Active female/2-5 years retired)

The same was the case for individuals who had not yet retired. For instance, an individual admitted, "There's satisfaction in having achieved something and those achievements can be self-set targets within the target if you like. So you can create your own levels of satisfaction" (Active male/pre-retiree).

**Barriers**

Barriers described factors that could limit PA engagement. Two categories emerged in this theme: (1) personal; and (2) social-environmental barriers. Figure 3 represents a conceptual framework of the barriers of PA higher order theme.

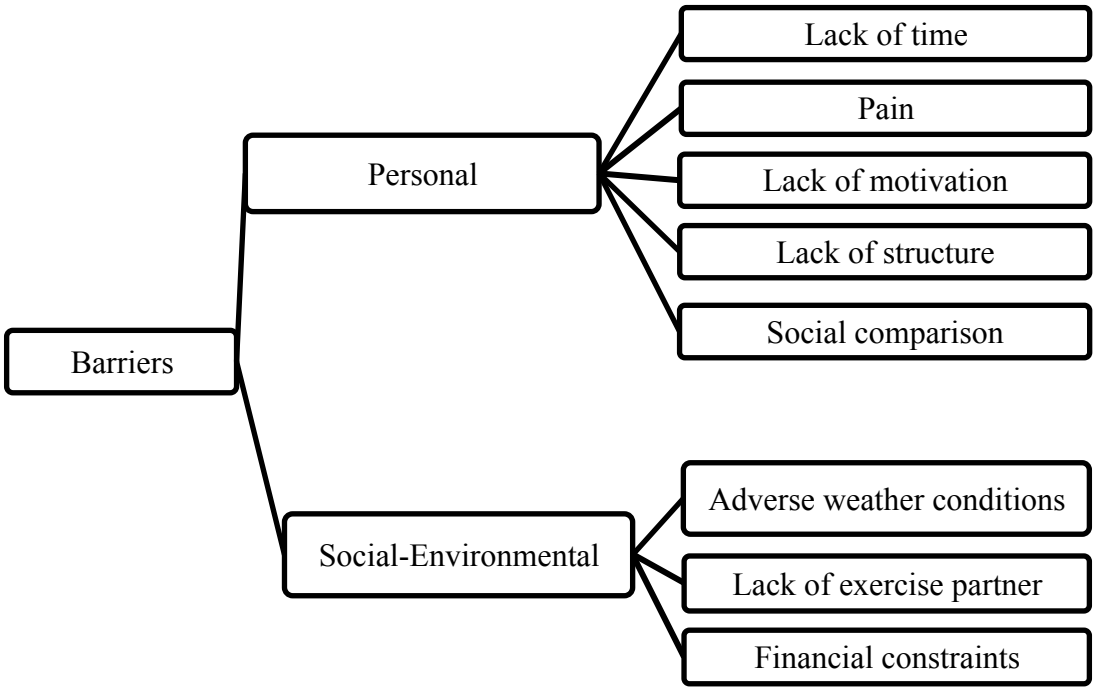


*Figure 3*. A conceptual framework of the barriers of physical activity

**Personal barriers.** Personal barriers were factors related to participants such as lack of time, pain, lack of motivation, health perceptions, lack of structure/routine, and dislike for the exercise setting.

***Lack of time.*** Lack of time could be either a real or perceived barrier that could limit PA participation. Some older adults, especially ***insufficiently active*** ones, were not motivated to adopt PA in their lifestyles and thus they perceived having limited amount of time after retirement. A participant stated, "My barrier is making time to do it. I'm not really stretching my time since I finished work" (Insufficiently active male/2-5 years retired). Although lack

of time was also recognised as a barrier from ***physically active*** participants, it mostly reflected real obstacles. For example, one of the physically active participants reported having family or personal commitments that prevented him from exercising, along the lines of "Hang on, people are pulling me this way, that way and perhaps it should be that everybody should designate some of my time only for me" (Active male/2-5 years retired). Similarly, some individuals reported that lack of time was their motive for retiring, along the lines of, "Time was my problem, I never had time because I was working. One reason I'm retiring is because I want more time to be able to do activity" (Insufficiently active/pre-retiree).

***Pain.*** Aches and pains associated with PA reduced its enjoyment and prevented people from being active. A few participants referred to pain as a warning sign and something that they should avoid as highlighted by one of the oldest participants, "Muscles sort of hurting during exercise, which as you say can be a warning that perhaps you shouldn't push it any further" (Active female/>10 years retired). The idea of avoiding pain in older age was also highlighted by one of the younger and ***insufficiently active*** participants who was about to retire. He said: "As you get older you're told as soon as you get anything, any ache or pain you should stop and that's what I've tended to do" (Insufficiently active male/pre-retiree). However, pain perception varied due to the individual's PA level. More ***physically active*** people were more familiar with stretching themselves and perceived it as normal,

> I think if you've done PA throughout your life you are used to that, you are used to pushing yourself a little bit. If you wake up the following day and you're a bit stiff you know why it is and you just get over it (Active male/2-5 years retired).

***Lack of motivation.*** Some participants talked about lacking motivation to initiate PA. This was mostly the case for those who reported being ***insufficiently active***,

> I know I need to lose weight. PA would probably help. As I say I know what I should do, I know how I should do it, it's not a problem it's just getting the motivation to do it. You know I'd rather sit down with a book and a chocolate bar than go out and run three miles these days. (Insufficiently active male/1st year retired)

Lack of motivation was also a concern for insufficiently active participants who had been retired longer. One participant explained, "I think basically I'm just lazy, nothing to do so I don't do anything" (Insufficiently active male/2-5 years retired).

***Lack of structure.*** Some participants particularly those who were ***insufficiently active*** discussed the impact of having less structure post-retirement. This could be defined as the lack of routine or simply disorganisation that comes from the abundance of free time as explained by one participant,

> I think most of us have said it would be nice if we didn't have to work or that sort of thing. Now we've got it, it's more difficult to organise, because we are in total charge. Nobody tells us what to do or guides us, we have to work it out for ourselves. (Insufficiently active male/2-5 years retired)

Lack of structure also resonated with more ***active people*** who were about to retire. For example, a participant said "I think you do less when you've got more time than when you've actually got to do it in an hour, you actually get it done whereas you can put off doing things" (Active female/pre-retiree). The lack of structure seemed to have a great effect on recently retired individuals as well. Another recently retired participant said, "I find not so much gets done as it did before because in a routine you have to do it, now it's oh shall we go out, shall we leave it, lets get up later…this is all new" (Active female/1st year retired).

***Social comparison.*** Another barrier discouraging older adults to engage in PA was comparisons they made between themselves to others who are younger or more fit.

***Insufficiently active*** individuals were more likely to make unequal social comparisons. A participant reported,

> It would stop me going to a gym because you see all these fit young people who are slim and not overweight. So you tend to think well it's for younger people, it's not for me. You see in magazines and its young people running and they're offering sports equipment or sports drinks and you rarely see anybody over 30 in those adverts. (Insufficiently active male/1st year retired)

On the other hand, ***physically active*** older adults seemed to make more healthy comparisons and get positively influenced along the lines of, "My husband is 80 and he is still running, he still does marathons and still plays tennis and he walks everywhere, he is very fit" (Active female/2-5 years retired).

**Social-environmental barriers.** Social-environmental barriers involved external influences that affected people's involvement in PA such as adverse weather conditions, lack of exercise partner, and financial constraints.

***Adverse weather conditions.*** Regardless of PA level and the stage of retirement, the majority of participants talked about being discouraged to exercise in the presence of inclement weather such as rainy or snowy or short days. The weather severity influenced whether people were active along the lines of, "I do pick my days. Like yesterday there was a chance of a shower but I went and I took my umbrella. But if I knew it was going to rain I wouldn't go in the rain" (Active male/2-5 years retired). Individuals about to retire also found the weather off-putting and expressed the same idea along the lines of, "In the winter when it's really coming down or it's really bad winter like snow, it does put you off" (Active male/pre-retiree).

***Lack of exercise partner.*** Several older adults perceived lack of an exercise partner to be a barrier when it comes to exercise. This barrier was present for both ***active and insufficiently active*** participants. For example, "For me personally I like somebody to do it with and I find that difficult" (Insufficiently active female/1st year retired). Another recently retired individual found that being away from the work setting minimised the opportunities for PA. He said,

> I'm doing less now because I don't have the range of people to ask for a game or things to do. The sort of ability to walk across the corridor and say do you fancy a game just isn't there. It's much more organised. It has to be. (Active male/1st year retired)

***Financial constraints.*** Some participants perceived they couldn't afford to participate in certain types of PA because there is a decrease in income as a result of retirement. For these participants, PA was associated with having a gym membership or participating in organised sport activities that required membership fees or other incurred expenses. One participant said, "Obviously retired I've got less money than when I was at work so you know perhaps some more exciting activities you know you can't do" (Active female/2-5 years retired). Similarly, a recently retired individual reported, "I think money is also an aspect now that I'm retired, I've got far less money, it's more of a consideration now than it used to be" (Active female/1st year retired). However, the most ***physically active*** participants, who had a broader definition of PA, did not see cost as an issue. For instance, a very active participant said,

> It does not cost anything to exercise, it does not cost anything to go for a walk, but some people think that you've got to be able to afford to go to the gym, you've got to

be able to afford a posh bike or go on a walking holiday to exercise and they can no longer afford it. (Active male/2-5 years retired)

**Enablers**

This final theme included factors that could positively influence PA behaviours and encourage people to be active. Two categories emerged in this theme: (1) internal; and (2) external enablers. Figure 4 represents a conceptual framework of the factors that facilitate PA.

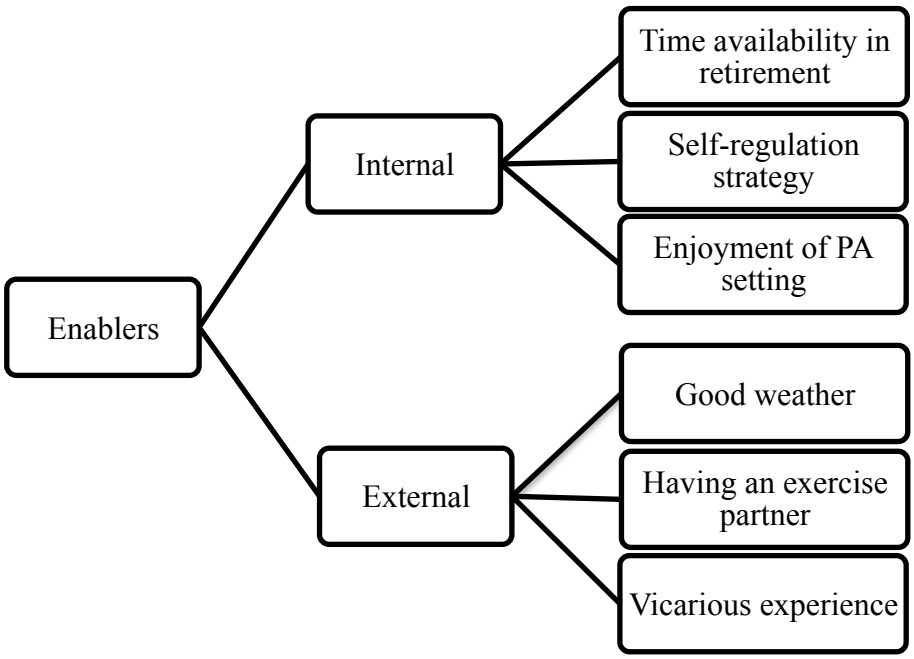


*Figure 4*. A conceptual framework of the enablers of physical activity

**Internal enablers.** Internal enablers refer to factors under a person's control that can motivate older adults to engage in PA. These involve time availability in retirement, self-regulation strategy, and enjoyment of the PA setting.

***Time availability in retirement.*** Most participants anticipated having more free time to exercise after retirement. For example, a recently retired participant stated, "Well I am retired so I have all the time in the world" (Active female/1$^{st}$ year retired). Although participants acknowledged that retirement is associated with increased leisure time and more opportunities to become more physically active, not all utilised this time for PA purposes. Participants who

had been retired for a longer time, were aware of the challenges of having so much freedom, especially in the first few months after retirement. For example, a participant said,

> I think the first 12 to 18 months after retirement are quite busy. You do a lot of things that you haven't had time to do before like catching up with people, dashing here or there. After that initial period I think it just tires off and you gradually slow down (Insufficiently active male/2-5 years retired).

***Self-regulation strategy.*** A few participants talked about the importance of committing to an exercise routine either by setting a specific time for PA, and/or making plans to engage in PA with other people. One participant reported, "Commitment, in other words joining something or not letting other people down if you don't go" (Active female/2-5 years retired). Time off from PA could demotivate older adults getting back into it along the lines of, "I think having stopped then it's harder to get started again" (Insufficiently active male/1st year retired). To self-regulate their behaviour, older adults sometimes tried to find alternative ways to maintain PA. For instance, a participant said,

> If you've got the option of a lift or the stairs try and use the stairs that sort of thing, as I do brisk walking, do a bit more of that or as you say walk to an extra bus stop. (Insufficiently active male/>10 years retired)

***Enjoyment of physical activity setting.*** Many participants talked about enjoying and being positively influenced by the natural surroundings and location of the PA. The enjoyment and pleasure derived from the environment seemed to be more important than the activity itself and helped older adults overcome barriers like bad weather. For example, a participant said,

> When I first started walking years ago I was a fair weather walker, I just walked during the good weather but now I walk right through the year and its lovely, you see

nature and I really enjoy that, the birds and you see the winter and everything about it and those are the things that I enjoy. (Active female/2-5 years retired)

The exercise location and the positive feelings associated with it had a major impact on the participants' motivation to engage in PA and facilitated engagement in PA. One participant explained, "I don't like going to the gym and I find it hard to make the time to do that because I don't want to do it" (Active male/>10 years retired).

**External enablers.** External enablers refer to social and environmental factors that are somewhat beyond an individual's control, and include good weather, having an exercise partner, and positive vicarious experience of PA.

***Good weather.*** Across the sample, most of the older adults recognised the importance of good weather as a determinant factor in their engagement of PA. Lack of rain and warm weather were among the most important factors that determined whether older adults would engage in PA. A participant commented, "It's much better in the summer than in the winter for walking or any outdoor activity, its far more enjoyable so that does play a part in it actually the weather and outside influences" (Active female/pre-retiree).

***Having an exercise partner.*** One of the most frequently reported sources of social support that motivated older adults to engage in PA was the presence of an exercise partner. Almost all participants reported the importance of having an exercise companion or being part of a group. An exercise partner could help older adults not only withstand the possible physical unpleasantness associated with PA but also motivate them to initiate the activity. For instance, a participant said, "If I've got a friend who went to the gym locally perhaps I might be more motivated" (Active female/2-5 years retired). Similarly, insufficiently active older adults reported that doing PA with somebody else could motivate them to overcome barriers associated with it. A participant explained,

> I got to get to the swimming pool, it's awful, it's windy, it's raining, but if my lady friend goes with me she says get going and we do and you come back out of it and you do, well I certainly feel better. (Insufficiently active male/2-5 years retired)

The same positive effect could be achieved through having a non-human exercise partner, such as a dog. Specifically a participant reported,

> I think if I wasn't involved with walking the dog then perhaps I would degenerate into lazing around at home. I'm a dog walker for the past two years and when we had the dog to start with, it rained every single morning that I took the dog out and I thought I don't really fancy it today but the dog needs its exercise. So you put on all your wet water equipment on and you just go and when the wind and the rain hits you, you think oh I… but you're doing it for a purpose. (Active male/>10 years retired)

***Positive vicarious experience of physical activity.*** Some participants described being inspired by other people's experiences with PA. Seeing others engage in PA and the health benefits experienced from this was a strong motivator for older adults. A participant said, "I've had that example of people remaining fit in older, older age and I sort of think in myself…to keep as active as I can within the parameters I can do" (Active female/2-5 years retired).

## Discussion

The goal of the present study was to investigate how pre- and post-retirees representing a variety of activity levels perceive PA and how they self-regulate their behaviour. The present study is one of the few studies that have focussed specifically on the transition to retirement (McDonald et al., 2015), and the first to adopt Bandura's SCT as a theoretical framework to understand the psychosocial determinants of PA behaviour during this transition. The variability in PA levels and retirement lengths allowed for a range of

perceptions to emerge and shed light on the factors that influence PA during transition to retirement.

Findings are consistent with SCT and highlight self-efficacy as one of the underlying reasons for engaging in PA in individuals who are in retirement age. The participants reflected on whether they could retain a physically active lifestyle in retirement and identified several reasons that influenced their confidence levels. Specifically, findings highlighted that subjective health status, and time perception were related to their belief in their ability to remain active throughout retirement. Thus, perceived poor health, and lack of time made them less confident that they could sustain PA in retirement. Furthermore, self-regulation was identified as another major reason for engaging in PA. Participants referred to strategies they used to regulate their behaviour such as paying gym subscription, getting an exercise partner, and joining an exercise group. This supports previous research that indicates self-regulation as a key social-cognitive factor for changing health behaviour in older adults (Umstattd et al., 2008)

Overall, physically active older adults were more confident in their ability to maintain PA throughout retirement, expected fewer barriers, and perceived more benefits from exercising compared to insufficiently active individuals. Their beliefs in their capabilities to overcome certain barriers along with having positive outcome expectations appeared to facilitate their motives to initiate a PA regime. Although all participants held positive physical, psychological, and social outcome expectations, only a few engaged in PA while others remained insufficiently active. This supports previous research, which has shown that outcome expectations alone is not a strong predictor of PA (Rovniak, Anderson, Winett, & Stephens, 2002), whereas targeting self-efficacy can be an effective way to help older people overcome barriers to PA (Lee, Arthur, & Avis, 2008). Thus, boosting older adults'

confidence in their ability to sustain PA throughout retirement should be one of the primary aims of PA interventions for older adults.

In our study, the attitudes and beliefs that retirees had about the benefits and barriers of PA seemed to differ between activity levels. Active older adults perceived fewer barriers and more enablers to PA compared to those who were not sufficiently active, defined as exercising less than 2.5 hours per week. Active older adults may have more resources to cope with the barriers they face in regards to PA (Netz et al., 2008). Furthermore, barriers seemed to differ across activity levels. Sufficiently active older adults reported more social-environmental barriers (e.g., adverse weather conditions) whereas less active individuals faced more personal barriers related to motivation (e.g., lack of organisation). Indeed, lack of motivation was the most frequently reported barrier for insufficiently active older adults.

Some barriers in the present study were consistent with previous research such as not having sufficient time to be physically active (Sherwood & Jeffery, 2000). Contrary to the common belief that retirement is associated with more free time and thus provides more opportunities for PA, it is important to note that a number of retired individuals perceive lack of time to be a barrier to PA – particularly those who are insufficiently active. Most physically active participants recognised that having time in retirement can facilitate engagement in PA. It is likely that PA is not a high priority for insufficiently active individuals and this is why they perceive having limited time in retirement. This supports research suggesting that lack of time can instead reflect lack of motivation towards PA (Bowles, Morrow, Leonard, Hawkins, & Couzelis, 2002). Thus, insufficiently active older adults likely use lack of time to rationalise their low PA levels. Accounting for PA level and exploring the attitudes and feelings older adults have towards PA can shed light on whether some barriers are real or just perceived.

All retired adults reported not having a daily routine to be a major barrier preventing the development of goals and plans for PA. Feeling in 'charge of yourself' was a new experience for newly retired adults, which made them less ready to incorporate PA into their daily routine. Particularly in the case of new retirees who have yet to establish a routine, it is likely that they feel less confident in their ability to incorporate PA in their daily lifestyle. This supports research suggesting that lack of structure in retirees' daily lives can be a challenge (Pettican & Prior, 2011). Consequently, it is important to help older adults establish a new routine in retirement, through incorporating PA in their daily schedules.

Another commonly reported barrier by insufficiently active people was social comparison. Insufficiently active people compared themselves to younger and fitter people, which discouraged them from initiating PA. This contradicts social comparison theory, which suggests people compare themselves with others who have similarities on a particular domain (Festinger, 1954). The more similar people are to reference comparison groups, the more likely they will evaluate themselves through the comparisons. Although social comparisons are not always healthy, under certain circumstances they can facilitate engagement in PA. For instance, physically active people reflected on experiences of people who remained active until an old age and experienced positive health outcomes. Thus, instead of comparing themselves to younger and fitter people they were getting encouraged to participate in PA by following the example of people who had been physically active in the past.

Consistent with SCT, social comparisons in the form of positive vicarious experiences of PA seemed to be an important source of self-efficacy for older adults (Bandura, 1986). Vicarious experience or modelling refers to observing the consequences of another person's actions and adjusting behaviour accordingly. Having examples of others who were physically active in an older age, helped individuals feel more confident that they too could remain

active and experience similar positive outcomes as a result of PA. Booth, Owen, Bauman, Clavisi, and Leslie (2000) demonstrated that older adults who interacted with physically active individuals in their social circle tended to be more physically active themselves, indicating the importance of social modelling. Thus, PA behaviour change appears to occur through these observations and vicarious experiences (Bandura & Huston, 1961).

Despite the numerous barriers to PA, participants reported experiencing a number of motivators similar to those identified in previous research (Beck, Gillison, & Standage, 2010). The results of our study supported previously reported factors underpinning older adults' PA motivation during the retirement transition. For instance, similar to Costello, Kafchinski, Vrazel, and Sullivan's (2011) study, older adults reported that socialising is a big part of their PA. Furthermore, an exercise partner or belonging to a group positively influenced older adults to engage in PA, which is consistent with SCT and supports the importance of social support as a motivator for PA (Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006). However, exercising with people of similar age is considered more beneficial (Beauchamp, Carron, McCutcheon, & Harper, 2007) whereas exercising with older or younger people could result in negative social comparisons that hinder an individual engaging in PA. Thus, placing older adults in exercise groups with similar others seems to be an important goal for future interventions. Consistent with Peel, Douglas, Parry, and Lawton (2010), walking with a dog is another form of companionship that can give a sense of purpose to older adults and can motivate them to stay physically active.

In the present study older adults who were confident in their ability to sustain PA throughout retirement were more likely to self-regulate their behaviour and enjoy PA. Both active and inactive retirees seemed to pick activities they enjoyed and felt comfortable doing. The majority of physically active participants reported engaging in PA because they enjoyed

it rather than the health benefits associated with PA. This supports the importance of enjoyment, which is one of the strongest predictors of PA (Deci & Ryan, 2000). Moreover, positive feelings experienced during exercise can predict future behaviour (Rhodes & Kates, 2015) and enjoyment is likely to determine not only whether older adults engage in PA but also the type of activities chosen.

As well as enjoyment, the feeling of accomplishment and achievement after engaging in PA seemed to be important – particularly for older adults retired for more than 10 years. These individuals use PA as a mechanism to cope with ageing. The sense of accomplishment is the most important source of self-efficacy (Bandura, 1997). Although there is no previous research on the effect of performance accomplishments on older adults, the present findings suggest older adults who have previous positive experiences and success are going to be more confident in their ability to engage in PA. Helping older adults to focus on what their bodies can do rather than their physical limitations can be very self-fulfilling.

A limitation of the present study is that PA levels were self-reported, which can be subject to memory bias, and participants may have over- or underestimated their PA levels (Slootmaker, Schuit, Chinapaw, Seidell, & Van Mechelen, 2009). Future research may wish to use more objective measures, such as accelerometers, to classify whether older adults meet the recommended levels of PA. Furthermore, it must be noted that participants were given a definition of PA at the start of the focus groups, which might have influenced their own personal definition, and consequently their responses. Future research should allow for participants to reflect on what PA means to them before providing them with a predefined description of PA. Another limitation is that we do not know whether participants changed their PA habits throughout retirement. Future longitudinal research could follow a set of participants throughout different stages of retirement and see how PA may change. Future

research could also differentiate between determinants of PA and exercise and find differences and similarities in the type of barriers and enablers people face in the different activity categories. It could be that those who define PA as going to the gym face different set of determinants than those who define it as a lifestyle activity.

## Conclusions

In conclusion, the current study generated knowledge that can be used as the basis for interventions attempting to promote PA in older adults. Boosting self-efficacy, promoting enjoyable activities, creating similar-age exercise groups, positive reinforcement, and improving time-management skills seem viable ways to help individuals in transition to retirement to become more active. The barriers physically active older adults face appear less under their control while the barriers insufficiently active older adults face seem to be related to motivation and self-regulation. Enablers to PA for this population included commitment to an exercise group or class and the continuation of regular exercise. By understanding the unique challenges and facilitators to PA that older adults experience in retirement, interventions can be tailored to the population to maximise their effectiveness. Apart from the unique challenges faced during retirement there are other factors that can influence the way older adults regard PA such as chronic illness. The next chapter is focussing on older adults with chronic obstructive pulmonary disease (COPD).

# Chapter 3

Barriers and enablers of physical activity engagement for individuals with chronic obstructive pulmonary disease (COPD)

# Barriers and Enablers of Physical Activity Engagement for Individuals with Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a debilitating respiratory disease most commonly found in chronic smokers, although other less frequent causes include second-hand smoke, air pollution, chemical fumes and environmental dust (American Lung Association, 2015). It is associated with both physical functional limitations (e.g., airflow obstruction, reduced lung function, decreased exercise capacity, increased breathlessness and frequent infections) and psychological distress (e.g., anxiety and depression) (Effing et al., 2007; Hill, Geist, Goldstein, & Lacasse, 2008). As COPD progresses, it is characterised by repeated infections and hospital admissions, which has significant economic consequences for the health care system (Nowak et al., 2005).

While the true prevalence is hard to determine, it is estimated that more than 65 million people live with moderate to severe COPD worldwide. These statistics do not account for individuals with mild COPD or those who are undiagnosed (World Health Organisation, 2015). In the UK alone, it is estimated that of the 3 million people affected with COPD, less than 1 million people are officially diagnosed (British Thoracic Society, 2015). Taking into account expected global increases in the ageing population with longer life expectancy (UN, 2015), it is estimated COPD will be the fourth major cause of death by 2020 (Patel & Hurst, 2011), and by 2030 it will become the third (GOLD, 2015).

Because COPD is associated with high mortality (Soriano et al., 2000), early diagnosis and management is important (Wilkinson, Donaldson, Hurst, Seemungal, & Wedzicha, 2004). With increasingly limited healthcare resources, much focus has been and continues to be on promotion of self-management (Effing et al., 2007). Whilst improved self-management behaviour has been reported to increase adherence to medication and symptom management

and improve clinical outcomes (Bourbeau, Nault, & Dang-Tan, 2004; Lorig et al., 1999), it is not clear which aspects of self-management are the most important. A recent review however suggested that PA might be the most beneficial component (Jordan et al., 2015). However, it seems that individuals with COPD face difficulties when it comes to self-care and self-management, with the majority of patients failing to adhere to a prescribed exercise programme (Bourbeau & Bartlett, 2008).

PA is well accepted as an important behaviour associated with a variety of health benefits such as increased physical capacity, improved ventilation and oxygen consumption, and lower levels of dyspnoea and fatigue (Garcia-Aymerich, Lange, Benet, Schnohr, & Antó, 2007; Rabe et al., 2007). Structured and supported PA is an important component of the pulmonary rehabilitation programmes, currently offered to people with COPD as per National Institute for Clinical Excellence (NICE) guidelines. However, poor uptake of these programmes and poor adherence to regular exercise upon its completion are current limiting factors (NICE, 2004).

The Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2015) advise participation in daily PA. However, to ensure the minimum benefits, engagement in moderate PA three days per week for at least 15 minutes is recommended (Dressendorfer, Haykowsky, & Eves, 2015). Despite these recommendations and the reported benefits of PA, the vast majority of individuals with COPD do not sufficiently engage in PA (Troosters et al., 2010), and are significantly less active on a daily basis than healthy older adults (Vorrink, Kort, Troosters, & Lammers, 2011). For instance, in a pilot study, Troosters et al., (2010) found that individuals with COPD took 5584 steps compared to 9372 steps in control groups. As COPD symptoms become more severe over time, with lung functionality steadily declining and breathlessness and discomfort steadily increasing, PA levels decline further (Donaire-

Gonzalez et al., 2013; Pitta et al., 2005). For instance, individuals with COPD were found to spend 55% lower walking time compared to healthy adults (Pitta et al., 2005). Inactivity can in turn lead to further deterioration of the physical condition, which becomes a further barrier to PA engagement (Pitta et al., 2006). Understanding what barriers exist for people with COPD in being regularly active as well as determining factors that facilitate involvement is an important step to take before effective health behaviour change interventions can be developed.

Previous studies have attempted to understand the PA habits of healthy older adults using Bandura's social cognitive theory (SCT) (Booth, Owen, Bauman, Clavisi, & Leslie, 2000). SCT refers to the impact of societal factors and thoughts on human motivation, attitudes, and behaviour (Stajkovic & Luthans, 1998). Results from a systematic review of PA determinants, including 44 studies, show that social cognitive constructs can explain 31% of the variance in PA behaviour (Young, Plotnikoff, Collins, Callister, & Morgan, 2014). Within the COPD literature, according to a recent study guided by SCT, social-cognitive variables can positively predict COPD outcomes such as quality of life, health status, dyspnoea, and lung function via its association with PA behaviour (Lemmens, Nieboer, & Huijsman, 2008). These results indicate that SCT is a useful theoretical approach to explain PA behaviour in healthy individuals as well as those with COPD (White, Wójcicki, & McAuley, 2011).

Barriers and enablers are two important components of SCT, and are the focus of the present study. Barriers are either real or perceived, and can be classed as personal factors, environmental factors, or social factors (Dishman & Sallis 1994). Past research on healthy older adults has indicated that the most common barriers appear to be health issues (Crombie et al., 2004; Newson & Kemps, 2007) while other well-reported barriers include pain,

weather, lack of time (Kosteli, Williams, & Cumming, 2016; Chapter 2), lack of transportation, or fatigue (Sherwood & Jeffery, 2000). In contrast, enablers refer to all the factors that facilitate engagement in PA and can include physical, psychological, social, and environmental motivators (Allender, Cowburn, & Foster, 2006). Before getting to the enablers it is crucial to examine the barriers that individuals face because the more barriers people perceive, the less likely it is for them to self-regulate their behaviour to engage in PA (Ayotte et al., 2010).

Individuals with chronic diseases such as COPD, have similar barriers and enablers to those found in a healthy older adult population, but also experience unique ones. In a systematic review by Thorpe, Johnston, and Kumar (2012), which included 8 qualitative and 3 quantitative studies, disease-specific barriers were identified such as shortness of breath, and negative experiences with pulmonary rehabilitation programmes along with some more common barriers to the general population were also reported such as personal issues, lack of support, and external factors. Disease-specific enablers included guidance from health professionals, control of the condition, and programme-related factors while more common enablers also commonly found in the general population included social support, transportation, recognising a personal benefit, and setting specific goals.

Although past research has primarily focussed on PA as part of pulmonary rehabilitation, an organised psycho-educational programme (Keating, Lee, & Holland, 2011), little research exists on daily PA as a lifestyle choice. For instance, Thorpe et al.'s. (2012) systematic review explored barriers and enablers of engaging in pulmonary rehabilitation but identified no studies focussing exclusively on the barriers and enablers of daily living PA. To date, there are only two qualitative studies exploring barriers and enablers of daily life PA in individuals with COPD (Hartman et al., 2013; Thorpe, Kumar, & Johnston, 2014). Hartman

et al. (2013) conducted a mixed-methods study and identified four major barriers to PA in people with COPD, including the weather, COPD-related health problems, financial constraints, and shame. Similarly, Thorpe et al. (2014) examined the barriers to PA that individuals with COPD faced two months after a hospital admission. This population reported primarily health-related barriers (e.g., breathlessness, other co-occurring diseases, injury, sickness) as well as environmental ones (e.g., weather and transportation issues). However, it should be noted that individuals with COPD also perceive certain factors that facilitate engagement in PA such as health benefits, enjoyment, continuation of an active lifestyle, and functional purposes like gardening or travelling to another location (Hartman et al., 2013).

Prospective studies should address PA as a lifestyle choice, and part of a self-management strategy that can be used independently at home. Furthermore previous research has focussed on understanding the experiences of individuals with advanced COPD from secondary care settings. With management of long term conditions in the UK shifting to primary care settings and the increased emphasis on self-management, further research is needed into attitudes and beliefs of individuals experiencing a range of disease severities and who are being managed in primary care. Similar to Chapter 2, the primary aim of Chapter 3 was to examine the reasons that promote and prevent free-living PA in older adults but instead the focus was on people diagnosed with mild and moderate COPD. SCT was used as the theoretical framework to provide a better understanding of PA perceptions. A secondary aim of Chapter 3 was to understand how COPD influences involvement in PA and explore PA perceptions in relation to subjective experiences of COPD.

# Methods

## Design

A qualitative approach was used by employing focus groups to retrieve in-depth information in regards to the perceptions of PA in a COPD cohort. Thematic analysis was used to make sense of the data.

## Participants

Participants were drawn from the Birmingham COPD cohort, which is a unique primary care cohort. Individuals eligible to participate were those over 40 years old (since they are more at risk for developing COPD; Buist et al., 2007), currently diagnosed with COPD, and registered in a general practice in the West Midlands of the UK. Individuals with any serious life threatening disease in addition to the COPD or other condition that could act as a confounding variable and interfere with participation in the study were excluded.

The 26 participants of this study (15 male, 11 female) were middle-aged and older adults from the local community in Birmingham (UK) with a physician diagnosis of COPD aged between 50 to 89 years ($M$ = 69.50, $SD$ = 27.57). The participants took part in one of the following focus groups; newly diagnosed (i.e., received a diagnosis of COPD within the last year) ($n$ = 6), referred to pulmonary rehabilitation ($n$ = 7), mixed group including newly diagnosed and those referred to pulmonary rehabilitation ($n$ = 8) and currently employed full-time ($n$ = 5). The participants represented Grade 1 through 5 of breathlessness symptoms according to the Medical Research Council Dyspnoea scale (MRC; Fletcher, 1959). Grade 1 is being short of breath during strenuous exercise ($n$ = 7), Grade 2 is breathlessness while on a slight hill ($n$ = 8), Grade 3 is walking slower than most people and stopping after a mile or 15 minutes ($n$ = 7), Grade 4 is being breathless after walking for a few yards or a few minutes on level ground ($n$ = 3), and Grade 5 is being too breathless to be mobile ($n$ = 1). Severity of

airflow obstruction ranged from stages 1 (mild) to 4 (very severe) as defined by GOLD (2015). Participants' characteristics are presented in Table 1.

Table 1
*Participants' characteristics*

Focus Group

| **Group 1 (Recently Diagnosed)** | **Gender** | **Age** | **Breathlessness** |
|---|---|---|---|
| Participant 1 | F | 60-69 | MRC3 |
| Participant 2 | M | 50-59 | MRC1 |
| Participant 3 | M | 60-69 | MRC1 |
| Participant 4 | F | 60-69 | MRC2 |
| Participant 5 | F | 50-59 | MRC1 |
| **Group 2 (Employed)** | **Gender** | **Age** | **Breathlessness** |
| Participant 1 | M | 60-69 | MRC1 |
| Participant 2 | F | 60-69 | MRC2 |
| Participant 3 | M | 60-69 | MRC2 |
| Participant 4 | M | 70-79 | MRC1 |
| Participant 5 | F | 70-79 | MRC2 |
| Participant 6 | F | 60-69 | MRC3 |
| **Group 3 (Pulmonary Rehabilitation)** | **Gender** | **Age** | **Breathlessness** |
| Participant 1 | M | 60-69 | MRC3 |
| Participant 2 | M | 50-59 | MRC4 |
| Participant 3 | M | 70-79 | MRC1 |
| Participant 4 | M | 60-69 | MRC1 |
| Participant 5 | M | 60-69 | MRC3 |
| Participant 6 | M | 80-89 | MRC2 |
| Participant 7 | F | 60-69 | MRC5 |
| Participant 8 | F | 60-69 | MRC3 |
| **Group 4 (Mixed)** | **Gender** | **Age** | **Breathlessness** |
| Participant 1 | F | 70-79 | MRC3 |
| Participant 2 | M | 60-69 | MRC3 |
| Participant 3 | M | 70-79 | MRC2 |
| Participant 4 | M | 70-79 | MRC4 |
| Participant 5 | M | 80-89 | MRC4 |
| Participant 6 | M | 70-79 | MRC2 |
| Participant 7 | F | 60-69 | MRC2 |

**Procedure**

Approval to conduct this study was obtained from the National Research Ethics Service (REC reference: 11/WM/0304). Individuals who met the eligibility criteria were invited to participate in this study via a letter as part of a wider study of the Birmingham Lung Improvement Studies (BLISS) program supported by the National Institute for Health Research (Appendix 8). Those who desired to participate completed a form confirming their interest and returned it by mail using a provided pre-paid envelope. After a list of all interested parties was generated, participants were contacted by phone, to check their availability for that month, while accounting for certain criteria (e.g., recency of diagnosis, participation in pulmonary rehabilitation, employment status and severity of the symptoms). Out of all the participants who were contacted, this number was downsized to meet the parameters of the study (e.g., time availability, even distribution of participants in groups). The shortlisted participants were then contacted to arrange a date for them to participate in one of four predefined focus groups. The focus groups discussed above comprised between 5 and 8 people. Each group was composed by an equal number of participants in terms of demographic characteristics (e.g., age and gender) and symptom severity. This categorisation provided a relaxed environment so that participants felt free to give their opinions without feeling judged. The reasoning for allocating the participants to these groups was to allow for a variety of perceptions to emerge including individuals with a full range of disease severity and functional limitations. For instance, the group of working age individuals was included to account for the potential impact of employment. For the sake of comparison with previous studies, the group referred for pulmonary rehabilitation was included to account for the potential effect of physical conditioning as part of a structured programme. This broad range

of perspectives enabled a more comprehensive view of the potential influence of contextual factors on PA engagement in people with COPD.

The focus groups took place at the University of Birmingham during July 2014. Three of the researchers conducted the focus groups with interchangeable roles; moderator and observer (CR, MCK, NH). During one of the focus groups, a participant's wife sat in as an observer but made no contribution to discussion. In their perspective roles, the moderator facilitated the focus group and the observer took notes on participant's non-verbal communication, group interaction and other key points. Each discussion was audio recorded and lasted between 84 and 89 minutes, with an average duration of 87 minutes. After the participants completed the informed consent form (Appendix 10), they were notified about the purpose of the study, confidentiality and the rules of engagement for discussion within the focus groups (e.g., allow others to speak without interrupting and without speaking simultaneously). At the end participants were allowed to ask questions before the interview guide was introduced.

**Interview Guide**

As a preamble to the interview guide, the participants were asked a warm up question to help them feel at ease. They were then asked to give a personally meaningful definition of PA, which encouraged them to initially reflect on their own understanding and experiences. This personalised approach also ensured that the researchers did not make any assumptions based on a predefined definition. After getting a sense of the personal meaning of PA in this population, a common definition was provided to all the participants describing PA as "any structured activity with the goal of achieving fitness and health while it involves other lifestyle activities". The provision of a common definition encouraged those who perceived PA as a structured activity to also reflect on other experiences representing overall

PA. Furthermore, it ensured that all participants understood the context in which PA questions were being asked and that there was consistency in all responses provided.

The focus groups followed a semi-structured interview guide (Rabionet, 2011), initially pilot tested with a healthy group of older adults in a prior study and was modified to fit the present purposes. The content was informed by the current evidence and developed, drawing on methodological and subject expertise. Open-ended questions based on SCT and derived by a previous study (Kosteli et al., 2016, Chapter 2), were used to elicit the participants' perceptions about PA. The questions were related to the perceived benefits of PA, views on the importance of setting PA goals, ways of incorporating PA into one's daily routine, obstacles faced when engaging in PA, and factors that made it easier to be active (Appendix 11). Probes were used to extract more in-depth information about participant thoughts in regards to PA (e.g., "Could you give a specific example?", "Can you talk about that more?", "Help me to understand what you mean").

**Data Analysis**

The audiotapes from each focus group were transcribed verbatim and resulted in 254 pages of double-spaced transcripts. To protect confidentiality, all names were removed and substituted with pseudonyms. Thematic analysis was used as a systematic way of organising the data in a few principal concepts, or themes that reflect the major key ideas of the study (Frith & Gleeson, 2004). A critical realist perspective was adopted according to which people's experiences are accounted for, but also the role of researcher is acknowledged in creating knowledge (Willig, 2013). A post-positivist paradigm informed the procedures that were followed to establish validity (Guba & Lincoln, 1994). According to this paradigm, the whole truth may not be fully accessed, but may be gradually retrieved through the process of research (Clark, 1998).

A preliminary analysis indicated that data saturation was achieved (Francis et al., 2010). The main analytical steps included: (a) data familiarisation; (b) initial coding; (c) sorting codes into themes; (d) refining, defining and labelling the themes, (e) a devil's advocate meeting; and (f) finalising the thematic structure (Braun & Clarke, 2006). An open coding process was used to identify patterns of data with subsequent grouping together of any frequently recurring topics emerging from the responses, to form codes, being descriptive headings based on the content (Strauss & Corbin, 2008). The codes were further classified and reduced into broader structures, identified as themes, which were further reviewed and organised in higher hierarchical structures, identified as categories (Braun & Clarke, 2006; Ryan & Bernard, 2003).

Following extensive discussion, all the authors agreed on the final selection of the themes and subthemes. Regular group meetings, with involvement of all the authors in the decision-making process, ensured that the process of coding was unbiased and that the themes developed were based on sufficient evidence. Thus, different research members acted as the devil's advocate by asking hard questions and encouraging everyone to be more critical in their interpretations. Although SCT informed the interview guide, the themes were analysed inductively and not based on a pre-existing coding framework (Braun & Clarke 2006). This approach allowed for new findings to emerge that do not necessarily fit within SCT and accounted for in previous research.

**Issues of Trustworthiness**

To establish trustworthiness and increase consensus between researchers, the coding process was initially performed by the first author and then discussed and confirmed by all authors. As a method of triangulation of evidence, all members of the research team were asked to reflect on random quotes and contribute to interpretation of the overall findings until

agreement was reached. The discussion among research members allowed for some peer debriefing, adding credibility to the study (Creswell & Miller, 2000). Furthermore, to ensure consistency in the data collection process, the same research protocol was followed in each focus group. Lastly, throughout the study, an audit trail portraying the decisions made in the data analysis was maintained by the first author, to establish credibility and ensure transferability of the findings beyond the particular project (Guba & Lincoln, 1994; Thomas & Magilvy, 2011).

## Results

### Understanding of Physical Activity

Individuals with COPD broadly defined PA as any lifestyle activity including walking, gardening and housework. Furthermore, the participants associated PA with movement as part of their daily routine. For instance, one participant explained, "PA is anything that keeps me bending up and down, walking along, anything that makes me feel that I'm stretching my body in some way" (Employed/MRC 2). The results were based on this personalised PA definition. The analysis identified two overall higher-order themes associated with PA: "the perceived barriers" and "the enablers". The theme, barriers, involved all those factors that prevented people with COPD from engaging in PA. Categories under this theme were personal and social barriers. The theme, enablers, included factors that could have a positive impact on PA behaviours and encourage people to be active. Categories under this theme were personal and social enablers. Quotations from the participants were selected to illustrate themes and sub-themes and to ensure that the findings represent the participants' voices. To provide context, quotations are referenced by participant grouping and MRC severity of breathlessness.

**Personal Barriers**

Personal barriers were related to the individuals themselves. This category consisted of four subthemes including: (a) physical limitations of COPD; (b) psychological distress of COPD; (c) attitudes/perceptions; and (d) motivation. (see Figure 1)

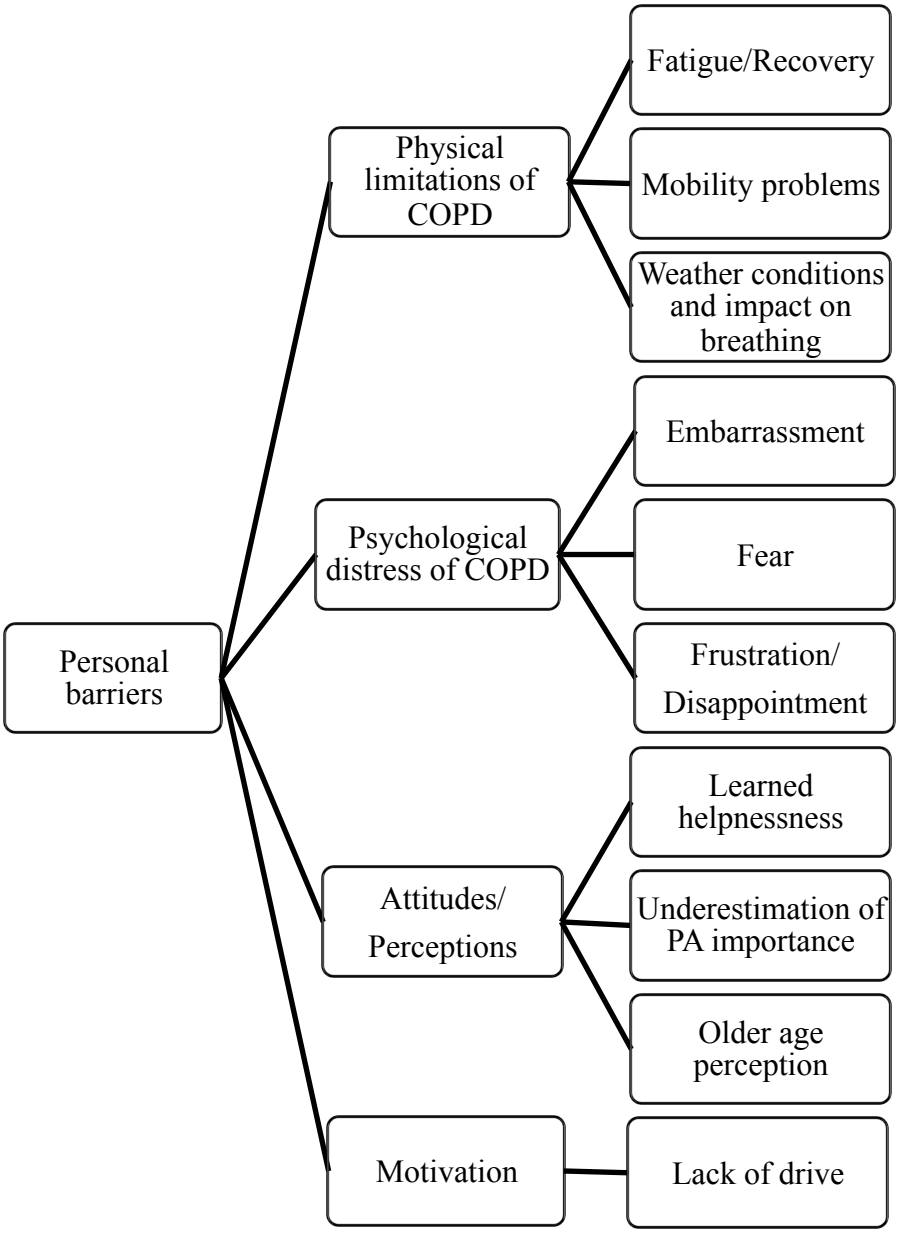


*Figure 1*. A conceptual framework of the personal barriers of physical activity higher order theme.

**Physical limitations of COPD.** The physical limitations of COPD refer to all the health-related issues that most individuals face as a result of having COPD. This theme consisted of three subthemes including fatigue/recovery, mobility problems, and weather conditions and potential impact on breathing.

***Fatigue/Recovery***. Some of the participants felt unable to carry out PA as part of their daily routine due to a lack of stamina. One participant stated, "So I'd like to be able to be more active but I haven't got the energy basically" (Employed/MRC 3). Other participants equated PA with a slow recovery as they had a hard time getting over breathless symptoms after they engaged in PA. One of the participants reported, "If you look at an athlete who's just run, they're out of breath but they recover much quicker, that's the difference, their recovery time is much quicker than ours" (Mixed/MRC 5).

***Mobility problems***. A large number of participants talked about getting out of breath as a result of engaging in certain types of activity and how this could have a negative impact on their mobility. The mobility issues were closely associated with activities involving an incline (i.e., walking upstairs) and lifting. This has been highlighted by one of the oldest participants acknowledging that even simple routines can be a challenge, "Going upstairs for example, I find it really difficult to go upstairs even to go to the toilet but you know its one of the things you have to do" (Mixed/MRC 3).

***Weather conditions and potential impact on breathing***. Some participants specified how adverse weather conditions could affect their breathing. Specific weather conditions such as wet, hot, cold and damp air was a major concern for people with COPD. One participant highlighted the issue, "That affects me quite a lot, it makes me a lot more breathless and I seem to get more pain as well in my chest with the cold weather" (Employed/MRC 3).

**Psychological distress of COPD.** The majority of participants talked about the feelings associated with COPD and how their condition affected them emotionally while it influenced their engagement in PA. The participants reported a number of feelings including: (a) embarrassment; (b) fear; and (c) frustration/disappointment as a result of COPD.

***Embarrassment.*** In some cases, participants talked about the negative feelings they have to endure whilst carrying out PA. Such instances include feeling ashamed of experiencing symptoms such as breathlessness and immobility in front of others. Some participants seemed to believe that if others saw their frailties linked to this disease whilst carrying out PA, it would make them feel uncomfortable and embarrassed. The following participant indicated this,

> They see you out of breath or you're on a rollator, people do come up to you and say are you all right. You do get kind of embarrassed because you're only taking a breather you know but they just see you're in distress. (Mixed/MRC 4)

***Fear.*** Some participants talked about being concerned whenever they experienced symptoms such as breathlessness or pain. One participant indicated how this felt, "When I first got the pains when I went up steps or walking up a hill, it used to actually frighten me a bit, I used to think oh god this is my heart or you know" (Employed/MRC3). This feeling could get stronger and could even escalate to a panic attack as indicated by one of the participants, "I get panic attacks. They hit me at any time during the day; they are a growing influence on my life. I become desperate to try to move something off my chest that won't go. I'm fighting for breath" (Mixed/MRC 3).

***Frustration/Disappointment.*** A few of the participants reported experiencing negative feelings and a lack of motivation to exercise due to the irreversible nature of their disease. A participant reported,

> You get frustrated to a very high degree. I've come home from work and I've played football with the kids and you know done all these things and suddenly you get to this point where you just cannot anymore and you feel as if it's the end of the road. (Mixed/MRC 3)

**Attitudes/perceptions.** The way people with COPD perceived their condition and their perceived ability to do something about it, defined their engagement in PA. This theme consisted of three subthemes: (a) learned helplessness; (b) underestimation of PA importance; and (c) older age perception.

***Learned helplessness***. A few participants spoke about not being in control of their condition. This feeling of being unable to change their situation, led them to believe that there was no point of engaging in PA. For instance, a participant said,

> If your lungs are scarred, they can do nothing about that, so it's a state of mind so you think well its done now, its too late you know, I'm not going to bother, my lungs are getting no better, but you wont get better so there's no big incentive. (Mixed/MRC 4)

***Underestimation of physical activity importance.*** A few of the participants undervalued PA and compared themselves to others who, although they exercised, were less healthy than themselves. This argument suggests that PA does not make any difference to their wellbeing and justifies why they believe there is no need for PA in their lives. For example, a participant said,

> I don't think they're any fitter. I have got a large circle of friends and a lot of them go to the gym. One is mad keen cyclist, he goes for miles and miles and as I say I don't do anything, but I'm the only one that don't take any pills, they're all on pills, blood pressure tablets, I am in better condition than they are (Newly diagnosed/MRC 1).

***Older age perception.*** A few participants perceived that exercise is not necessary in older age and supported their argument with the belief of not wanting to overdo it as you get older. There was a perception that PA is not appropriate after a certain age in life as indicated by one participant, "So why do we need to do all this exercising at our age now, I don't really think you can get a massive amount of benefit at our age. Younger people yes, but our age no" (Newly diagnosed/MRC 1).

**Motivation.** Having a reason to stimulate the desire for PA was an important factor that could determine PA and how it relates to the behaviour of people with COPD. One argument was having no motivation to engage in PA. This was discussed by a few of the participants and pinpointed a single theme, lack of drive.

***Lack of drive.*** This can be seen as one's inability to carry out exercise due to insufficient 'get up and go' or potentially a mental block that limits their self-belief in it being a worthwhile experience. One participant reported being unwilling to engage in PA as indicated by the quote below, "I can't motivate myself to do physical exercise. I've done it when I was younger, yoga and things like that but now, I just don't want to" (Newly diagnosed/MRC 2).

**Social barriers**

Social barriers can be seen as external influences that affected people's involvement in PA. This category consisted of two subthemes: (a) overprotective family members and (b) lack of time. (see Figure 2)

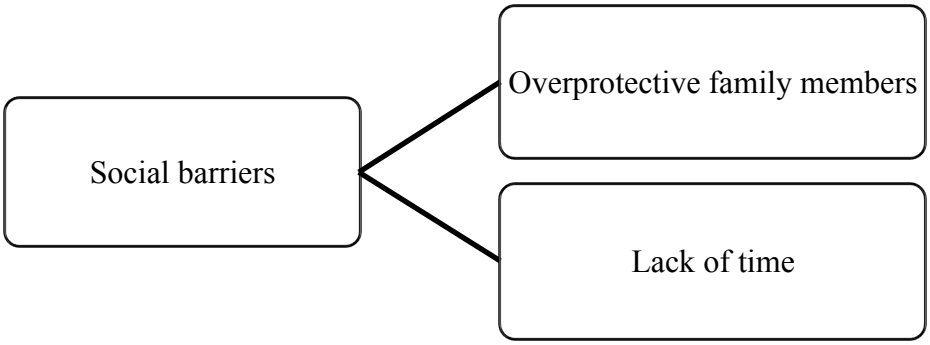


*Figure 2*. A conceptual framework of the social barriers of physical activity higher order theme.

**Overprotective family members.** This subtheme referred to the negative effect of social support. A few participants discussed having family members who do everything for them. The constant offer of help appeared to discourage COPD individuals from engaging in PA as indicated by the following participant, "My husband takes me everywhere and he does everything, he won't let me do anything though…It is a problem when somebody is over-protective" (Mixed/MRC 5).

**Lack of time**. Several participants perceived that there is not enough time in their day to engage in exercise. This can be seen as the case mostly for those individuals who were still employed, as their free time is limited. One employed participant reported, "If I didn't work so many hours then I'd have more hours to put aside for activity" (Employed/MRC 3).

**Personal enablers**

Personal enablers referred to factors that can motivate individuals with COPD to engage in PA that are under a person's control. This category consisted of five subthemes: (a) autonomous motivation; (b) controlled motivation; (c) attitudes/perceptions; (d) self-regulation; and (e) achievement. (see Figure 3)

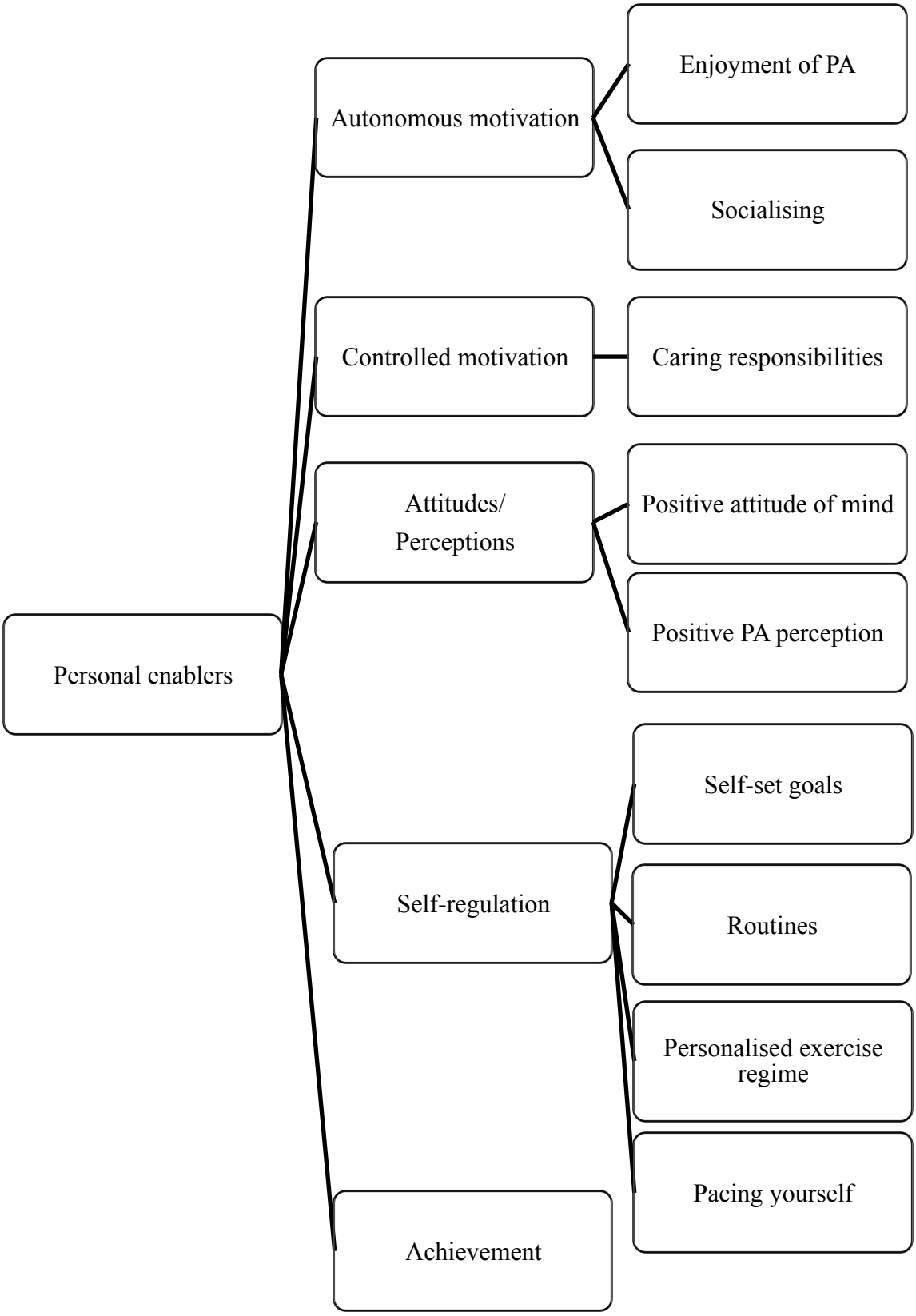


*Figure 3*. A conceptual framework of the personal enablers of physical activity higher order theme

**Autonomous motivation.** Many participants described pursuing PA because of personal interests and values reflecting autonomous motivation. This theme comprised two subthemes: (a) enjoyment of PA and (b) socialising.

***Enjoyment of physical activity***. One of the most frequently reported reasons for engaging in PA was the feeling of pleasure from engaging in PA. Almost all participants reported the importance of enjoying PA. For instance, a participant said, "While I'm doing it I'm in heaven, I'm on another planet, it make you relax" (Employed/MRC 1).

***Socialising.*** A few participants talked about the importance of meeting other people through engagement in PA. Thus, the social side of PA could motivate people with COPD to initiate PA and stay involved. For example a participant reported, "I'm motivated by the social side, the people I meet with or play. I'll play any sport just for the social side of it; yeah I do enjoy that, that's a motivation" (Employed/MRC 1).

**Controlled motivation.** Controlled motivation refers to feeling compelled to engage in a behaviour because of external influences. This theme consists of the single theme of having to take care of others.

***Caring responsibilities***. Many participants reported engaging in PA due to on-going obligations such as having to take care of another family member or a pet. In this instance there is not necessarily a want to carry out exercise but it comes out of a need to complete a task, as indicated by the following participant, "If it was just me on my own sitting there with the dog, the dog wouldn't go anywhere end of story. So there's an element of that as well" (Mixed/MRC 3).

**Attitudes/Perceptions.** People's opinions of COPD and how it affects them fundamentally influences their behaviour and therefore their ability to engage in PA. The perceptions of those with COPD about their condition could define their engagement in PA.

This theme was comprised of two subthemes: (a) positive attitude of mind and (b) positive PA perception.

***Positive attitude of mind.*** A few participants recognised the importance of normalising their condition and aiming for a regular life. Keeping a positive attitude about their condition helped them cope with the stresses and strains of the COPD, therefore having a more positive outlook on life. For instance a participant said, "It never affects me; I might as well not have COPD because I don't think I've got it" (Mixed/MRC 2).

***Positive physical activity perception.*** A person's belief that PA is beneficial can be aligned with their understanding that it will have a positive impact on their physical health and psychological wellbeing. Having positive outcome expectations could motivate individuals to participate in PA. One participant spoke of this as, "I think if you're improving your cardiovascular health overall PA is bound to help you to manage the symptoms of COPD" (Newly diagnosed/MRC 1).

**Self-regulation.** Self-regulation refers to the different strategies that people with COPD used to manage their symptoms and to control their behaviour. The aim of self-regulatory behaviour was to incorporate PA into their daily lives while adjusting to the nature of their condition. This theme comprised four subthemes: (a) self-set goals; (b) routines; (c) personalised exercise regime; and (d) pacing yourself.

***Self-set goals.*** Establishing a set of personal goals when carrying out PA can give motivation to not only meet targets but also give an added incentive to complete their goals that they may otherwise give up on. The majority of participants described setting their own goals for PA and having an incentive. For example, a participant stated, "I have the idea in my mind if its less than two miles or up to two miles I will walk rather than take the car or the bike" (Newly diagnosed/MRC 1).

***Routines.*** Establishing a habitual behaviour was an important strategy for many of the participants. Keeping a daily routine helped individuals with COPD to have some consistency in their lives as indicated by one of the participants,

> Over the years I got in the habit of getting out of bed at 6 o'clock in the morning, going downstairs, making me and my wife a cup of teas and taking it back again and then going down and repeating the exercise. So that's sort of a very early morning routine which is something I don't think I can give up because its part of my life which has to be done (Mixed/MRC 3).

***Personalised exercise regime.*** Identifying an exercise you feel comfortable doing was a way to facilitate initiation of PA. Recognising the individuality of each person was seen as an important aspect of incorporating exercise into their lives as stated by a participant, " I use my weights. Because I'm not walking, I'm not moving, I can do my exercises and I feel comfortable with that, I do it every day" (Mixed/MRC 4).

***Pacing yourself.*** Another way to deal with their breathlessness symptoms was to adopt a slower pace when engaging in PA. This strategy allowed them to rest and take a breath whenever they experienced symptoms that interfered with their ability to engage in PA. One participant reported pacing himself along the lines of,

> I do most of things that I used to do but I find that I do have to keep stopping because I get breathless with all the housework and things…I do try to do most things that I do just at a slower pace sometimes. (Employed/MRC 1)

**Achievement.** Getting positive reinforcement as a result of engaging in PA was an important facilitator that could motivate them to maintain PA. The majority of participants experienced feelings of satisfaction and fulfilment whenever they were able to set a goal and achieve it. Being able to physically stretch themselves made them feel better as indicated by a

participant "I'll go somewhere where there might be a bit of walking in it as well and I feel as though I've achieved something, which is great" (Employed/MRC 1).

**Social Enablers**

Social enablers referred to social and environmental factors that are somewhat beyond an individual's control and are summed up by the single theme of social support. (see Figure 4)

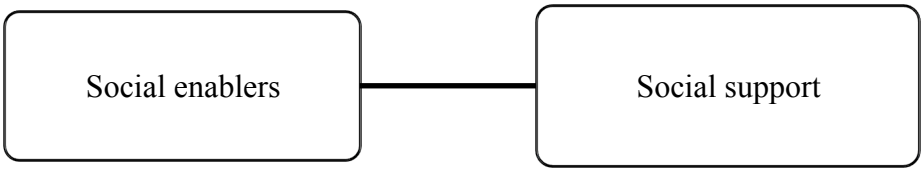


*Figure 4*. A conceptual framework of the social barriers of physical activity higher order theme.

**Social support.** Feeling understood and encouraged to be physically active from partners, friends and people with similar issues could motivate people with COPD to become more active. For instance a participant reported,

> I also think that support from family, i.e. your partner, husband, wife or whatever, is pretty important on a day-to day routine. My wife might say to me, nice day out, so you fancy taking the dog for a walk in the park…there's a backing there. (Mixed/MRC 3)

## Discussion

Although the factors that influence PA levels in COPD individuals have been the focus of past research, this is one of the few qualitative studies to focus on the barriers and enablers to PA in individuals with a range of severity levels of COPD in the primary care setting. Bandura's (1986) SCT was used to explain PA behaviour in a sample of middle-aged and older adults with COPD. Our study expands on past research by examining the reasons that

motivate and prevent COPD individuals to engage in PA (Hartman et al., 2013; Thorpe et al., 2014), and provides a new insight of how several contextual factors (e.g., disease severity, recency of diagnosis, employment status) can influence PA engagement.

According to SCT, barriers can play an important role when it comes to behaviour change (Bandura, 2004). Specifically, it has been suggested that the more barriers someone perceives, the less likely is for this person to engage in health behaviour change. In our study, the majority of the barriers to PA faced by individuals were related to the nature of their disease, but some of the perceived barriers were also related to motivation and self-efficacy. Consistent with SCT (Bandura, 1986), participants' confidence in their ability to cope with the challenges related to COPD, along with their outcome expectations, appeared to define their levels of engagement in PA.

While a few studies have focussed on the reasons that prevent COPD individuals from participating and adhering to pulmonary rehabilitation (Fischer et al., 2009), there is no research to date on the barriers of free-living PA. Understanding how to incorporate PA in daily life as a lifestyle change can be valuable in the design of interventions. Thus, it is important to differentiate between structured PA as part of pulmonary rehabilitation vs. unstructured daily life PA because different types of barriers might emerge. As it has been previously indicated, pulmonary rehabilitation is closely related to external barriers such as lack of time, lack of transportation, or issues specific to the programme (Thorpe et al., 2014). However, in the present study, lifestyle PA is related to more personal barriers that have to do with perceptions, attitudes and motivation towards PA. Given the complexity of COPD and the importance of engagement in PA in individuals with COPD, it is important to identify the unique needs of this population and design interventions that can help them overcome the barriers they face.

The results of this study partially support research that has been conducted with older adults (Grossman & Stewart, 2003), which suggests health problems can be a major barrier to regular PA. Similarly, individuals with COPD in our study discussed how their symptoms (e.g., breathlessness) influenced their ability to be physically active. Specifically, COPD individuals described the physical limitations they faced as a result of their condition, along with the associated negative feelings they experienced. These results coincide with previous research that has shown that individuals with COPD face health problems related to the nature of their disease that can influence PA participation (Thorpe et al., 2014). In contrast, healthy older adults appear to face slightly different barriers that are more or less under their control such as lack of time, adverse weather conditions, lack of exercise partner, financial constraints (Kosteli et al., 2016; Chapter 2).

In a previous study with COPD individuals (Hartman et al., 2013), weather was identified as one of the most important factors that could impact on breathing and influence health status. By comparison, in this study mobility problems were reported across all the groups representing a major barrier to PA. For instance, individuals with COPD reported having trouble with certain types of activities such as those conducted on an incline (e.g., walking up the stairs). Supporting the idea of having a personalised exercise regime, our findings suggest the importance of encouraging COPD individuals to begin with activities that they feel confident with before introducing more challenging activities.

Considering that COPD is an irreversible chronic disease, it is not surprising that it is accompanied by a negative psychological impact. Existing research on the psychological distress associated with COPD is limited and focuses mostly on clinical symptoms such as depression (Wagena, Arrindell, Wouters, & Van Schayck, 2005). Our study adds to the existing literature as it recognises the emotional impact of COPD as a major barrier to PA

engagement and provides a detailed account of the feelings individuals with COPD experience including feeling embarrassment and fear as a result of getting breathless. This is in line with previous research, which has indicated shame (Hartman et al., 2013) and fear (Lewis & Cramp, 2010) to be related to low levels of PA in people with COPD.

In past research with healthy older adults, fear of injury/falling has been shown to be among the top barriers to PA (Hill, Schwarz, Kalogeropulos, & Gibson, 1996; Lees, Clark, Nigg, & Newman, 2005). By comparison, the fear of getting breathless emerged as one of the main reasons for low PA levels in COPD. This might reflect lack of confidence in participants' ability to manage breathing difficulties when engaging in PA. As a consequence of the fear of getting breathless, individuals with COPD might abstain from engaging in PA as a way to avoid the discomfort associated with breathlessness.

Another unique theme that emerged in our study and reflects the negative psychological impact of COPD is frustration/ disappointment. This negative feeling indicates how difficult it is for individuals with COPD to come to terms with the fact that they are limited in the things they can do as a result of the nature of their condition. It is likely that disappointment is the result of experiencing loss of identity and autonomy while coming into terms with their disability (Lindgren, Storli, & Wiklund-Gustin, 2014) and how their condition is compared to what they used to do in the past. Providing appropriate support to individuals with COPD to adjust and acquire realistic expectations may result in experiencing less negative feelings.

Although several participants recognised PA as beneficial, many appeared to underestimate the value of PA and did not perceive it as necessary. Having neutral or low expectations that PA could lead to positive outcomes might explain why there was a negative attitude towards PA. This finding is consistent with research that identified outcome expectations to be an important determinant of behaviour change (Bandura, 2004). The

importance of outcome expectations was also reflected in the participants' beliefs of perceived control over their health. There were a few individuals who acknowledged their limitations and reported unwillingness to take action due to the irreversible nature of their disease. The belief that they have little control over their disease and that PA cannot make a difference can also be a sign of perceived lack of self-efficacy. Therefore, strengthening self-efficacy beliefs and cultivating positive outcome expectations can be an important initial target in interventions that aim at increasing PA in people with COPD.

While a number of barriers were reported, it is worthwhile examining the factors that facilitated engagement to PA. One of the most commonly referred facilitators of PA was enjoyment. This is in line with self-determination theory, which indicates that people who are intrinsically motivated are more likely to engage in PA (Deci & Ryan, 2000). Thus, picking activities that are pleasurable can be important while trying to encourage COPD individuals to become more physically active. Furthermore, this finding expands upon past research that has shown that individuals who enjoy PA are more likely to actually engage in the behaviour (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Similarly, in our study, COPD individuals reported being physically active when the activity was enjoyable. However, some COPD individuals reported engaging in PA because of an external reason. According to self-determination theory, controlled motivation is associated with less positive outcomes compared to autonomous motivation. However, it seems that COPD individuals find it useful when they have a reason to engage in PA. For instance, some individuals reported motivating themselves to be physically active because of having to keep up with grandchildren.

Another source of motivation in individuals with COPD was the social aspect of PA. Many participants reported engaging in PA with the purpose of meeting other people. Thus social interaction can be particularly important in people with COPD as they might feel

socially isolated (Jonsdottir, 1998). This is also reflected in their need for social support from their immediate environment. Social support has been identified as an important social-cognitive factor that can impact PA levels (Bandura, 2004).

It is important to note that this study comes with some limitations that can be addressed in future research. First, the majority of participants were suffering from mild to moderate COPD. This limits generalisability of the findings to individuals who suffer from severe COPD. Although, we cannot draw firm conclusions about the full spectrum of individuals with COPD, a broad range of perspectives were gained in the present study. Another limitation is the exclusion of people with mobility problems through holding the study at the university, requiring them to travel and move to the location. It is possible that people who did not volunteer to participate had more severe symptoms and mobility problems. These people might face different kind of barriers and need more support when it comes to incorporating PA into their daily lives.

Despite these limitations, this study is one of the only studies to examine the factors that prevent and facilitate engagement to PA in COPD individuals under a social cognitive perspective. The qualitative approach allows for an in-depth understanding of the beliefs that individuals with COPD hold when it comes to changing their health behaviour. The results emphasise the importance of self-efficacy beliefs in achieving health behaviour change and suggest that improving a patient's adherence to PA can happen by building up the participant's confidence. Consequently, those who feel confident that they can manage their symptoms and overcome the barriers associated with their condition are more likely to self-regulate their behaviour so as to incorporate PA into their daily lives. The confidence in their ability to self-regulate their behaviour might have more to do with their physical limitations, which are not under their control rather than their actual abilities to self-regulate. Moreover,

the perceptions that people with COPD hold about the importance of incorporating PA into their lives and the benefits associated with it can influence PA participation. COPD individuals are more likely to engage in PA when they expect more positive outcomes from PA and they believe it will improve disease management. Thus, interventions that are aiming to promote PA in individuals with COPD have to be carefully designed to address all the factors that can hinder their participation while at the same time focus on the factors that facilitate PA engagement. A potential intervention strategy that could possibly facilitate PA engagement in both healthy and unhealthy older adults is imagery. The next chapter is focussing on getting an insight into the use of imagery in healthy older adults.

# Chapter 4

## Exploring Imagery as a Technique for Promoting Physical Activity in Older Adults

## Exploring Imagery as a Technique for Promoting Physical Activity in Older Adults

Physical activity (PA) improves the quality of life of older adults by eliminating the risk of certain diseases associated with morbidity and mortality, such as cardiovascular diseases, diabetes, and cancer as well as promoting psychological well-being (Baker, Meisner, Logan, Kungl, & Weir, 2009; Reed & Ones, 2006; Pate et al., 1995; Weiss, Suzuki, Bean, & Fielding, 2000). Despite the significant health benefits of PA (Hogan, 2005), more than 60% of the worldwide adult population are not sufficiently active (World Health Organisation, 2003). According to the UK's Department of Health (2013), a large proportion of older adults are not reaching the minimum recommended amount of PA (i.e., 150 minutes of moderate-intensity PA per week or 75 minutes of vigorous-intensity PA per week), with PA rates generally lowering with increased age (Pate et al., 1995).

In light of the large portion of older adults who are insufficiently active, there is a need for suitable interventions to target this age group. One potential intervention technique is mental imagery, which involves the representation of an experience in one's mind without the presence of an actual stimulus and includes one or more senses (Moran, 2004). An example of imagery is when you lose your keys and you create a mental picture of when you last had them to retrace your steps to locate them. Although the majority of past research has focussed on imagery as a performance enhancing technique for athletes (Janssen & Sheikh, 1994), increasing attention has also been given to its use within an exercise setting (Giacobbi, Hausenblas, Fallon, & Hall, 2003). Exercise imagery refers to engaging in such images as being active, enjoying the workout, and achieving certain fitness outcomes from exercise behaviour (Hall, 1995). Hall (1995) was one of the first advocates of exercise imagery by suggesting that it may have a positive impact on motivation to exercise. This assertion has

been supported by more recent evidence that images of a lean and healthy body as well as feelings of energy and relief can boost motivation to engage in PA levels (Gammage, Hall, & Rodgers, 2000).

To more fully realise the potential role of exercise imagery for promoting PA, it is important to first understand its effective use within the targeted population; in this case older adults. A model for guiding research into exercise imagery as well as practical application, is the revised applied model of deliberate imagery use (RAMDIU; Cumming & Williams, 2012, 2013), a recent extension of the applied model of imagery use originally developed by Martin, Moritz, and Hall (1999). The RAMDIU focusses on deliberate imagery (i.e., carried out with a specific purpose in mind such as becoming more active), as opposed to the spontaneous or unintentional images that individuals can experience in everyday life (e.g., day dreams). The model applies to a variety of individuals (e.g., athletes, exercisers, dancers, rehabilitation patients) and is composed of the interacting components of why, what, how, who, when, and where, which are thought to explain whether imagery will facilitate the desired outcome(s).

A major component of the model is the function of imagery use, which corresponds to "why" exercisers use imagery. Consistent with Paivios' (1985) 2 (cognitive/motivational) x 2 (general/specific) conceptual framework, mental imagery serves similar functions for exercisers as it does for the athletes (Hall, 1995; Munroe-Chandler & Gammage, 2005). Cognitive reasons refer to using imagery to improve skills (specific), or strategies and routines (general), while motivational reasons refer to using imagery for functions such as but not limited to achieving certain goals (specific), increasing confidence (general), or for arousal-stress reduction (general). However, depending on the context of imagery use (e.g., rehabilitation), the functions of imagery are not limited to those proposed by Paivio (1985) (e.g., to manage pain and facilitate healing). Thus, regular exercisers may use imagery to

achieve a variety of outcomes such as to develop their skills, improve how they look, increase self-confidence, and achieve positive psychological outcomes (Gammage et al., 2000; Hausenblas, Hall, Rodgers, & Munroe, 1999).

Despite the popularity of exercise imagery and its apparent effectiveness at increasing or maintaining PA levels (Giacobbi et al., 2003), to our knowledge there has been no qualitative research that has investigated exercise imagery use in older adults. Hardy and Grogan (2009) indicated that one of the most important determinants of PA participation in older adults is to prevent health decline. It is therefore possible that the reasons for using imagery in older adults could reflect their motivation to exercise (e.g., health benefits). Future research should therefore examine the functions of exercise imagery use in the older adult population.

Another component of RAMDIU refers to the types of images exercisers use (i.e., the "what"). According to Hausenblas et al. (1999) exercise imagery is classified in three distinct types: 1) appearance imagery, which involves images of an improved physical appearance such as having a lean, fit, and healthy body; 2) energy imagery, which includes images of feeling increased energy and relief from stress; and 3) technique imagery, which includes images of learning and completing the exercise tasks correctly. This simple classification was later expanded to include other types of exercise imagery such as self-efficacy images and health-related images (Giacobbi, Hausenblas, & Penfield, 2005), relaxation images (Cumming & Stanley, 2009), exercise routine images (Giacobbi, Tuccitto, Buman, & Munroe-Chandler, 2010), enjoyment images (Stanley & Cumming, 2010a), as well as goal images (Chan & Cameron, 2012). Consequently, exercisers use a variety of imagery content.

According to the original model of applied imagery use by Martin et al. (1999), the type of imagery (the what) depends on the motivation of exercisers and what they want to

achieve. For instance, an individual who wants to become leaner is more likely to use appearance imagery. Consequently, it is assumed that the content of the images would match the purposes for using exercise imagery. However, according to RAMDIU, the content of images does not always reflect why individuals image. For example, one individual might use appearance imagery to motivate himself or herself exercise while another individual might use energy imagery for the same purpose. Thus, it is important to account for the interaction between "what" and "why" and identify the personal meaning associated with a certain image, as a wide range of images can be used to achieve the same outcome and vice-versa. For instance, an exerciser might use technique imagery either for skill improvement or for attaining confidence. Given the interaction between "what" and "why", it is important to identify what types of images and which functions would work the best for a particular individual.

Another important but usually overlooked component of RAMDIU focuses on "how" individuals experience images. This element of the model refers to characteristics of the imagery such as whether it is in real time, how long it lasts, whether it is from the front or the side, whether it is experienced by self or other, and the colours and sensory modalities involved. Middle-aged exercisers seem to use multisensory images, which are either positive or negative in nature and range from deliberate to spontaneous images. In regards to visual perspective, exercisers tend to use both an internal and external perspective with a preference to internal (Kim & Giacobbi, 2009). Despite these results, previous literature has not yet investigated in detail "how" older adults image. Information of this nature will be useful when creating personalised imagery interventions addressing the needs of older adults.

The "who" component of the RAMDIU describes characteristics of the individual such as gender, age, and level of PA that can impact upon the content, function, and

characteristics of imagery use (Cumming & Williams, 2012). Given the individual differences, the content and function of imagery is likely to vary not only among individuals of different ages but also amongst older adults themselves. Therefore, it is important to use a qualitative approach to examine whether the "who" component interacts with the other components of the model ("what", "why" and "how") and how this interaction affects the outcome and effectiveness of imagery.

Gender differences were previously found in a study conducted by Giacobbi et al. (2003; also see Cumming, 2008), with men reporting more technique imagery than women, and women reporting more appearance imagery than men. In older adults, there is a tendency for females to use more appearance imagery than males, but few gender differences have been found to exist (Milne, Burke, Hall, Nederhof, & Gammage, 2005). When compared to younger adults, older adults tend to report less appearance imagery but similar amounts of energy and technique imagery. Also in contrast to the pattern found in young adults, older adults report engaging in energy imagery the most and appearance imagery the least (Thøgersen-Ntoumani, Cumming, & Ntoumanis, 2012). This has not yet been examined using qualitative methods, as compared to the research done with younger and middle-aged adults (Giacobbi et al., 2003; Kim & Giacobbi, 2009).

Kim and Giacobbi (2009) were the first to qualitatively examine the imagery use of middle-aged adults. Similar to younger exercisers (Gammage et al., 2000), this population most commonly used exercise technique images, appearance images, and confidence enhancing images. However, middle-aged adults also used some additional types of images such as health outcome images, plan/strategy images, stress level images, and energy images. Some of the most commonly reported reasons for using imagery in middle-aged adults are to increase their confidence in achieving their goals, to reduce stress, and to motivate themselves

exercise (Kim & Giacobbi, 2009). However, it cannot be assumed that this will generalise to older adults. Future research would need to explore whether older adults use the same imagery content and for the same purposes as younger and middle-aged exercisers. It is possible that older adults use different types of imagery relevant to their needs and reflecting their motivation to engage in PA.

Age also interacts with PA levels to explain exercise imagery use; that is, younger and more active individuals report the greatest use of exercise imagery (Giacobbi, 2007). Indeed, a robust finding in this area has been that regular exercisers use imagery more often than non-exercisers (Gammage et al., 2000). Altogether, these individual differences suggest it is important for researchers and applied practitioners to factor in the characteristics of the exerciser when designing imagery interventions.

Another assertion of the RAMDIU is that imagery use varies according to the situation (i.e., timeframe and location). Previous research has indicated that regular exercisers employ imagery in a variety of settings (i.e., within or away from the exercise setting, in bed, in the car) and at different time points (i.e., prior, during, or after exercise, during the day or at night) (Giacobbi et al., 2003; Kim & Giacobbi, 2009). The timing and location of imagery can define imagery's effectiveness. Getting an insight on when imagery is being used is important as the reason why imagery is employed and the content of images may differ depending on the situation. Therefore, it is possible that "when", "why" and "what" interact. For instance, one image might be used before competition for preparation, while the same image might be used during competition for stress-reduction. In regards to "where", according to Holmes and Collins (2001), the more similar the imaged setting is to the actual setting, the more effective the imagery will be. When for instance imagery is employed to learn how to use exercise equipment at the gym, the imaged setting should include the gym

and the specific equipment. To date, there is no research on where and when older adult exercisers image and whether this is similar to younger aged exercisers.

Due to the scant amount of research surrounding the use of imagery with older adults to promote PA, the study in Chapter 4 was carried out to gain a comprehensive understanding of imagery use in this population. Using a qualitative approach, underpinned by the RAMDIU as a theoretical framework, the primary aim of this study was to explore the key propositions of this model (e.g., what, why, where and when), and their interactions. Particular emphasis was placed on how the "who" component (older adults) interacts with the "where", "what", and "why" older adults image. A further purpose of this study was to advance the imagery literature by examining if there are any differences in the patterns of imagery use in individuals who are sufficiently active and individuals who are insufficiently active. Understanding the interactions of the 4 W's and "how" in this population will help future practitioners to develop personalised imagery interventions appropriate for older adults.

## Methods

### Participants

The participants were 37 older adult males ($n$ = 20) and females ($n$ = 17) from a local community in West Midlands, UK. The participants ranged in age from 55 to 80 years ($M$ = 64.9) and represented a range of PA levels and retirement length. While a number of participants ($n$ = 26) reported engaging in moderate PA, there were some participants ($n$ = 11) who reported being insufficiently active, defined by the Department of Health (2013) as engaging in less than 150 minutes of moderate intensity PA a week. Thirteen were currently employed but were planning to retire within the next two years whereas 24 were already retired. While the majority of the participants ($n$ = 36) were Caucasian, one participant reported belonging to a mixed ethnic group.

**Procedure**

This study, as part of a larger project, was approved by the Ethical Review Committee at a major University in West Midlands, UK. The participants were recruited from the local community through flyers and by word of mouth. Seven focus groups lasting between 48 to 89 minutes were held, each consisting of 3-6 participants grouped mainly by their activity level and employment statuses. However, for practical reasons these groupings were somewhat flexible depending on the participants' self-reported PA levels as well as their availability. The first author moderated all of the discussions with the help of an observer who took notes.

At the start of each focus group, participants were given an information letter and then completed a consent form. They also provided demographic information on their age, gender, ethnicity, length of retirement, and PA level. The moderator outlined the study purposes, confidentiality and data management procedures, and the rules for engaging in a group discussion. White and Hardy's (1998) definition of imagery was provided to the participants to familiarise them with the concept and ensure that all participants perceived imagery in a similar way:

> Imagery, also referred to as visualisation, is an experience that mimics real experience. We can be aware of seeing an image, feeling movements as an image, or experiencing an image of smell, taste or sounds without experiencing the real thing. It differs from dreams in that we are awake and conscious when we form an image (p. 389).

The definition was followed by an example to further clarify what was meant by the term imagery (i.e., "An example of imagery is when you do not remember where you left your keys and in order to find them you create a mental picture of where you usually put your keys"). Participants were then asked to do a simple imagery exercise, which involved

imaging holding a lemon and incorporating all their senses. After the imagery exercise, the participants were debriefed to get a sense of their imagery ability and ensure they understood the concept of imagery (e.g., the participants were asked to talk about whether they were able to replicate the image of the lemon). The moderator then led the imagery focus groups by following a pre-defined set of questions. At the end of the focus groups, participants were given the opportunity to ask questions and make comments, and were thanked for their participation.

**Interview Guide**

A semi-structured interview guide was developed based on the RAMDIU with an emphasis on what, why, where and when the participants image (Appendix 4). The questions directed participants to think about their use of imagery in general, and in relation to PA. Follow-up questions and probes were used to further explore the experiences of participants who were familiar with imagery use, whereas less familiar participants to imagery were asked to think of ways that imagery could be used to help them be more physically active in retirement.

**Data Analysis**

Each focus group was audiotape recorded and transcribed verbatim, which resulted in 340 pages of double-spaced text. To protect participants' confidentiality, each participant was identified with a pseudonym. Following transcription, the data was organised in folders and sub folders in NVIVO version 10. A combination of inductive and deductive procedures was used to conduct a thematic analysis of the data (Frith & Gleeson, 2004). The aim was to make sense of the responses of the participants in relation to the overall research question (Braun & Clarke, 2006); in this case, to explore whether they use imagery for exercise related purposes. A deductive approach was initially followed trying to match themes arising from

the data with the RAMDIU. For example, when participants referred to reasons for imaging, their responses were coded in the dimension "why". However, themes that did not readily fit the model were also allowed to emerge inductively (Braun & Clarke, 2006). For example, the inductive analysis revealed unique conceptual subthemes within each higher-order theme. Instead of using previously identified categories of imagery (Giacobbi et al., 2010), the present study was therefore able to identify imagery types unique for older adults.

A critical realist perspective was adopted that espouses the belief that it is possible to gain insight into people's experiences through their accounts, but also that researchers have a role in constructing knowledge (Madill, Jordan, & Shirley, 2000). Furthermore, a post-positivism approach was adopted, which involves the researcher admitting the possible effect of biases on research (Clark, 1998). In this instance, it is important to acknowledge that the familiarity of the researchers with previous exercise imagery research might have caused anticipation of research findings. For example, the focus group interview guide was based on the RAMDIU, which may have influenced the interpretations of our results. Thus, even though the goal is to grasp the reality as objectively as possible, it is recognised that the researchers' perceptions about reality can have an impact on the findings (Ponterotto, 2005).

Based on the recommendations of Braun and Clarke (2006), the following steps were followed during the analysis: (a) familiarisation with the transcripts and generation of codes based on recurring words or topics; (b) discussion and comparison of codes with other researchers involved in the study; (c) creation of themes by classifying similar codes together (Ryan & Bernard, 2003); (d) a "devil's advocate" meeting with the other researchers to reach consensus on the final structure of the themes and subthemes; and (e) production of final report.

**Issues of Trustworthiness**

In the current study, a number of steps aligned with the critical realist and post-positivist standards of rigour were taken to establish trustworthiness (Creswell, 2007): (a) triangulation of the analysis was performed (Creswell & Miller, 2000) by using a variety of sources of information to analyse the data. Because of the involvement of three researchers in the analysis, the data were interpreted from different perspectives (Denzin, 1970) providing consistency throughout the analysis process; (b) a pilot focus group was used to establish credibility; (c) thick description (Tracy, 2010) was achieved by describing the participants in detail while direct quotes from the participants were provided to give context in the findings and credibility to the researcher's interpretations, allowing the readers to make their own judgments; and (d) peer debriefing was provided through regular research group meetings as a way to ensure credibility (Onwuegbuzie & Leech, 2007). These meetings took place while creating the interview guide, throughout the analysis stage by having multiple coders, as well as by getting support and exchanging ideas when interpreting the findings. Finally, prior to interpreting the results, the primary researcher, as part of researcher reflexivity (Thomas & Magilvy, 2011) disclosed their feelings, biases, and assumptions during this research in a self-reflective journal, while these assumptions were discussed during the group research meetings.

## Results and Discussion

The analysis identified five higher-order themes associated with imagery use: (1) who; (2) where and when; (3) why; (4) what; and (5) how. When appropriate, the interaction between the different components of the model is highlighted. The results reported below represent deliberate imagery use. Demographic information (e.g., activity level and gender)

complemented each quote as a way to give it context. Figure 1 is a representation of RAMDIU as it applies to the findings of this study.

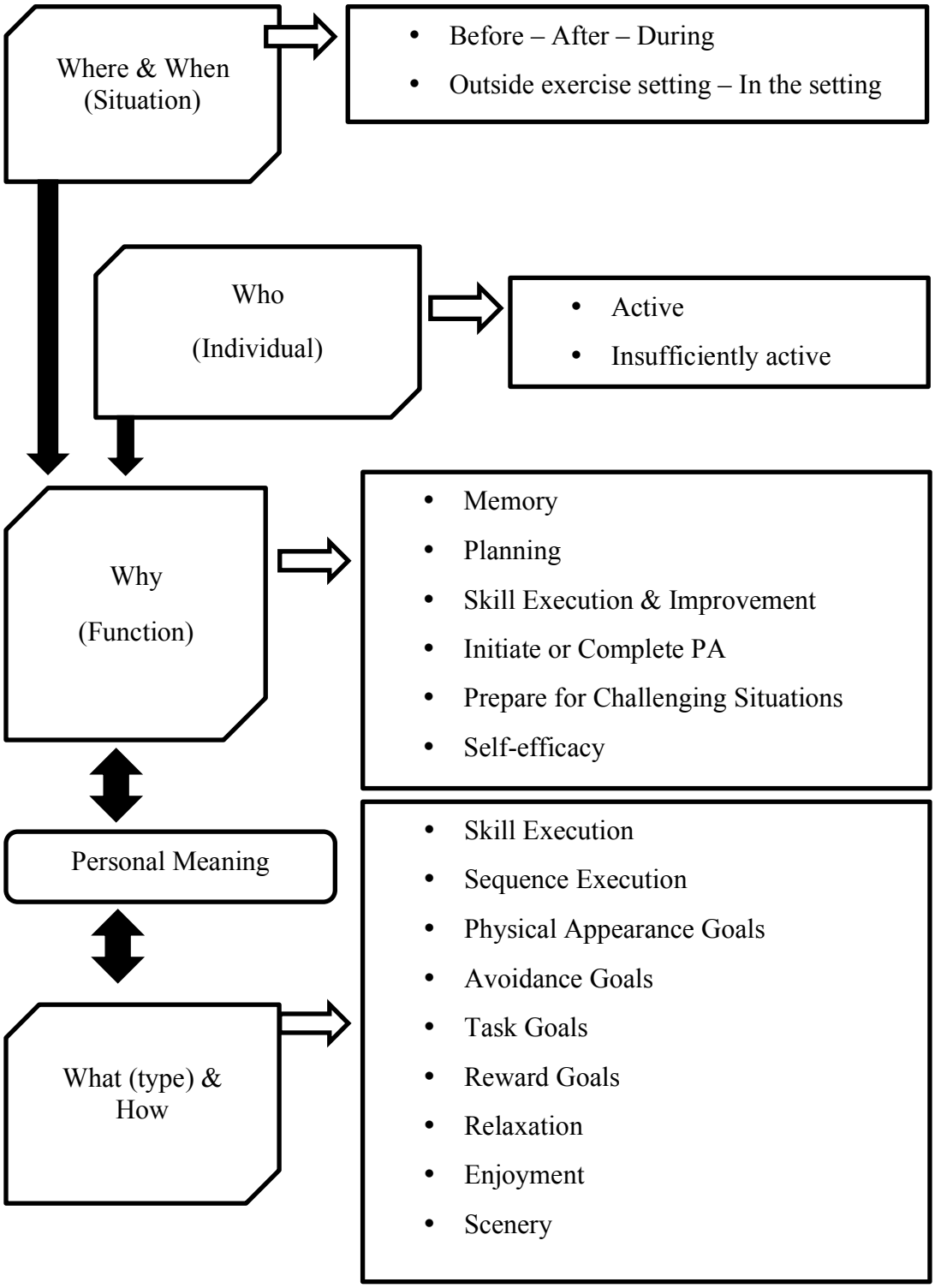


*Figure 1.* Revised applied model of deliberate imagery use

**Who**

The dimension "who" refers to characteristics of the individual that differentiated participants in terms of imagery use. Two subthemes emerged under "who": (a) participation and (b) familiarity with imagery.

**Participation.** This category has to do with who is doing the imagery and contains two dimensions: (a) imager and (b) observer. While the majority of the participants talked about their experiences using imagery, there were a few participants who described observing other people experiencing imagery. Although these people had not experienced imagery themselves, they had some vicarious experience. For example, one participant, who was aware that top athletes used imagery, described:

> You will normally see the top athletes before they get to the blocks, they're standing there and they are quite focussed, their eyes aren't closed, but you can almost see them imagining or seeing themselves and getting to the finishing line or whatever. (Active female)

Similarly another participant vicariously experienced imagery through watching a friend's son utilising imagery. He said: "We've got a friend whose son plays golf. He'll be in the garden swinging clubs and he's visualising his movements" (Active male).

**Familiarity with imagery**. A pattern of responses indicated a tendency for physically active individuals to report being more familiar with exercise imagery. They were able to describe their imagery use in more detail and seemed more open to the idea of using imagery for PA purposes as compared to insufficiently active participants. This finding supports previous research, which has shown that those who exercise regularly use more imagery than less frequent exercisers (Gammage et al., 2000; Giacobbi, 2007). However, less physically active individuals were less familiar with imagery as indicated by an insufficiently active

female, “Imagery is not something I use, hardly at all or I should say I don’t really understand it very well. It doesn’t come natural to me”. Our results suggest that older adults’ motivation to use exercise imagery reflects their motivation to be physically active. This finding should not be that surprising because insufficiently active individuals usually struggle with motivation, and the barriers they face tend to be more internal in nature (Kosteli, Williams, & Cumming, 2016; Chapter 2).

Many of the insufficiently active participants who initially reported not using imagery, nevertheless described spontaneous use of imagery in their daily lives or talked about possible applications of imagery as the focus group discussions progressed. It is possible that the focus groups provided a relaxed environment that allowed participants to reflect on their imagery use through interacting with others (Walden, 2012). Hearing others speak about their experiences with using imagery encouraged participants who were initially unfamiliar with the concept to try imagery for themselves, which further reinforces the idea that interaction with others is a strong methodological approach of conducting focus groups (Litosseliti, 2003).

The dynamic nature of the focus groups can bring to light viewpoints that would otherwise remain hidden (Farnsworth & Boon, 2010). The following quote is an example of an individual, who reported being unfamiliar with imagery but after listening to others talking about it, seemed to recognise its potential application to exercise and expressed a desire to try it in the future,

> I’m just thinking that yeah it would be worth a try. I just thought about the possibility of seeing myself going there and changing and enjoying the water and swimming and feeling the water supporting your body and so on, perhaps if I did think that for a

whole week perhaps every day, then perhaps the next week I might try it you know (Insufficiently active male).

These results suggest that imagery interventions are feasible with the older adult population, regardless of their level of PA. Furthermore, the findings suggest that it is important to account for "who is the messenger" of imagery interventions as peer supporters may be more effective at conveying information about the intervention. For instance, older adults exercisers who have previously used imagery might be more convincing on the effectiveness of imagery and could perhaps have a greater impact on imagery adoption.

**Where and When Older Adults Use Imagery**

Older adults reported using imagery more frequently right before they engage in PA rather than during or after the activity. For example, one participant described, "It's visualising before the event if there's maybe something coming up with folk dancing that I am nervous about getting right" (Active male). In support of RAMDIU, it appeared that people match the timeframe of their imagery use to its intended function. Highlighting the interaction between "when" and "why", the same participant referred to using imagery after engaging in folk dancing to review and correct any mistakes. He stated, "After an event if I was dancing and something went wrong in the dance". Thus, the same image can be used for different purposes at different times. Less frequently active participants referred to using imagery during the activity. For example, one participant reported imaging while doing yoga. She stated "I use that in yoga. I sometimes use it when I'm doing it actually" (Active female).

While the majority of the participants stated that they used exercise imagery away from the exercise environment (e.g., at home, at work, and in the car), there were still a few participants who used imagery while in the exercise location. For example, one participant

stated, “When you’re actually in the gym and doing something I think it can help” (Active female).

**Why**

The dimension why refers to the functions of older adults’ imagery, which constituted two categories: (a) motivational reasons and (b) cognitive reasons. Figure 2 represents a conceptual framework of the analysis for the higher order theme why.

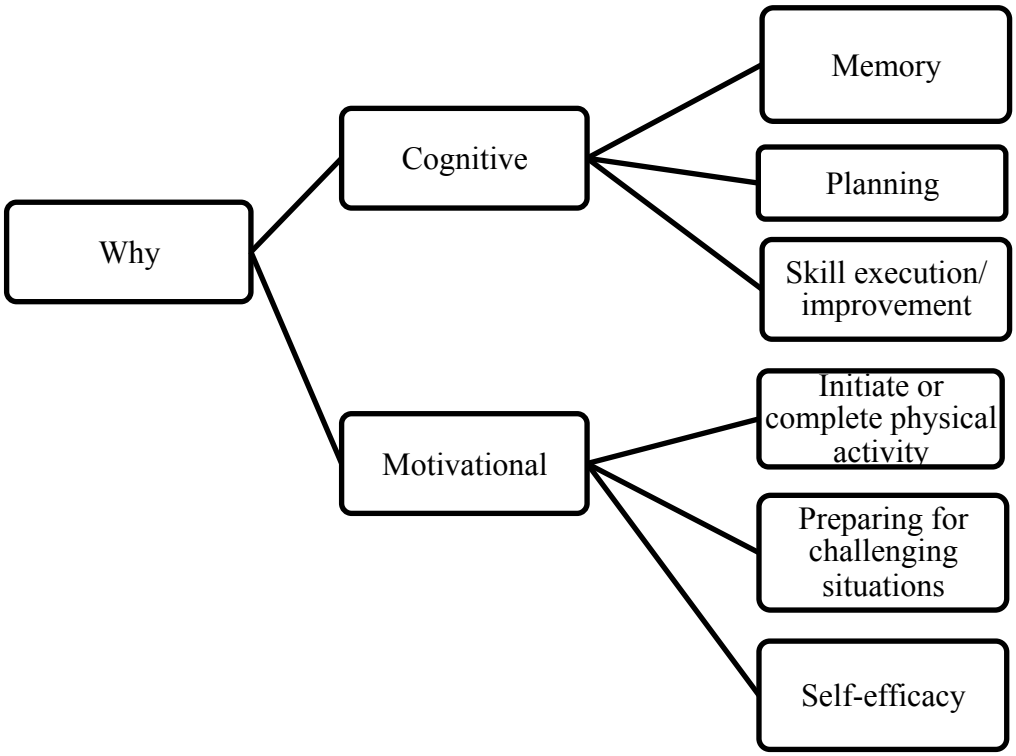


*Figure 2.* A conceptual framework of the reasons why older adults use imagery

**Motivational reasons.** Several participants used imagery as a motivator to exercise. This higher order theme consists of the following three subthemes: (a) initiate or complete physical activity; (b) preparing for challenging situations; and (c) self-efficacy.

***Initiate or complete physical activity.*** The majority of participants talked about using imagery before exercise to motivate themselves to initiate PA. For instance, one participant

shared the following experience, "I can think through that walk and think yes I will go, I'll pack my bag and I'll go. It motivates me to pack my sandwiches and get my flask and go" (Active female). However, imagery could also bring back memories from the past and could give older adults an incentive to do something that they have not done for years. For instance, a participant talked about motivating himself to exercise by recalling an activity that he used to do in the past, "Imagery could make me go back and do something I've done in the past, like I haven't been skiing for many years" (Active male).

***Preparing for challenging situations.*** A few participants talked about using imagery to overcome different types of barriers that prevented them from exercising. For instance, one participant reported using imagery to overcome bad weather, as reflected in the statement, "It gives a little bit of motivation towards going out into the pouring rain" (Active male). Another participant described using imagery to overcome fear, and concern for the unknown when she joins a new exercise class. She stated, "When I know I'm going to be doing something or going somewhere that I'm a bit concerned about, I try to see myself in the situation" (Active female). Similarly, one of the older females stated,

> I have used it when I was doing some dance exams because it's always a very difficult time. You're apprehensive and you're trying to imagine how it's going to be. It can be a form of preparation for what's to come.

***Self-efficacy.*** Several participants stated that imagery gave them confidence to achieve a goal, including attending an exercise class. For example, the participant who used imagery to prepare for challenging situations related to her dance class, reported having a secondary aim of gaining confidence, "You can think I'm quite comfortable now and I'll be like this and I'll be standing at the back of the class and it'll be alright. It's a form of comfort, it gives you a little bit of confidence" (Active female). This example reinforces a main

proposition of the RAMDIU that the same image may serve different purposes for the same individual. Other participants reported using imagery to become confident in sport related skills along the lines of, "If I use imagery I do feel more comfortable in my back hand" (Active male).

**Cognitive reasons.** This higher order theme consists of the following three subthemes: (a) memory; (b) planning; and (c) skill execution & improvement.

***Memory.*** Participants acknowledged the importance of employing imagery in regards to memorising steps in exercise classes or remembering. This was particularly true for the most physically active participants who engaged in activities such as folk dancing. A participant described using imagery in Tai Chi "to memorise the sequence of the movements" (Active female). Less active participants also recognised the importance of imagery to help them remember and trace back lost objects. One participant shared the following,

> If you lose things, you've got to retrace your steps in your mind where you've been and go backwards in time like and you might be able to work it back. I have actually used that to find things, which I didn't think I'd ever find. (Insufficiently active male)

***Planning.*** Some older adults reported using imagery in an exercise setting to plan their moves ahead of time, which is reflected in the following statement,

> In sport I used it when I was doing competitive 1500 metre runs and 800 metres. I'd have the race in my head, every 200 metres would be a different stage of the race for me. So you'd know how you were going to run and you changed the way you were going to run depending on what the others were going to do. So you imagined the race before you actually ran it. (Insufficiently active male)

***Skill execution & improvement.*** Even though not all the participants in this study were sufficiently active, more active individuals and/or those who were involved in a sport

referred to be using imagery to master sport-related skills. For instance, one participant reported, "I use it in some activities to achieve something which I probably wouldn't without it. It's usually yoga or not being able to jump back and… back to the front elegantly, with control" (Active female).

**What**

The dimension "what" includes the type of images older adults use; that is, the content of their images. This higher order theme consists of the following four subthemes (i.e., imagery types): (a) execution images; (b) goal images; (c) affect images; and (d) scenery images. Although some of the imagery types that emerged in the current study are similar to those referred by Kim and Giacobbi (2009) (e.g., physical appearance images, health images, plan/strategy images, relaxation images), older adults engaged in unique types of imagery to motivate themselves to exercise (e.g., reward images, avoidance images, and scenery images). Figure 3 represents a conceptual framework of the analysis for the higher order theme of "what".

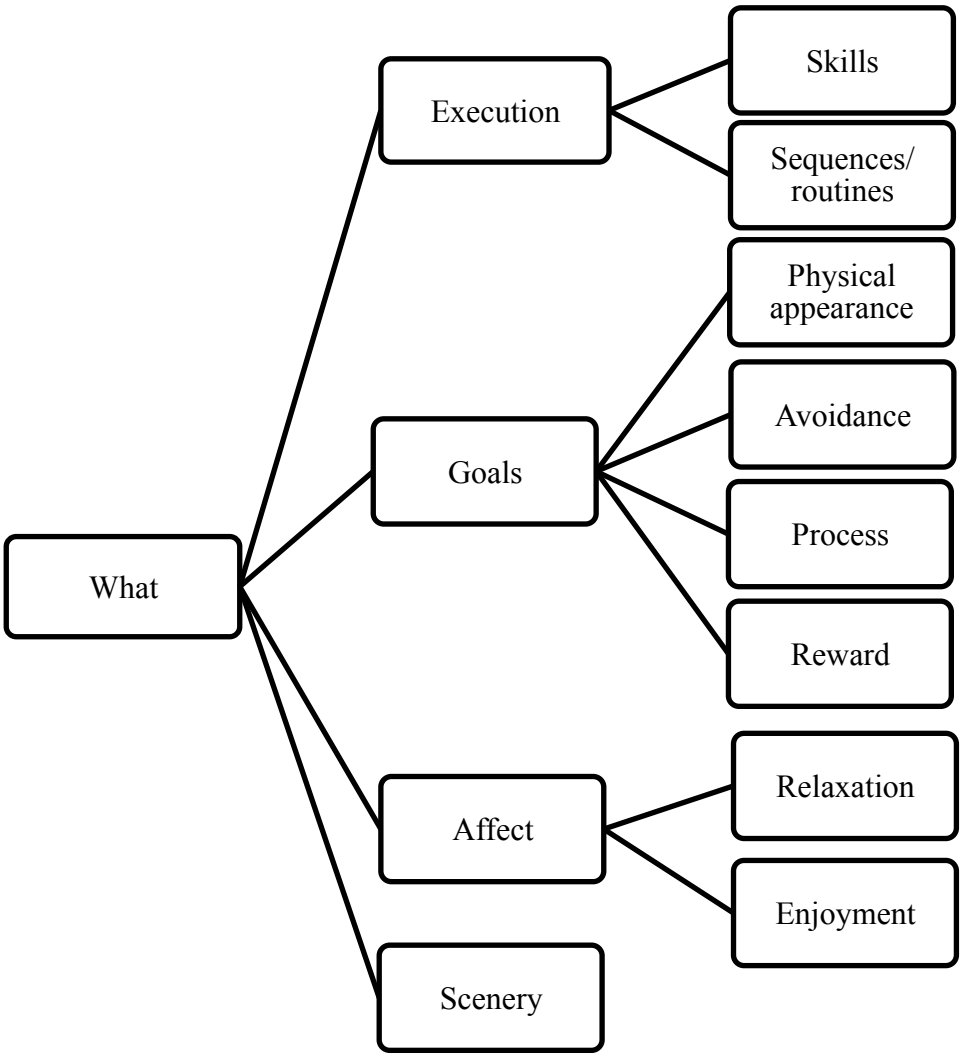


*Figure 3.* A conceptual framework of the type of images older adults use

**Execution images.** This higher order theme consists of the following two subthemes: (a) skill and (b) sequence/routine.

***Skill execution images***. Some participants reported imagining themselves executing certain sport-related skills with the aim of mastering them or for other reasons. These images are similar in nature to technique images that athletes use but rather than focusing on exercise movements they focus on specific skills (e.g., how to hold the racket). For instance, one participant used the same image for two different purposes. He stated,

> For me its badminton with my back hand. Before I go to badminton sometimes I'll try and imagine that because some of the players I play against thought that was my weakest area and if I don't get it right I don't win the game (Active male).

However, he also used the same skill execution image to boost his self-efficacy and feel more comfortable with his back hand, "If you imagine and play it through, then you're going to be better. And if I do that, I do feel more comfortable in my back hand". This example supports the assertion of the RAMDIU and suggests that the same imagery content can serve multiple functions, as well as further highlighting the interaction between "what" and "why" (Nordin & Cumming, 2005). The idea that skill execution images could serve dual functions (e.g., motivation to initiate PA and skill improvement) was expressed by several participants. Other individuals reported using skill execution images to master non-exercise related tasks. For example, one participant used imagery while learning to play a musical instrument. He stated, "I'm learning to play the ukelele very badly, so I do visualise about the chord structures and how my hands should be" (Active male).

***Sequence/routine execution images.*** Several participants indicated using images of the steps required to complete a certain exercise task. For instance, a participant described going through each step in folk dancing using imagery. He stated, "With folk dancing there may be a tricky sequence of steps and you try and work it out. You try to visualise where everybody else is supposed to be" (Active male). Another participant described his experience of using sequence imagery (what) to master a non-exercise related skill (why), relevant to his job as a pilot. Imagery was used in the initial stages of learning how the necessary skills. He said, "When I was learning to fly I used it, its very valuable, trying to land a plane, you know if you try to get the whole sequence in your head" (Active male).

This quote also demonstrates the interaction between "what" and "why" as older adults were found to use imagery within a range of activities.

**Goal images.** A commonly reported theme amongst participants were images concerned with exercise-related goals, which particularly focussed on the results older adults desired achieving. This theme was composed of four subthemes: (a) physical appearance; (b) reward; (c) avoidance; and (d) process.

***Physical appearance goal images.*** Participants reported experiencing images related to their desired physical appearance such as becoming thinner. For example, a participant imaged how she would like to look following weight loss, "Sometimes I've visualised that I've lost all my weight and I'm doing all sorts of things" (Insufficiently active female). Appearance images also included changes in musculature, "With my walking I think about the inner experience of the muscles toning up" (Insufficiently active female). Although physical appearance imagery was mentioned by a few of the participants, it was not the most frequently reported type of imagery. This is not surprising as incentives for exercise vary with age, with older adults focusing on improving their physical and mental health rather than appearance (Gill & Overdorf, 1994). These findings further reinforce the suggestions from Wesch, Milne, Burke, & Hall (2006) that older adults' motivation to exercise is less likely to focus on improving physical appearance.

***Reward goal images.*** Some participants indicated that they imaged themselves receiving a reward at the end of the exercise session in recognition of their achievement. Reward images could involve anything that provided a sense of satisfaction to older adults. For instance, one participant described imaging having a hot drink at the end of exercise. He stated, "Having the reward at the end of it perhaps of that sort of you know, a nice hot cup of tea when you come back" (Active male). Even insufficiently active participants recalled

motivating themselves by using reward images when they were more active. A participant commented on how he used imagery while participating in a race, "I was imagining this pasty[1] at the end of the race because by then I was starving" (Insufficiently active male).

***Avoidance goal images.*** Some participants discussed wanting to prevent a negative health outcome as a result of getting older. For example, one participant reported, "You might think of yourself either in a wheelchair or not being able to get upstairs, having to have a carer and the longer you keep that off the better" (Active male).

***Process goal images.*** A few participants talked about how they would carry out a given task. These images focussed on the process to follow for achieving goals rather than on the actual outcome. For example, one participant reported, "I imagined that my ball going exactly where I wanted it that over the tree and onto the green and it did" (Insufficiently active male). Similarly, another participant experienced process goal images in tennis, "About tennis you've got to visualise where you're going to serve it and where you're going to return it" (Insufficiently active male).

**Affect images.** Images of affect were related to mental health and psychological affect. This theme was composed by two subthemes: (a) relaxation and (b) enjoyment.

***Relaxation***. Several participants indicated that they experienced images of being calm and relaxed. For instance, one participant said, "I imagined myself that my blood pressure would remain calm and I'd be at peace" (Insufficiently active female). Another had similar images. He said "You go to your happy place and you're just calm and you can just feel yourself relaxing" (Active male).

***Enjoyment.*** Images of enjoyment were not as common as relaxation images but there were a couple of participants who referred to imagining their enjoyment of PA, "I just thought

[1] Baked pastry filled with meat, fish, or vegetables

about the possibility of seeing myself going there and changing and enjoying the water" (Active male).

**Scenery images.** The final type of images, mentioned by most participants, related to the scenery. These images referred to the physical place or general location where exercise would take place. These images support the assertion of Lang's bio informational theory (1977) about the importance of including stimulus propositions in imagery, referring to any details about the environment to be imaged. For example, a participant described, "For me it would be like thinking oh yeah I'm going to swim, I mean in the Mediterranean you know and it's going to be lovely and warm and sunshine and everything around me" (Insufficiently active male). This individual not only imaged the ideal exercise setting, but also used response propositions by imagining how it would feel to be there (e.g., it's going to be lovely). The combination of stimulus and response propositions can lead to more vivid imagery, which can be more effective (Lang, Kozak, Miller, Levin, & McLean, 1980). Similarly, another participant reported using scenery images (what) during a spinning class (where) guided by the instructor, highlighting the interaction between "where" and "what",

> In the spinning classes you've got an instructor and he is telling you're actually picturing this and you know come on push and he is telling about the greenery, all the scenery that you're seeing and that sort of motivates you. (Insufficiently active female)

Another participant described of imagining the natural surroundings (what) for motivational purposes (why), highlighting the interaction "what" and "why". She said, "If you want to go on a walk you could imagine the walk, the birds, the open spaces and that might actually make you want to do it more and actually go on the walk" (Active female). Overall, the results of the present study suggested that different types of imagery are better suited for individuals depending on their age, gender, or PA level.

**How**

The dimension "how" refers to imagery characteristics and consists of two categories: (a) senses and (b) direction. Figure 4 represents a conceptual framework of the analysis for the higher order theme.

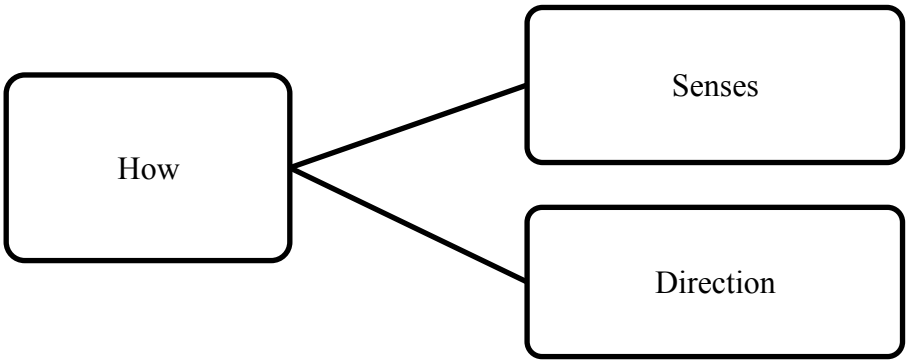


*Figure 4*. A conceptual framework of how older adults image

**Senses.** This category included the main sensory modalities involved when older adults image including visual, tactile, auditory, and olfactory sensations. The majority of the images tended to be mainly visual. One participant described, "I'm visualising, you're going to get dressed and you're going to go out and you're going to start running" (Insufficiently active male). However, some participants referred to kinaesthetic images. For example, one participant shared the following experience, "Sitting here I've just been visualising it, going through the feeling of skiing and I think perhaps I should go again this winter" (Active male).

**Direction.** This category consists of quotes describing whether the image is positive versus negative. A few participants described using negative health images to motivate themselves to exercise, reflecting an interaction between "what", and "why". For instance, a

participant said, "You might think of yourself either in a wheelchair or not being able to get upstairs, having to have a carer and the longer you keep that off the better" (Active male).

## General Discussion

Previous research on exercise imagery use in older adults has mainly been cross-sectional in nature (Wesch et al., 2006; Thøgersen-Ntoumani et al., 2012). To date, there is limited qualitative research on exercise imagery use and has mainly focussed on young (Giacobbi et al., 2003) or middle-aged adults (Kim & Giacobbi, 2009). This study is a unique contribution to the exercise imagery literature by being the first qualitative study to explore the imagery use of older adults. Underpinned by the RAMDIU, the study investigated the interactions among the different components of the model (where, when, why, and what), while drawing comparisons between physically active and insufficiently active individuals. The inclusion of individuals from a variety of PA levels allowed us to get an insight on a wide range of experiences and understand more about the content and the function of imagery of both physically active and insufficiently active individuals.

Findings from this study are promising in that older adults use exercise imagery to a great extent suggesting they would benefit from imagery intervention programmes. Similar to athletes and younger exercisers, older adults reported using imagery for both cognitive and motivational reasons (Hall, Mack, Paivio, & Hausenblas, 1998; Hausenblas et al., 1999). Thus, exercise imagery has the potential to become an effective intervention tool to motivate older adults to engage in PA, which in turn can facilitate healthy ageing and have tremendous public health implications.

A number of interactions emerged throughout the results. One of the most apparent interactions was between "what" and "why". The results confirmed the suggestion of the RAMDIU that the content of images is not always indicative of the function of images. Older

adults often use the same image for multiple purposes or a variety of images for the same purpose. Accounting for the personal meaning of images, practitioners can help older exercisers to find the right type of images that work for them and make sure they can serve the right purpose. The interaction of the "when", "what", and "why" components was highlighted in the results, as the same image was used for different purposes in certain time points. This further highlights the importance of accounting for the particular situation. The interaction of the "who" and "what" components is apparent due to different individuals using a variety of images to motivate themselves initiate PA. These results confirm a main assertion of the RAMDIU, that when considering the specific reasons or content of imagery, it is important to account for who is using the imagery. Individual characteristics of the imager such as age, gender, and PA level appear to impact both the function and the content of images used. For instance, what is motivational for an older adult might not be emphasised by young exercisers. Similarly, regular exercisers seemed to differ in their imagery use compared to insufficiently active individuals. The implication of this is that practitioners working with older adults might want to consider their PA level before designing an imagery intervention.

The interaction between "who" and the other model components indicate that it is important to personalise the interventions to make them individually tailored to the PA level of the individual. Customising interventions according to activity level should also consider the specific content being imaged. In the present study imagery content seemed to vary according to activity level of the participants. Specifically, physically active individuals reported using more skill execution images and sequence execution for cognitive reasons (e.g., planning, mastering and improving skills). Finally, the results indicated that older adults were not very descriptive when discussing how they imaged compared to what athletes

would describe – i.e., there was no mention of timing, colour/vividness. This finding suggests that their meta-imagery skills may need to develop further in order to fully benefit from an imagery intervention. According to MacIntyre and Moran (2009), layered stimulus response training could be used within this population to enhance their ability to image, as well as to increase their awareness of how they image (i.e., meta-imagery).

A limitation from this study is the use of self-reported PA as a way to classify participants in distinct focus groups. Although participants were screened at the beginning of the study and placed in different focus groups depending on their reported PA levels, there was a mixture of PA levels in each group as was revealed during the discussions. The PA levels reported in the initial screening depended on participants' definitions of PA. For instance, it is likely that those who defined PA strictly as going to the gym might have under-reported their PA levels, as they ignored their involvement in other lifestyle activities. Thus, it is possible that some physically active participants were placed in an insufficiently active group. Therefore, direct comparisons among groups may not be entirely accurate. As a way to tackle this issue, any comparisons between physically active and insufficiently active participants were based on their responses during the focus groups and not based on the classifications during the initial screening. Furthermore, future researchers may wish to consider the type of activity participants are involved in. A differentiation among those who reported walking as their main activity and those who involved in more physically demanding activities such as folk dancing and Tai-Chi could be useful in understanding more about imagery use in people from different activity levels.

Despite this limitation, the results of this study provided evidence that older adults differ in their imagery use compared to younger exercisers. Older adults engaged in some unique types of images (e.g., reward images, scenery images) and these images served

functions reflecting their needs (e.g., remembering, preparing for challenging situations). Furthermore, the results suggest that the RAMDIU can be a useful conceptual framework to better understand imagery use in older adults and further supports it's applicability for non-athlete populations in general. Findings can be used to inform the creation of personalised imagery scripts appropriate for this population. As it has been previously suggested, it is important to account for the five Ws (who, where and when, why, and what) when creating imagery scripts (Williams, Cooley, Newell, Weibull, & Cumming, 2013). Tailoring the content of imagery interventions to the outcomes older adults want to achieve for themselves, will ensure the effectiveness of the interventions. Future researchers might want to consider personalising their approach by providing an appropriate definition of imagery and instructions, as well as relevant examples according to the PA level of the participants. By considering the needs of this group, it is more likely for older adults to be able to relate to imagery and thus make a better use of it. After establishing the use of imagery in older adults, the goal of the next chapter is to examine the association of imagery and PA through social cognitive variables.

# Chapter 5

# Self-regulatory Imagery and Physical Activity in Middle Aged and Older Adults: A Social-Cognitive Perspective

# Imagery Use and Physical Activity in Middle Aged and Older Adults: A Social-Cognitive Perspective

Physical activity (PA) can prevent many of the negative outcomes associated with ageing such as bone loss, risk of cardiovascular disease, and arthritis (Shephard, 1997). It also induces many positive psychological outcomes such as improved mental health and mood (Sonstroem, Harlow, & Josephs, 1994). Despite its significant health benefits, the majority of older adults do not engage in sufficient levels of PA, and these levels continue to decline with age (Besson et al., 2009). Therefore, techniques to enhance PA in middle-aged and older adults are imperative to ensure healthy ageing. However, it is important to first understand the key determinants that influence PA behaviour in this population, and how techniques that can increase PA relate to the different determinants.

One of the most popular theories used to explain PA behaviour in middle-aged and older adults is social cognitive theory (SCT; Bandura, 1997), which refers to all the social and cognitive factors that determine human motivation. Some of the most popular social cognitive determinants include self-efficacy (belief in one's ability to engage in a particular task and achieve an outcome), barriers (factors that prevent individuals from being active), outcome expectations (benefits people expect from participation to PA), and self-regulatory behaviour (skills necessary to regulate behaviour). Rovniak, Anderson, Winett, and Stephens (2002) found that social cognitive factors accounted for 55% of the variance in PA in young adults. Similar results have been found in retired older adults with SCT accounting for 52% of the variance in PA (Schuster, Petosa, & Petosa, 1995). Thus, SCT appears to be an important framework to underpin interventions for promoting PA in middle-aged and older

adults. Each of the social-cognitive constructs influence PA behaviour to varying degrees, with self-efficacy being one of the strongest predictors (McAuley, 1993).

Previous research with middle-aged and older adults has indicated that overall increases in self-efficacy are associated with more engagement in PA (Conn, 1998). Specifically, feeling confident in one's ability to overcome exercise-related barriers, referred to as barrier self-efficacy, influences the frequency and the intensity of exercise participation in middle-aged and older adults (McAuley, 1992), as well as the number of barriers perceived, which is another social-cognitive variable. Studies show that there is a strong relationship between barriers and PA, with more perceived barriers related to lower levels of PA (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). This is especially true for older exercisers who tend to report low levels of PA because of the high number of barriers they face (Kosteli, Williams, & Cumming, 2016; Chapter 2).

Similarly, outcome expectations can be predictive of exercise behaviour, with higher outcome expectations related to higher levels of PA (Schwarzer & Fuchs, 1995). Expecting positive outcomes, such as health benefits, is thought to facilitate engagement in PA (Mathews et al., 2010). In a study with younger adults, Rovniak et al. (2002) found that outcome expectations did not directly predict PA and had a small total effect on PA. This finding is consistent with other research, which has shown that the relationship between outcome expectations and PA is primarily indirect through self-regulation (Ayotte, Margrett, & Hicks-Patrick, 2010). This indirect relationship could be explained by the fact that middle-aged and older adults are not likely to engage in PA if they do not have the strategies in place to self-regulate their behaviour (Bandura, 1997).

Self-regulation refers to the goals and plans older adults set to manage their behaviour. Consistent with previous research, self-regulation represents a combination of planning and

goal setting (Luszczynska, Diehl, Gutiérrez-Doña, Kuusinen, & Schwarzer, 2004) and can predict PA behaviour both directly and indirectly (Anderson, Wojcik, Winett, & Williams, 2006; Ayotte et al., 2010; Umstattd, Wilcox, Saunders, Watkins, & Dowda, 2008). These results indicate the importance of self-regulation as a strategy to enhance PA.

Self-regulation is possibly associated with PA through other PA correlates. An intrinsic and affective variable that could possibly mediate the relationship between self-regulation and PA is enjoyment, which can in turn directly predict PA (Salmon et al., 2003). In a recent systematic review, Rhodes and Kates (2015) indicated that experiencing positive feelings during exercise can predict future PA behaviour. Thus, enjoyment as an integral part of intrinsic motivation can facilitate involvement in PA (Wankel, 1993). Enjoyment has also been found to be associated with a variety of PA correlates, such as self-efficacy and goal setting (Rovniak et al., 2002). For instance, enjoyment of PA can influence the perceptions of competence for engaging in PA. However, research is still needed to determine whether enjoyment relates to social-cognitive variables such as self-regulation, as well as examining the interrelationships between these variables and PA.

More recently, Ayotte et al. (2010) investigated the relationship among the social-cognitive determinants of PA in a group of older adults. Self-efficacy expectations related to self-regulatory behaviour through their strong association with outcome expectations and perceived barriers. Specifically, higher self-efficacy was associated with more positive outcome expectations and fewer barriers to PA. Self-regulation can impact PA through self-efficacy in both younger and older adult populations (Dishman et al., 2005; Rovniak, et al., 2002; Umstattd et al., 2008). Higher self-efficacy is associated with more self-regulatory strategies, which in turn are associated with higher levels of PA. These results indicate that

when designing PA interventions, it is important to employ strategies that target these various social-cognitive factors.

A well-known intervention strategy to promote PA is imagery (Hall, 1995). Imagery is defined as the mental representation of an object, action, or psychological state in the absence of any external stimulus (Moran, 2009). For example, it could involve imagining yourself performing the exercises in an aerobics class and experiencing positive psychological outcomes such as feeling energetic. Previous research on exercise imagery has indicated that it can be an effective strategy to increase and/or maintain PA levels (Giacobbi, Hausenblas, Fallon, & Hall, 2003). For example, Chan and Cameron (2012) found that insufficiently active adults who imaged themselves being physically active reported higher levels of PA at the end of the intervention programme compared to before. Studies have also tried to explain how imagery leads to higher levels of PA by focussing on the concept of self-efficacy.

Imagery is a well-known source of self-efficacy that can increase motivation and influence PA behaviour (Hall, 1995). For instance, imaging oneself completing a workout can enhance one's confidence in their ability to overcome barriers to exercise such as bad weather or fatigue. Thus, imagery can boost self-efficacy (Duncan, Rodgers, Hall, & Wilson, 2011). Previous research found that participants had higher levels of barrier self-efficacy at the end of an imagery intervention (Weibull, Cumming, Cooley, Williams, & Burns, 2014). As a result of these increased efficacy beliefs through using imagery, individuals will be more likely to engage in PA (Cumming, 2008). Collectively, these results indicate that there is a relationship between imagery, self-efficacy and PA. However, research is now needed to examine the relationship between different types of exercise imagery and a fuller complement of social-cognitive variables in middle-aged and older adults.

Exercise imagery research to date has primarily focussed on appearance, energy, and technique imagery (Hausenblas, Hall, Rodgers, & Munroe, 1999). However, qualitative research suggests that older adults can also benefit from using other types of imagery to help them engage in PA (Kosteli, Williams, & Cumming, 2015; Chapter 4). For instance, middle-aged and older adults frequently used images of the goals they wanted to achieve (e.g., appearance, task, reward, and avoidance goal images). It is likely that goal images might have to do with the motivation of middle-aged and older adults to exercise. This is in support of previous research that has shown that goal-oriented imagery can be beneficial for increasing PA (Chan & Cameron, 2012). Similarly, goal-oriented imagery has been found to motivate individuals not only to pursue their goals but also to commit and extend more effort to achieve their goals (Schultheiss & Brunstein, 1999). Consequently, goal imagery likely represents part of the self-regulatory behaviour and is considered to be an important determinant of PA. Planning imagery is another component of self-regulatory behaviour that would also be worth investigating. Kosteli et al. (2016; Chapter 2) found that middle-aged and older adults value the importance of committing to an exercise routine and use planning to help them engage in PA (e.g., set a time to exercise). Based on the potential for self-regulation to promote PA in middle-aged and older adults (Purdie & McCrindle, 2002), a new type of imagery is proposed in the present study named self-regulatory imagery and consisting of planning and goal setting. To our knowledge, research has yet to investigate whether self-regulatory imagery can be an effective intervention tool to promote PA in middle-aged and older adults and examine the pathways through which this type of imagery is related to PA.

Therefore, the aim of the present study was to examine whether self-regulation imagery is related to middle-aged and older adults' PA through its relationship with social-

cognitive variables including self-efficacy, outcome expectancies, perceived barriers to exercise, self-regulatory behaviour, and affective states. Based on the existing literature, it was hypothesised that imaging setting goals and monitoring exercise behaviour (i.e., greater self-regulatory imagery use) would positively predict PA behaviour. It was also hypothesised that self-efficacy would mediate the relationship between self-regulatory imagery and self-regulatory behaviour while perceived barriers and outcome expectations would mediate the relationship between self-efficacy and self-regulatory behaviour. Furthermore, it was hypothesised that self-regulatory behaviour and enjoyment would mediate the relationship between imagery and PA. Understanding the relationship between self-regulatory imagery and other social-cognitive variables may lead to better insight on which variables to target when designing imagery interventions while at the same time provides evidence to support using self-regulatory imagery as a intervention tool for middle-aged and older adults.

## Method

### Participants

Three hundred and twelve male ($n$ = 168) and female ($n$ = 144) middle-aged and older adults ranging in age from 50 to 80 years ($M$age 59.73; $SD$ = 7.73) took part in the study. Most participants ($n$ = 296) were white with the remaining participants being Asian ($n$ = 6), from a multiple ethnic group ($n$ = 2), or choosing not to report their ethnicity ($n$ = 7). Participants represented a variety of education levels ranging from not attending high school to doctoral degree, and were from different socio-economic status with annual salaries ranging from £10,000 to more than £50,000. Participants also ranged from being employed (part-time = 36, full time = 134), unemployed ($n$ = 2), and retired ($n$ = 140) and had different perceptions about their health ranging from excellent ($n$ = 87), very good ($n$ = 128), good ($n$ = 79), fair ($n$ = 13), and poor ($n$ = 5).

**Measures**

**Demographic information**. Participants provided information regarding their age, gender, ethnicity, income, education, occupational status, and perception of health (Appendix 14).

**Imagery use.** For the present study, 12 items were developed to represent self-regulatory imagery (Appendix 15). Based on previous research that acknowledges self-regulation as a unidimensional concept consisting of planning and goal setting (Luszczynska et al., 2004), in the current study one imagery factor was originally developed with six items represented planning (e.g., "I imagine keeping to my plans for exercising") and six items represented goal-setting (e.g., "I imagine the exercise goals I have set"). Item wording was based on the format of the Exercise Imagery Inventory-Revised (EII-R; Giacobbi, Hausenblas, & Penfield, 2005), which assesses appearance-health, technique, self-efficacy, routine, and feelings exercise imagery. Similarly to the EII-R, responses to all items were made on a scale ranging from 1 *(never/rarely)* to 7 *(always)*. Prior to completing the items participants were provided with a description of exercise imagery similar to the one provided in previous qualitative studies (Giacobbi et al., 2003; Kim & Giacobbi, 2009);

> Imagery involves mentally seeing yourself exercising. The image in your mind should approximate the actual physical activity as closely as possible. Imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energised), staying focused (concentrating on an aerobic class and not being distracted), setting exercise plans/goals (e.g., imaging achieving a goal of losing weight), etc.

**Self-regulation.** Self-regulation was measured using the Exercise Planning and Scheduling Scale (EPS; Rovniak et al., 2002; Appendix 16) and the Exercise Goal-Setting Scale (EGS; Rovniak et al., 2002; Appendix 17). Similar to past research (Elavsky, Doerksen, & Conroy, 2012) a total self-regulation score was computed by taking the average of both scales with a higher score indicating higher self-regulation. The EPS and EGS each represent a 10-item scale assessing how participants plan and schedule PA (e.g., 'I schedule my exercise at specific times each week) and how they go about setting PA goals (e.g., 'I usually set dates for achieving my exercise goals') respectively. Participants indicate how well each item describes them on a 5-point Likert-type scale from 1 (*does not describe me*) to 5 (*describes me completely*). Both questionnaires are valid and reliable measures of self-regulation (Elavsky el al., 2012).

**Outcome expectations.** The Outcome Expectations for Exercise Scale (OEES; Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000; Appendix 18) is a 9-item scale on which participants indicate how they feel about exercise by rating how strongly they agreed with each of the nine positive outcomes of PA (e.g., 'makes me feel better physically'). Responses are made on a 5-point Likert-type scale (1 = *strongly disagree*, to 5 = *strongly agree*). After certain items are reversed, responses are averaged across the 9 items so that a higher score represents greater outcome expectancies. The OEES is a valid and reliable measure of outcome expectations (Resnick et al., 2000).

**Barriers**. The Perceived Barriers to Exercise (PBE; Salmon et al., 2003; Appendix 19) is an 18-item scale on which participants rate how much certain barriers (e.g. cost, age, lack of time) prevent them from engaging in PA. Responses to each barrier are made on a 5-point Likert-type scale (1= *is not a barrier* to 5 = *very much a barrier*). Responses are

averaged across the 18 items so that a higher score indicates greater barriers to exercise. This PBE is a valid and reliable measure (Salmon et al., 2003).

**Barriers self-efficacy.** The 13-item Barriers Specific Self-Efficacy Scale (BSSES; McAuley, 1992; Appendix 20) assessed participants' belief that they could exercise three times a week for the next three months in the face of certain barriers (e.g., bad weather, pain, tiredness). Responses to the items ranged on an 11-point scale from 0% (*not at all confident*) to 100% (*very confident*). Items were averaged so that a higher score represented a higher barrier efficacy. The BSSES is a valid and reliable measure (McAuley, 1992, 1993).

**Interest-Enjoyment.** The Interest-Enjoyment Subscale from the Intrinsic Motivation Inventory (IES; Ryan, 1982; Appendix 21) is a 7-item scale, which assesses participants' enjoyment of exercise participation. Participants indicate how much they agree or disagree with each statement on a 7-point Likert-type scale ranging from 1 (*not at all*) to 7 (*extremely*). Responses are averaged so that a higher score indicates greater enjoyment. The IES is a valid and reliable measure of enjoyment (McAuley, Duncan, & Tammen, 1989).

**Physical activity.** Participants' PA levels were assessed with the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003; Appendix 22). Participants reported how often in the last week they engaged in walking, moderate, and vigorous PA for at least 10 min. A metabolic equivalent (MET) score was calculated using the following equation: [3.3 * walking minutes * walking days] + [4.0 * moderate-intensity activity minutes * moderate days] + [8.0 * vigorous-intensity activity minutes* vigorous-intensity days]. The IPAQ has been identified as a valid and reliable measure of PA in 12 countries with good psychometric properties (Booth et al., 2003).

**Procedures**

After ethical approval from the University where the authors are based, participants were recruited through word of mouth, posters, and social media. Individuals interested in participating in the study were provided with an information sheet outlining the nature of the study and were given the opportunity to ask questions. They were informed that participation was voluntary, they were free to withdraw at any time without giving reason, and their confidentiality would be maintained. Participants willing to participate provided written consent and their contact information (address or email) so that they could receive a questionnaire pack. Participants then completed either a hard copy or electronic copy of the questionnaire pack (depending on their preference), which took no longer than 30 minutes. Completed hard copies were returned to the researcher in a prepaid envelope. All participants were thanked for their participation.

**Data Analysis**

Data were screened for missing values and outliers according to the recommendations of Tabachnick and Fidell (2001). Univariate and multivariate normality (i.e., skewness and kurtosis) was then examined. An exploratory confirmatory factor analysis (CFA) using AMOS 22.0 (Arbuckle, 2012) with the bootstrapping technique was then conducted to determine the factor structure of the self-regulatory imagery items. The chi-squared likelihood statistic ratio ($\chi^2$; Jöreskog & Sörbom, 1993) was used to test the model's overall goodness of fit along with other commonly reported fit indices (SRMR, TLI, CFI, and RMSEA) following Hu and Bentler's recommendations (1999). To determine acceptable model fit the following guidelines were followed: (a) Standardised Root Mean Square Residual (SRMR; Bentler, 1995) values of $\leq$.08; (b) Root Mean Square Error of Approximation (RMSEA; Kline, 2011) values $\leq$.06; and (c) Comparative Fit index (CFI;

Browne & Cudeck, 1992) and Tucker Lewis Index (TLI) values close ≥.95. Problematic items were removed in a step-by-step process to improve the model fit by examining the modification indices and factor loadings of subsequent analysis. Once the final set of imagery items had been established, means, standard deviations, internal reliabilities, correlations, and multicollinearity of all study variables were established. Separate 2 gender (male, female) × 3 age groups (50 to 61, 61 to 71, 71 to 80) factorial ANOVAs were then conducted to examine any differences in any of the study variables.

To test the hypothesised model, driven by SCT, path analysis was conducted using AMOS 22.0 software and the same model fit criteria as described above. To conduct structural equation modelling (SEM) it is necessary to account for the ratio of indicators to latent variables (Westland, 2010) and to have at least 5-10 cases for each parameter (Kline, 2011). However, because of the model complexity (including a large number of parameters in the model), the sample size was deemed insufficient and path analysis was selected as a more appropriate analytical approach over SEM (Loehlin, 2004). As a way to assess the indirect effects and establish whether mediation exists, bootstrapping approach was followed (Preacher & Hayes, 2008). Mediation analysis was conducted based on the recommendations of Hayes (2013) for testing indirect effects. Bootstrapping of 2000 samples was used as it has been recommended to provide more accurate confidence intervals (Efron & Tibshirani, 1994). To control for age and gender, these variables were entered into all path analyses.

## Results

### Missing Data and Outliers

There were no variables with > 5% missing values. Overall, 0.9% of the data were missing. Little's missing completely at random (MCAR; Tabachnick & Fidell, 2001) test was non significant ($\chi^2 = 392.87$, $df = 377$, $p > .05$), indicating that there was no significant

deviation from a pattern of values that are missing completely at random. Nine cases were deleted because of missing an entire measure or most of a measure. Missing values in the remaining cases ($N = 303$) were imputed using the expectation maximisation (EM) algorithm (Enders, 2006). Two multivariate outliers were identified ($p < .01$) using Mahalanobis distance as well as two univariate outliers ($z > 3.29$). Thus the four outliers were removed from the dataset leaving a final sample of 299 participants.

**Confirmatory Factor Analysis**

The aim of the exploratory CFA was to identify the best set of items representing the unidimensional concept of self-regulatory imagery. When examining the factor structure of the 12 imagery items, the single factor solution yielded an adequate fit to the data, $\chi^2$ (54) = 298.03, $p < .001$, CFI = .93, TLI = .91, SRMR = .04, RMSEA = .12 (90% CI= 0.11 - 0.14). Inspection of the modification indices revealed two problematic items, which were deleted. The second and third run factor solutions were improved but highlighted 3 problematic items as illustrated by the modification indices and thus removed. In the fourth run, a 7-item single factor solution yielded a much improved fit to the data, $\chi^2$ (14) = 37.896, $p = .001$, CFI = .99, TLI = .98, SRMR = .02, RMSEA = .08 (90% CI= 0.08 - 0.10). However, the factor loading of one item was lower than the recommendations and was deleted from the model (Hair, Black, Babin, Anderson, & Tatham, 2006). In the fifth and final run, an adequate fit to the data was established for the 6-item one-factor model consisting of three planning items and three goal items, $\chi^2$ (9) = 23.36, $p = .005$, CFI = .99, TLI = .98, SRMR = .02, RMSEA = .07 (90% CI = 0.04 - 0.11) with all factor loadings, modification indices, and standardised residuals within acceptable limits and no offending estimates existed in the data (Hair et al., 2006).

**Descriptive Statistics, Intercorrelations, and Multicollinearity**

Mean, standard deviations, alpha coefficients, and bivariate correlations are reported in Table 1. All the variables were found to be internally reliable ($\alpha \geq 78$). Multicollinearity was not considered to be an issue due to correlation coefficients between the imagery subscale and the other study variables ranging from low to moderate (all < .07). Moreover, none of the variables has a condition index of above 30 and a Variance Inflation Factor of above 3.

Table 1
*Means, Standard Deviations, Alpha Coefficients and Correlations matrix*

| | 1 | 2 | 3 | 4 | 5 | 6 | α |
|---|---|---|---|---|---|---|---|
| 1. Self-regulatory imagery | 1 | | | | | | 0.94 |
| 2. Self-efficacy | .29** | 1 | | | | | 0.83 |
| 3. Barriers | -0.05 | -.36** | 1 | | | | 0.88 |
| 4. Outcome expectations | .52** | .36** | -0.27 | 1 | | | 0.94 |
| 5. Self-regulation | .59** | .50** | -.29** | .56** | 1 | | 0.78 |
| 6. Interest-Enjoyment | .49** | .50** | -.35** | .71** | .63** | 1 | 0.94 |
| 7. PA | .22** | .24** | -0.2 | .23** | .30** | .36** | |
| Range | 1-7 | 0-100 | 1-5 | 1-5 | 1-5 | 1-7 | |
| *M* | 4.03 | 60.76 | 1.92 | 4.03 | 2.63 | 5.12 | |
| *SD* | 1.61 | 21.00 | 0.53 | 0.53 | 0.90 | 1.42 | |

**Factorial ANOVAs**

Results of the 2 gender × 3 age group factorial ANOVAs revealed there was a significant main effect of age on imagery, $F(2, 293) = 4.18$, $p < .05$, $\eta_p^2 = .03$, self-efficacy $F(2, 293) = 7.02$, $p < .01$, $\eta_p^2 = .05$, outcome expectations, $F(2, 293) = 9.21$, $p = .00$, $\eta_p^2 = .06$, self-regulatory behaviours, $F(2, 293) = 6.60$, $p < .01$, $\eta_p^2 = .04$, and enjoyment, $F(2,293) = 6.27$, $p < .05$, $\eta_p^2 = .04$.

In an effort to classify participants into meaningful age categories, three life-stage subgroups were created; young-old (i.e., 50-60), middle-old (i.e., 61-70) and older-old (i.e., 71-80) (Bytheway, 2005; Hinrichsen, & Molinari, 1998; Neugarten, 1974). Post-hoc analyses revealed that individuals aged 50-60 years old reported greater self-efficacy ($M = 63.69$, $SD = 1.59$), more positive outcome expectations ($M = 4.13$, $SD = 3.92$), and self-regulated their behaviour more ($M = 2.76$, $SD = .07$) than those aged 61-70 years (self-efficacy: $M = 54.04$, $SD = 2.03$; outcome expectations: $M = 3.92$, $SD = .05$; self-regulation: $M = 2.49$, $SD = .08$). Also, individuals aged 50-60 years old reported significantly greater imagery use ($M = 4.30$, $SD = .12$), more positive outcome expectations ($M = 4.13$, SD = 3.92), self-regulated their behaviour more ($M = 2.76$, $SD = .07$), and enjoyed PA significantly more ($M = 5.33$, $SD = .11$) than those aged 71-80 years old (imagery use: $M = 3.46$, $SD = .28$; outcome expectations: $M = 3.75$, $SD = .09$; self-regulation: $M = 2.20$, $SD = .16$; enjoyment: $M = 4.50$, $SD = .26$).

With regard to gender differences, the factorial ANOVAs revealed there was a significant main effect for self-efficacy, $F(1, 293) = 3.8$, $p < .05$, $\eta_p^2 = .01$, self-regulatory behaviour, $F(1, 293) = 3.91$, $p < .05$, $\eta_p^2 = .01$, and PA, $F(1,293) = 7.09$, $p < .01$, $\eta_p^2 = .02$. Post-hoc analyses revealed that males reported significantly higher self-efficacy ($M = 61.75$, $SD = 55.8$), self-regulated their behaviour more ($M = 2.61$, $SD = .10$) and were significantly more physically active ($M = 6013$, $SD = 493$) than females (self-efficacy: $M = 55.8$, $SD =$

1.92; self-regulation: $M = 2.35$, $SD = .83$; PA: $M = 3944$, $SD = 600$). There were no main effects for gender or age in perceived barriers nor were there any age × gender interactions for any of the variables. Based on these results, age and gender were included as control variables in the subsequent path analyses.

**Path Analysis**

In accordance with our hypotheses, regression paths were drawn from self-regulatory imagery to all social-cognitive variables. These relationships are presented in Figure 1. The arrows represent the direction of the relationships and the signs indicate whether it is a positive or negative relationship. Specifically, direct regression paths were drawn from self-regulatory imagery to barriers, self-efficacy, outcome expectations, self-regulation, enjoyment and PA. Direct regression paths were added from self-efficacy to both barriers and outcome expectations as well as from barriers to self-regulatory behaviour and from outcome expectations to self-regulatory behaviour. Finally, a direct regression path was added from self-regulatory behaviour to PA and enjoyment. To control for age and gender, regression paths were also drawn from both variables to all the observed variables.

The hypothesised model showed acceptable model fit, $\chi^2$ (5) = 20.77, $p = .001$, by some indicators including CFI = .98 and SRMR = .03. However, two commonly used indicators had poor model fit; that is, TLI = .86 and RMSEA = .10 (90% CI= 0.06 - 0.15). Inspecting the regression weights indicated that the paths from self-regulatory imagery to both barriers ($p = .415$) and enjoyment ($p = .177$), as well as the path from self-regulatory behaviour to PA ($p = .268$) were non significant and thus removed from the model. These non significant relationships are represented with dashed lines in the final model in Figure 1. A large modification index also suggested inserting a direct path from barriers to outcome expectations. This path was added based on research that supports barriers being inversely

related to benefits of PA (El Ansari & Phillips, 2004; Vaughn, 2009). Thus it was expected that individuals who perceive more barriers to PA would have less positive outcome expectations. This relationship is represented with a dotted line in the final model in Figure 1. The paths from age to self-regulatory behaviour ($p$ = .065), enjoyment ($p$ = .630), and PA ($p$ = .369) were also removed from the model due to being non significant. Finally, the paths from gender to barriers ($p$ = .908), outcome expectations ($p$ = .069), enjoyment ($p$ = .177) and PA ($p$ = .105) were also non significant and removed from the model.

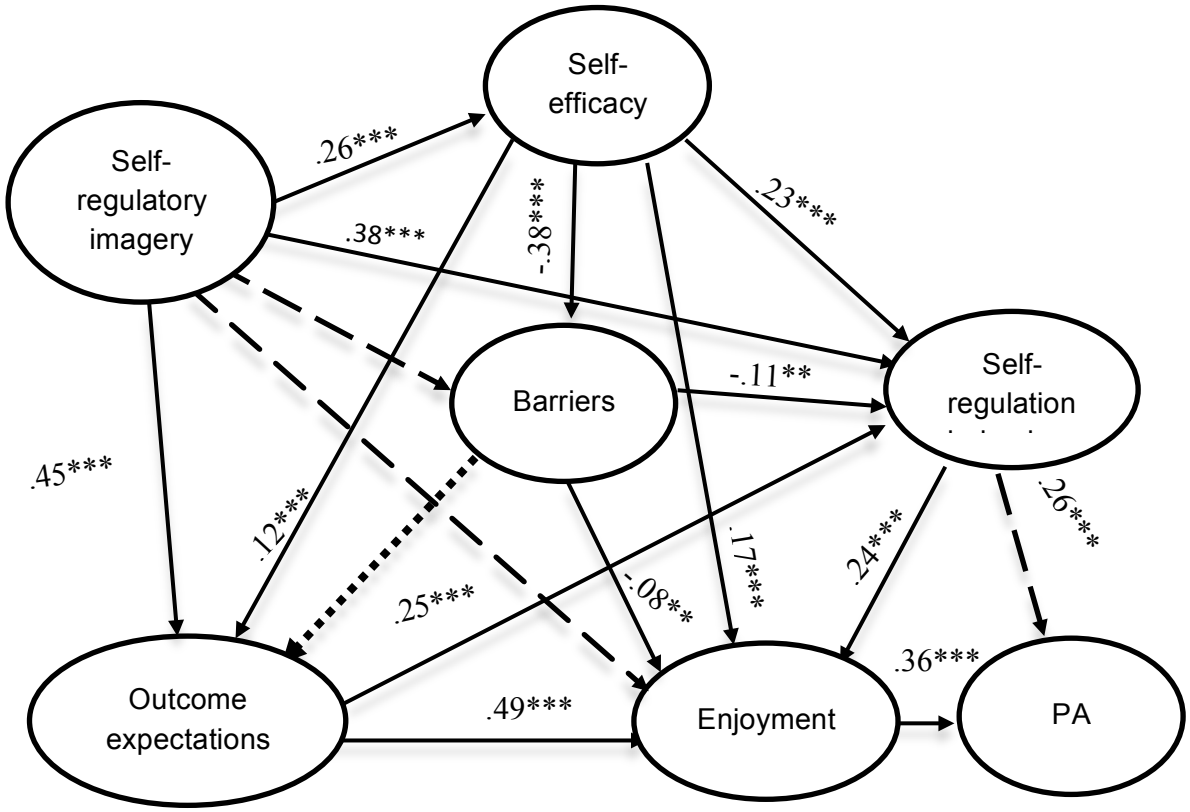


*Figure 1*. Hypothesised and final model predicting physical activity. Note. Dashed lines were non significant and were removed from the final model. The dotted line was not part of the original model but was added in the model later. For visual simplicity age and gender control variables are not presented in this model. All coefficients are standardized. * p < .05, ** p < .01, *** p < .001

After making these changes, the second model provided a very good fit to the data, $\chi^2$ (13) = 18.87, $p$ > .05, CFI = .99, TLI = .98, SRMR = .03, RMSEA = .04 (90% CI< 0.01 - 0.07). Inspecting the regression weights indicated that the path from self-regulatory behaviour to PA remained non significant ($p$ = .205) and was removed from the model. The final model revealed a similar fit to the data to the second model, $\chi^2$ (14) = 21.76, $p$ > .05, CFI = .99, TLI = .97, SRMR = .03, RMSEA = .04 (90% CI < 0.01 - 0.08).

**Direct and indirect effects of self-regulatory imagery.** Self-regulatory imagery directly predicted self-efficacy (βdirect = .26, $p$ = .001), outcome expectations (βdirect = .45, $p$ = .001), and self-regulatory behaviours (βdirect = .38, $p$ = .001). Self-regulatory imagery also had a total effect on self-regulatory behaviour (βtotal = .57, $p$ = .001), but this relationship was primarily indirect (βindirect = .19, $p$ = .001) through self-efficacy (βdirect = .23, $p$ = .001) and outcome expectations (βdirect = .25, $p$ = .001). Self-regulatory imagery had an indirect effect on perceived barriers (βindirect = –.10, $p$ = .001), outcome expectations (βindirect = .05, $p$ = .001), and enjoyment (βdirect = .44, $p$ = .001) through self-efficacy. Thus, self-efficacy mediated the relationship between self-regulatory imagery and the three social-cognitive variables; barriers, enjoyment, and outcome expectations. Also, self-regulatory imagery was indirectly related to enjoyment through outcome expectancies (βindirect = .44, $p$ = .001).

**Direct and indirect effects of social-cognitive variables.** Self-efficacy negatively predicted perceived barriers (β = -.38, $p$ = .001), and positively predicted outcome expectations (β = .12, $p$ = .030), self-regulatory behaviour (β = .23, $p$ = .001), and enjoyment (β = .17, $p$ = .001). In addition, self-efficacy was indirectly related to self-regulatory behaviours (βindirect = .09, $p$ = .001) through outcome expectancies, and perceived barriers. Self-efficacy was indirectly related to PA through enjoyment (βindirect = .14, $p$ = .001) and

indirectly related to enjoyment (βindirect = .21, $p$ = .001; βtotal = .38) through self-regulation and outcome expectations.

Perceived barriers negatively predicted outcome expectations (β = -.21, $p$ = .002), self-regulatory behaviour (β = -.11, $p$ = .004), and enjoyment (β = -.08, $p$ < .05). The relationship between perceived barriers and PA was indirect (βindirect = -.08, $p$ = .001) through enjoyment. Moreover, outcome expectations positively predicted self-regulatory behaviour (β = .25, $p$ = .001) and enjoyment (β = .49, $p$ = .001). However, the relationship between outcome expectations and PA was indirect (βindirect = .20, $p$ = .001) through enjoyment. Finally, self-regulatory behaviour positively predicted enjoyment (β = .24, $p$ = .001). Self-regulatory behaviour was also indirectly related to PA (βindirect = .09, $p$ = .001) through enjoyment. In turn, greater enjoyment predicts higher levels of PA (β = .36, $p$ = .002).

## Discussion

This study examined the relationship between imagery use in middle-aged and older adults and PA, both directly and indirectly via social-cognitive variables. Although evidence supports the relationship between imagery, self-efficacy, and PA (Cumming, 2008), no research to date has examined the potential relationship of imagery with the social-cognitive variables of self-efficacy, outcome expectations, barriers, self-regulatory behaviour, and enjoyment in middle-aged and older adults. The development of self-regulatory imagery in the present study was based on past research demonstrating the importance of self-regulatory strategies, including self-regulatory imagery, to increase PA in middle-aged and older adults (Kosteli et al., 2015, Chapter 4; Umstattd, Saunders, Wilcox, Valois, & Dowda, 2006). Based on SCT and past research (Ayotte et al., 2010; Cumming, 2008), it was hypothesised that a particular form of imagery, self-regulatory imagery, would be directly related to all the social-

cognitive variables in the model and would positively predict PA through its association with self-efficacy, outcome expectations, barriers, self-regulatory behaviour and enjoyment.

In support, middle-aged and older adults who used images of plans and goals were found to be more confident in their ability to engage in PA and were also more likely to perceive more positive outcome expectations (e.g., better health). These results are also aligned with previous research showing that imagery can increase self-efficacy (Wesch, Milne, Burke, & Hall, 2006) and boost outcome expectations (Hall, 1995). Imagery's role in enhancing self-efficacy is based on the idea that imagery can give individuals a sense of performance accomplishment and vicarious experience (Cumming, 2008). Similarly, when middle-aged and older adults imagine themselves accomplishing a certain outcome, both the outcome likelihood and the outcome value increase, and these in turn can strengthen the beliefs about the positive outcomes from engaging in PA (Hall, 1995). Overall, these results suggest that self-regulatory imagery is a potentially powerful tool for influencing exercise-related cognitions.

Higher levels of self-regulatory imagery were also associated with higher levels of self-regulatory behaviour. That is, middle-aged and older adults appear to self-regulate their behaviour by imagining achieving exercise goals (e.g., becoming fitter) and following an exercise plan. Previous research suggests that images of goals act as a vicarious experience for how emotionally satisfying it is to set and achieve a goal, and can influence both effort and the level of commitment in achieving the goals (Schultheiss & Brunstein, 1999). Thus, self-regulatory imagery directly predicts how individuals go about setting action plans to achieve a health behaviour change.

Despite the direct relationship between self-regulatory imagery and self-efficacy, outcome expectations and self-regulatory behaviour, no direct relationship was found between

self-regulatory imagery and enjoyment. Instead, the relationship was indirect through self-regulatory behaviour. This finding may be due to the imagery content of plans and goals not being directly associated with affect. Thus, if the function of imagery is to increase enjoyment, it is likely that the content of planning and goals images is not fulfilling this function and is may not influence how much middle-aged and older adults enjoy PA. Consistent with the revised applied model of deliberate imagery use (RAMDIU; Cumming & Williams, 2012, 2013), it is important to determine whether the imagery content is personally meaningful for helping to fulfil a particular function of imagery. In this case, the content of planning and goal imagery might not help middle-aged and older adults in the purposes of achieving enjoyment. Perhaps there are other types of imagery that are more appropriate for the purposes of getting enjoyment out of PA engagement. For instance, Stanley and Cumming (2010b) demonstrated that enjoyment imagery can significantly improve exercise enjoyment. Similarly, in a study with middle-aged and older adults, it was suggested that scenery imagery (imaging the ideal setting to exercise) can provide a positive psychological effect and make PA engagement more pleasurable (Kosteli et al., 2015; Chapter 4). Future research should focus on using more relevant and personally meaningful imagery types to promote enjoyment in middle-aged and older adults (e.g., enjoyment imagery, scenery imagery).

Self-regulatory imagery was also found to be indirectly related with other social-cognitive variables. For instance, self-efficacy mediated the relationship between self-regulatory imagery and outcome expectations, barriers, self-regulatory behaviour and enjoyment. This finding suggests that images of plans and goals may serve to increase motivation by improving middle-aged and older adults' confidence, and this in turn will likely lead to more positive outcome expectations, less barriers, more enjoyment, and more self-

regulatory behaviour. A recommendation for future imagery interventions aimed at middle-aged and older adults is to target self-efficacy enhancement due to its strong role in predicting not just PA but other social-cognitive determinants that serve to maintain this behaviour (White, Wójcicki, & McAuley, 2011).

With regards to the relationships among the different social-cognitive constructs, the results indicated an association between higher levels of self-efficacy and higher levels of outcome expectations, self-regulatory behaviour and enjoyment but lower levels of PA barriers. Furthermore, self-efficacy indirectly predicted self-regulatory behaviour through barriers and outcome expectations. The results are consistent with previous research (Ayotte et al., 2010; Rovniak et al., 2002; White et al., 2011) and further support the idea that raising middle-aged and older adults' self-efficacy can cause favourable changes in other social-cognitive variables. Collectively this research provides support for the applicability of SCT for explaining PA behaviour and encourages the idea of targeting self-efficacy in imagery intervention programmes to promote health behaviour change.

However, contrary to our hypothesis and previous research (Anderson et al., 2006), the direct relationship between self-regulatory behaviour and PA was not supported, nor was self-regulation's role as a possible mediator between self-efficacy and physical activity. Unlike most previous research, the present study incorporated enjoyment along with other social-cognitive variables into a single model and specified enjoyment as the only direct predictor of PA. Thus, higher levels of enjoyment could lead to higher levels of PA without the mediating effect of other factors. This finding confirms previous research, which shows that when older adults are in situations, in which enjoyment is experienced, they are more likely to engage in PA (Sallis & Owen, 1998). That is, middle-aged and older adults tend to

pick and engage in physical activities for which their motivation arises within themselves, ranging from a picturesque walk in the park to playing a sport with their friends.

A plausible explanation for why self-regulation did not directly predict PA could be due to the shared variance caused by the inclusion of enjoyment in our model that reduced the total variance of self-regulation on PA. This suggests that self-regulatory behaviour may be less important as social-cognitive variable when a more comprehensive model is considered. The role of enjoyment as a mediator between self-regulatory behaviour and PA highlights the importance of including enjoyment in future studies. Because enjoyment is directly predicted by all the social-cognitive variables in the model, it is logical to assume that enhancing social-cognitive variables will be associated with increases in enjoyment. It is therefore important for applied practitioners who design interventions to promote greater activity levels to encourage individuals to choose activities they enjoy. Strategies to target social cognitive theory variables are more likely to be effective only when high levels of enjoyment are experienced. Future research might want to examine how self-regulatory imagery relates to PA, when middle-aged and older adults enjoy it versus when they do not enjoy it. Thus, a key finding is that middle-aged and older adults who image plans and goals are more likely to self-regulate their behaviour and this leads them to enjoy PA more and it is the feeling of enjoyment that might lead them to higher levels of PA.

**Limitations**

A limitation of the current study is that the majority of participants were aged 50-60 years old. Despite aiming to recruit a range of ages above 50, only 32 participants were between 71-80 years old. Thus, it is important to be cautious when interpreting the results, as they might be more relevant to the young-old adults than the oldest-old adults. It would be interesting for research to replicate these findings among different age groups of middle-aged

and older adults. Second, PA was assessed using the IPAQ, which is a self-report measure. Although this is a valid measure of PA, all self-report measures of PA may result in over or under-estimation of PA levels (Sallis & Saelens, 2000). Future researchers should consider using objective PA measures such as accelerometers to determine if the same relationships between self-regulatory imagery and the other variables would emerge in this model. Furthermore, self-regulatory imagery was assessed with a newly developed six-item measure. Although, the psychometric properties of this measure were established in the present study, with CFA indicating that the overall fit indexes of this measure were good and had adequate internal reliability, future research should continue to further validate this measure. Although, the cross-sectional nature of the results does not allow us to assume causality among the different variables, the path analysis provided support for several of the proposed relationships while new relationships emerged. Thus, path analysis increased the explanatory power of the model by allowing us to test an apriori model and make hypotheses about how the different variables relate to each other (Loehlin, 2004).

**Conclusion**

The results of the present study suggest the importance of targeting many social-cognitive variables simultaneously within the same intervention to promote PA in middle-aged and older adults. The introduction of self-regulatory imagery was found to directly or indirectly target all the social-cognitive constructs included in the present model (self-efficacy, outcome expectations, barriers, self-regulation), further strengthening its position as an effective strategy in modifying exercise-related cognitions and behaviours. Furthermore, our results suggested that enjoyment can differentially influence how social cognitive variables relate to PA. That is, if middle-aged and older adults do not enjoy PA, then the effects of imagery and the other variables are likely not be relevant to PA. Thus, when

designing imagery interventions for middle-aged and older adults, it is important for practitioners to use imagery content that targets enjoyment (e.g., enjoyment imagery) combined with goal and planning images. Future research should try to replicate these results, re-validate the self-regulatory imagery questionnaire and investigate whether the same type of relationships occur when some of the social-cognitive constructs get removed or some new are added in the model (e.g., social support).

# Chapter 6

# General Discussion

The overall aim of this thesis was to determine the barriers and enablers to physical activity (PA) in healthy middle-aged and older adults and those with chronic obstructive pulmonary disease (COPD), as well as describe the exercise imagery use of middle-aged and older adults to inform an eventual intervention for the promotion of PA. Underpinned by social-cognitive theory (SCT; Bandura, 1997), this thesis aimed to give a comprehensive understanding of middle-aged and older adults' perceptions of PA and how imagery is used in this population to motivate them to become more physically active or maintain PA levels. This final chapter first summarises the empirical chapters (Chapters 2-5) before discussing the overall strengths, limitations, practical implications, and future research directions of this body of work.

## Summary of Results

### Chapter 2

The aim of Chapter 2 was to investigate the factors that prevent and facilitate engagement in PA for healthy middle-aged and older adults before and after retirement. Using a social-cognitive perspective, the perceptions of PA in middle-aged and older adults were investigated with a series of focus groups. To gain a range of perceptions, participants were recruited to represent a variety of PA levels and retirement stages.

Most of the middle-aged and older adults expected positive physical and psychological benefits from participating in PA, and placed emphasis on the sense of achievement they get from this activity – a major source of self-efficacy (Bandura, 1997, p.80). Despite holding these positive outcome expectations, middle-aged and older adults perceived a variety of personal and environmental barriers preventing them from being more physically active. Additionally, some unique barriers emerged relating to retirement

transition. Specifically, recently retired adults faced difficulties due to the lifestyle changes that result following retirement such as a lack of structure and financial constraints.

Perceived barriers differed between more physically active individuals and insufficiently active individuals. Lower levels of PA were associated with more personal barriers such as lack of motivation whereas higher levels of PA were associated with more environmental barriers such as adverse weather conditions. Another main difference between middle-aged and older adults of different activity levels was the perception of time availability, with insufficiently active participants voicing what would appear to be more legitimate reasons for not engaging in PA; not having enough time. Thus, time availability in retirement may or may not facilitate the inclusion of PA in their daily routines. Indeed, time perception appeared to be related to the beliefs in middle-aged and older adults' ability to engage in PA. Self-efficacy was an underlying concept that defined whether middle-aged and older adults perceived having time to engage in PA or not, with high self-efficacy levels related to more PA engagement. Finally, the findings supported the tenets of SCT, as social support, self-regulation and enjoyment were recognised as major motivators of PA. Overall, Chapter 2 highlighted the importance of considering the stage of retirement and PA level when examining barriers and enablers of PA.

**Chapter 3**

Chapter 3 investigated the barriers and enablers of PA with a sample of middle-aged and older adults diagnosed with COPD using a social-cognitive perspective. Whereas Chapter 2 focussed on PA level and retirement transition, Chapter 3 focussed on disease severity. Participants represented a wide range of disease severity and functional limitations, and engaged in one of four focus group discussions: a newly diagnosed group, a group who had been referred to pulmonary rehabilitation, a mixed group including newly diagnosed and

those referred to pulmonary rehabilitation, and a group of currently employed individuals who were diagnosed with COPD.

Results revealed that many of the PA barriers that emerged were related to the severity of their disease, which limits the participants both physically and psychologically. Barriers such as fatigue, mobility problems, breathing issues caused by the weather, embarrassment, fear, and frustration/disappointment caused by their symptoms differentiate these participants from the healthy middle-aged and older adults interviewed in Chapter 2. In addition, many of the barriers individuals with COPD face were related to their attitudes towards their disease. Specifically, several individuals with COPD underestimated the importance of PA for making a difference in their lives and for causing positive health outcomes while others felt helpless and unable to control their disease. However, not all the barriers appear to be specific to COPD. Similar to the healthy middle-aged and older adults from Chapter 2, individuals with COPD reported feeling too old for PA and reported lacking time and motivation to engage in PA.

Consistent with Chapter 2, this chapter also suggests differences in barriers between more and less active individuals. More active individuals with COPD reported feeling confident that they could manage their symptoms and overcome the barriers associated with PA. Collectively, Chapter 3 supports SCT and indicates that targeting self-efficacy beliefs is necessary for achieving health behaviour change. For example, boosting confidence in managing COPD symptoms and overcoming the inconvenience from the physical limitations of COPD may be useful in encouraging individuals with COPD to engage in more PA. Moreover, the results also demonstrate the importance of self-regulatory strategies such as goal setting, routines, personalising PA, and adjusting the pace of PA to the needs of individuals with COPD. Similar to the results from Chapter 2, enjoyment and social support

were recognised as major facilitators for PA. Overall, Chapter 3 highlighted the importance of accounting for the prevalence of chronic disease when examining barriers and enablers of PA.

**Chapter 4**

Drawing from the results of Chapter 2 and 3, which demonstrate difficulties healthy and unhealthy middle-aged and older adults face when engaging in PA, Chapter 4 examined whether imagery could be an appropriate strategy to increase older adult PA. Healthy middle-aged and older adults participated in focus groups in which they discussed their imagery use. Specifically they described "why", "what," "how", "where" and "when" they image, which form the components of the Revised Applied Model of Deliberate Imagery Use (RAMDIU; Cumming & Williams, 2012, 2013).

Middle-aged and older adults reported imaging for a variety of reasons and used a wide range of imagery content, in different settings and time points. Findings from Chapter 4 support the RAMDIU model and suggest that the content of middle-aged and older adults' images does not always reflect a particular function. For instance, some middle-aged and older adults imaged skill execution to improve their skills but in other instances they used the same type of image to increase confidence. These results are consistent with RAMDIU, which supports the importance of identifying the personal meaning of the images as a variety of images can be used for the same purpose and similarly the same image can be used for different purposes. Additionally, the different RAMDIU components appear to interact with each other. Specifically, individual characteristics of the person imaging ("who" component) seemed to influence "why", "what", "how", "where" and "when" imagery occurs. In this chapter, PA level represented the "who" component of the RAMDIU model and appeared to impact imagery use in middle-aged and older adults in terms of both the content and reasons

for imaging. For example, physically active individuals used more skill and sequence execution images to improve and master a skill whereas insufficiently active individuals used more scenery and reward images to motivate themselves initiate PA. Moreover, active individuals provided a more detailed account of their imagery use and employed it more deliberately for PA purposes. In contrast, insufficiently active individuals had greater difficulty describing their experiences.

In conclusion, results from Chapter 4 indicated imagery as a potential intervention for middle-aged and older adults and contributed to a better understanding of the imagery use in this population. Imagery emerged as a beneficial strategy for boosting motivation to exercise in both physically active and insufficiently active middle-aged and older adults. This is because imagery can help middle-aged and older adults overcome many of the barriers associated with PA while it facilitates the enablers. For instance, to overcome bad weather middle-aged and older adults imaged the reward at the end of exercise (e.g., a cup of tea, or a hot bath). Furthermore, the data from this study in combination with the data from Chapter 2 and 3 can be used to individualise future imagery interventions addressed to an older adult population by accounting for the specific barriers they face, as well as their individual characteristics (e.g., PA level, age).

**Chapter 5**

After establishing that middle-aged and older adults use imagery for PA purposes in Chapter 4, the final study of this PhD, using a cross-sectional design, examined how self-regulatory imagery is related to PA in middle-aged and older adults via SCT variables. The impetus for assessing self-regulatory imagery via the development of a bespoke measure was based on the findings of Chapters 2 and 4 in which middle-aged and older adults highlighted the importance of self-regulating their PA behaviour by committing to a routine or having a

schedule, and using goals to motivate themselves to be active. Self-regulatory imagery was therefore defined as a combination of planning and goal-setting and was introduced to the literature within the present thesis as a potential type of imagery that could be associated with PA levels.

Path analysis examined whether self-regulatory imagery relates to a series of social-cognitive variables suggested by Ayotte, Margrett, and Hicks-Patrick (2010). As hypothesised, self-regulatory imagery directly and positively predicted self-efficacy, outcome expectations and self-regulatory behaviour. This finding suggests a relationship between self-regulatory imagery and cognitive and behavioural outcomes in an older adult population. Middle-aged and older adults who imaged setting goals and plans are likely to be more confident in their ability to engage in PA, perceive more positive outcome expectations, and self-regulate their behaviour more. Interestingly, self-regulatory imagery did not directly predict PA, and neither did self-regulatory behaviour predict PA.

The findings from Chapter 5 confirmed the mediating effect of self-efficacy, as it mediated the relationship between self-regulatory imagery and all other social-cognitive variables (e.g., outcome expectations, perceived barriers, enjoyment, self-regulatory behaviour). Thus, self-regulatory imagery is directly associated to self-efficacy, which in turn relates to the other social cognitive determinants of PA. This is because self-regulatory imagery, imaging oneself successfully achieving goals and plans, is a form of mastery experiences – one of the strongest sources of efficacy. Consequently, high self-efficacy can likely explain how self-regulatory imagery use relates to more positive outcome expectations, fewer perceived barriers, greater enjoyment, and more self-regulatory behaviours.

Consistent with Chapter 2 and 3, the results of Chapter 5 not only support SCT but they also expand on it by highlighting the importance of including affective responses to

exercise along with the other social-cognitive factors to explain PA. Past research on the social-cognitive determinants of PA has overlooked enjoyment as an antecedent of PA. Chapter 5 indicated that enjoyment directly and indirectly predicts PA through self-regulatory behaviour, while it is directly predicted by all the social-cognitive variables in the model. Given the influential role of enjoyment in the model and the potential of self-regulatory imagery to predict enjoyment through other social-cognitive variables, the findings support the importance of picking activities that middle-aged and older adults enjoy, as a way to maximise the effectiveness of imagery intervention for promoting PA in middle-aged and older adults.

## Strengths and Limitations

The present thesis has a number of strengths, including the strong theoretical underpinning, specifically the use of SCT and the RAMDIU. Utilising a theoretical framework that captures the complexity of PA behaviour is essential to understand why some individuals engage in PA while others don't (Buchan, Ollis, Thomas, & Baker, 2012). SCT is one of the most widely known theories that have been used to understand the factors that affect behaviour change (Bandura, 1977; Conn, Minor, Burks, Rantz, & Pomeroy, 2003). Furthermore, a proposition of the RAMDIU that function and content are distinct concepts led to a careful examination of different types of images middle-aged and older adults use. The distinction of these concepts also led to a separate examination of the reasons why middle-aged and older adults use these images and whether the same image serves multiple functions and vice versa. Additionally, the theoretical models of SCT and RAMDIU that informed the interview guides for the focus groups, were the basis for the development of research questions, and helped in the interpretation of the results.

A final strength of the thesis that should be noted is the mixed-methods study design. Several researchers (e.g., Onwuegbuzie & Leech, 2005) have documented the importance of integrating qualitative and quantitative methods. In the present thesis, the mixed-methods design allowed for triangulation of the findings by giving a broader perspective of the reasons why some middle-aged and older adults are physically active while others are not, as well as providing a more holistic picture of middle-aged and older adults' imagery use (Jick, 1979). In this way, the different studies in this thesis were able to complement each other. For example, focus groups were employed in Chapters 2, 3, and 4 to extract information about the perceptions of PA in healthy and unhealthy middle-aged and older adults and gain an in-depth description of the imagery use in middle-aged and older adults. The final study (Chapter 5) was cross-sectional in design, and was informed by the preceding ones. Altogether, the four studies presented in this thesis provide insight into social-cognitive factors that determine PA engagement and suggest the potential for imagery interventions in adults over 50 years old.

With respect to the overall limitations of the studies that form this thesis, the sample of middle-aged and older adults used throughout the studies of the PhD has been defined slightly differently compared to past research. Past research has referred to middle-aged and older adults as over 50 (King, Rejeski, & Buchner, 1998), over 60 (Lee, Arthur, & Avis, 2007), over 65 (Yusuf et al., 1996), or over 80 (Dye & Wilcox, 2006). In this thesis middle-aged and older adults were between 50-80 years old. However, the sample seems to be skewed toward the younger cohort with most participants in the 50-65 years old group and much fewer older aged adults between 65-80 years. Future research could compare different subgroups and investigate whether middle-aged and older adults varying in age differ in their use of imagery as well as their beliefs about barriers and enablers of PA. However, the heterogeneous sample and the wide range in age of the participants' (50 to 80 years old) can also be viewed as a

strength. As a result of the wide spectrum of people that participated in the research in terms of health status (including healthy middle-aged and older adults and COPD cohort), PA level (including active versus insufficiently active middle-aged and older adults), and retirement length (including recently retired versus retired for longer time), the findings are more likely to represent the general population of middle-aged and older adults and can be more easily generalised. Consequently, the inclusion of a heterogeneous sample offers greater effect size and more trust in the data.

The second issue that could be viewed as a limitation is that many participants were unfamiliar with imagery. As a result these participants found it more difficult to relate to imagery and in some instances were not able to provide much information about it. To account this issue, caution was given when explaining what imagery is to participants. For instance, a definition of imagery was provided in all the focus groups as well as a short exercise to ensure that participants had a good understanding of the meaning of imagery.

The third limitation of the thesis is that PA was assessed by subjective self-report measures, which are prone to biases (Helmerhorst, Brage, Warren, Besson, & Ekelund, 2012). This can be particularly true in the case of older adults because of the age-associated decline in memory (Brickman & Stern, 2009). Thus, it might be difficult for older adults to recall how many hours of PA they accumulated throughout the week (Helmerhorst et al., 2012). Moreover, social desirability of reporting healthy behaviours might be another issue worth considering as it might have led to over-reporting of PA (Klesges et al., 1990). However, the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003), a self-report measure used in Chapter 5, has been proven to be a valid and reliable measure of PA for this age group. Despite this, it is important that future researchers use more objective measures to assess the PA level of middle-aged and older adults, such as accelerometers or pedometers, as

this would allow more accurate classification of participants in different groups (physically active versus insufficiently active). More general future directions are going to be outlined in detail later in the chapter.

A final possible limitation to note is that the term PA may have been interpreted differently between participants. Although a definition of PA was given to participants and examples were provided, it is hard to assess what types of activities the respondents had in mind when they participated in the focus groups and shared their experiences on PA. Middle-aged and older adults more frequently referred to vigorous-intensity structured activity while less often referred to other daily activities where they spend most of their time (e.g., gardening, household). To get more accurate information, participants could be asked instead to describe a typical week, listing all the activities they are involved in. Complementary, to avoid the subjective interpretation of PA, perhaps it would be useful to also use standardised instruments that assess all the low intensity activities typical of sedentary societies and help middle-aged and older adults differentiate among light, moderate, and heavy exercise (Shephard, 2003).

## Applied Implications

Although specific applied implications of each study have been addressed separately in each chapter, an overview of the overall implications of the entire thesis is presented in this section. Each study in this thesis incorporated different contextual factors (e.g., retirement length, PA level, and health status) to see how these factors can have an influence on the perceptions of PA in middle-aged and older adults. As it was indicated in Chapter 2, to understand how likely it is for newly retirees to incorporate PA after retirement, it is essential to assess middle-aged and older adults' perceptions about retirement. Given the fact that retirement is a period of adjustment and constant change, before designing an intervention to

promote PA, practitioners should first identify wether retirement has a positive or negative impact on middle-aged and older adults' lives.

The results in Chapter 2 could explain why although retirement is associated with more free time, PA levels can be lower. It is possible that middle-aged and older adults have different priorities in retirement, which can in turn define whether retirement will have a positive impact on PA levels or not. Thus, although retirement can provide new opportunities to be physically active, at the same time newly retirees might see retirement as the perfect timing to do things that they have not had the chance to do before such as start a hobby that is not related to PA. This agrees with the idea that some of the barriers retirees face (e.g., lack of time) could be an excuse to avoid exercise and in reality they represent the idea that "there are other things I would rather be doing". Consistent with previous research (Barnett, Ogilvie, & Guell, 2011), practitioners should help middle-aged and older adults to see the benefits of incorporating PA into their daily lives following retirement, by providing a new purpose in life and by giving a new daily structure. Understanding more about the way middle-aged and older adults perceive retirement can help practitioners to design an appropriate intervention for this population, while accounting for the unique challenges of retirement transition. Consequently, in order to help middle-aged and older adults create the conditions for successfully incorporating PA during this transition it is necessary to consider individual characteristics and personalise any given intervention.

The importance of accounting for individual differences when designing a PA intervention is further highlighted in Chapter 3, in which the participants were unhealthy middle-aged and older adults diagnosed with COPD. Individuals with COPD seem to differ from the healthy middle-aged and older adults that participated in Chapter 2, as the PA barriers they face are mostly related to the nature of their disease (e.g., physical limitations

and psychological distress). On the other hand, healthy middle-aged and older adults from Chapter 2 mostly reported experiencing barriers related to the transition in retirement (e.g., lack of structure). Consequently, it is important when designing interventions for people entering retirement to get them active at the early stages of retirement before they settle and get caught in an irreversible cycle of inactivity and deconditioning. An early intervention could encourage middle-aged and older adults to incorporate PA as part of a new routine. In this way newly retirees can get a new purpose in life, take advantage of their spare time, and make up for the lost occupational activity. All the results above highlight the importance of designing intervention programmes, which account for the individual and recognise the influence of unique contextual factors such as illness and transition to retirement.

Another key characteristic of middle-aged and older adults that is worth taking into account when designing interventions is their perceptions of self-efficacy in regards to PA behaviour. Consistent with SCT, Chapter 2, 3, and 5 confirmed that self-efficacy can determine PA behaviour in middle-aged and older adults. Specifically, lack of confidence in their ability to overcome PA obstacles and engage in PA was related to low levels of PA. The importance of self-efficacy was also noted in Chapter 4, where middle-aged and older adults reported using imagery for the purposes of feeling more confident. These findings provide evidence for the importance of targeting self-efficacy in PA interventions. As it was discussed in Chapter 1, interventions combining different sources of self-efficacy (e.g., performance accomplishments, vicarious learning, verbal encouragement, and interpretation of physiological and emotional responses) can be particularly effective (Bandura, 1997). The results of Chapter 2 confirm Bandura's assertions and further suggest the importance of targeting all the sources of self-efficacy simultaneously. For instance, middle-aged and older adults recognised that completing PA in older age is a major achievement and makes them

feel good. Middle-aged and older adults also reported comparing themselves to others and frequently judging their physical abilities based on younger or fitter people. Thus, helping middle-aged and older adults to make reasonable social comparisons and use similar others as a point of reference, while pointing out the health benefits these individuals experience as a result of PA can act as a source of vicarious learning and can encourage middle-aged and older adults stay active.

Furthermore, the perceptions that middle-aged and older adults have about ageing should certainly be addressed when designing an intervention to promote PA. As it was indicated in Chapter 3, feeling too old is likely to discourage middle-aged and older adults from participating in PA. According to O'Brien (1991), middle-aged and older adults are likely to underestimate their physical abilities because of the negative stereotypes about ageing in society. Similar results have been obtained in other lines of research, which have shown that exercise-related ageing stereotypes are related with decreased levels of exercise participation in middle-aged and older adults (Netz, Zeev, Arnon, & Tenenbaum, 2008). Therefore, their belief of being too old to exercise can become a self-imposing barrier that can have a negative effect on their belief in their ability to exercise. To encourage middle-aged and older adults participate in PA practitioners should help them change their cognitions and help them to realise the significance of PA in older age and the benefits associated with it.

The findings from Chapter 4 and 5, suggest that imagery could successfully be used as intervention to increase PA levels in middle-aged and older adults. In support of the RAMDIU, it is important to account for "who" is the recipient of the imagery intervention as there were some unique types of imagery that emerged in this population that may meet the needs of middle-aged and older adults. For instance, this population reported experiencing images of certain negative health outcomes as a result of ageing. This type of images

motivated middle-aged and older adults to be physically active to avoid the negative outcomes associated with old age. Appearance images of a fit and toned body would probably not be as effective as health images for this population. Consequently, identifying and encouraging middle-aged and older adults to use meaningful images to them is important as specific images seem to be more effective in motivating them to be physically active compared to younger adults.

Another unique type of imagery that served to motivate middle-aged and older adults to be physically active was scenery imagery. These images resemble in nature the exercise context images found in Giacobbi's et al. (2003) study. However, although in Chapter 4 middle-aged and older adults referred to their ideal environment to exercise (e.g., sunny day swimming in the Mediterranean sea) to motivate themselves initiate PA, the participants in Giacobbi's et al. (2003) study referred to the actual natural surroundings of the exercise setting (e.g., what the running route looks like) to help them improve their technique and enhance their confidence. These results indicate the importance of identifying the personal meaning of images as suggested by RAMDIU and discriminating between what is being imaged and why it is being imaged. In the case of middle-aged and older adults, it is apparent that imagining the real or ideal exercise setting serves distinct functions. Furthermore, the findings suggest that it is important to adjust the content of mental imagery interventions so that the imagery reflects the unique needs of the population at hand while accounting for where imagery takes place and incorporating stimulus propositions in the imagery scripts.

Furthermore, the findings of Chapter 4 suggest that it might be prudent for researchers and practitioners to use the RAMDIU when working with middle-aged and older adults as it can help identify the most appropriate type of imagery for the outcomes middle-aged and older adults want to achieve (e.g., become more physically active to avoid age decline). In

line with the model's predictions, imagery content (e.g., what is being imaged) did not always match the function (e.g., why imagery is used). This finding along with the interaction of the different elements of the model, provide theoretical reasoning to support the importance of identifying the meaning of imagery for middle-aged and older adults. As already discussed in Chapter 4, a few of the participants were unaware of using imagery. A greater theoretical understanding of the imagery use in middle-aged and older adults could be used to train middle-aged and older adults to make conscious decisions to use imagery systematically and choose the types of images that can increase their self-efficacy beliefs and PA behaviour.

The benefits of imagery were further highlighted in Chapter 5, where results suggested the effectiveness of self-regulatory imagery for increasing PA levels. Guiding middle-aged and older adults to use images of plans and goals might help them to be more confident in their ability to engage in PA, expect more positive outcomes, self-regulate their PA behaviour more and this can in turn lead them to enjoy PA more and engage more in it. As self-regulatory imagery can directly and indirectly influence so many correlates of PA, it is suggested to be a powerful intervention tool, which can be used as part of PA interventions and can make them more successful.

## Future Directions

The wide perspective of the thesis and findings from each chapter opened numerous possibilities for future research. This section is going to provide a detailed overview of some additional avenues for future research. Even though it is not possible to refer to all the potential directions for future research, for the purposes of this thesis only the most important ideas are going to be presented, while some ideas have already been referred previously in this chapter (e.g., use of accelerometers and pedometers to measure PA).

In Chapter 2, the participants were from different stages in retirement, which allowed

us to draw comparisons between those who were about to retire and those who were already retired for a few years. A possible avenue for future research is to investigate PA habits during transition to retirement by using a longitudinal approach and following the same group of people before and after retirement. Integrating PA as a regular activity at the onset of retirement would provide a more accurate representation of the impact retirement has on PA levels and would enable us to investigate whether middle-aged and older adults are able to sustain PA after they retire and their routine is disrupted.

In Chapter 4, middle-aged and older adults were asked whether they used deliberate imagery use for PA purposes. The results demonstrated that several participants denied using exercise imagery. However, at least one third of middle-aged and older adults reported experiencing images spontaneously for non-exercise related purposes (e.g., memorising) without even being aware of it. These results suggest that middle-aged and older adults might be using imagery more often than reported. Future researchers should explore middle-aged and older adults' views about imagery, probe more and get more in-depth information on their imagery use before implementing any interventions with them.

Chapter 4 suggests the RAMDIU is an appropriate theoretical framework to use with older adult imagery use to promote PA. Consequently, it is important to consider certain aspects of the RAMDIU model that were beyond the scope of the thesis. Although the participants provided a lot of information on the types of images they use and the reasons why the use imagery, they provided limited information on the characteristics of their images. For instance, there was no reference to whether they image in colour or black and white, and also no reference to the speed, duration, angle, and perspective of images. Instead, participants referred to the senses involved, and the direction of images (e.g., positive versus negative). Although this may be due to participants' initial unfamiliarity with imagery, future research

should investigate in more detail how middle-aged and older adults image and use this information for guidance and direction when creating imagery scripts and interventions.

Despite the fact that imagery is a successful cost-effective technique that been shown to promote self-efficacy in clinical populations (e.g., cancer, stroke) (Page, 2001), to date there are no studies that have used imagery in individuals with COPD to promote PA. Future studies should explore whether an imagery intervention would be equally effective with COPD patients. For this purpose, imagery would need to be carefully tailored and introduced in people with COPD to encourage rather than discourage participation in regular PA. Although imagery could be a useful technique to help people with COPD manage their symptoms, for imagery to be effective it must be personalised to fit the specific needs of the population using imagery. Therefore, future imagery interventions should focus on what individuals with COPD can currently do and help them create new experiences reflecting their skills at the present, rather than re-creating what they used to do before they got diagnosed with COPD. Thus, it is important to make imagery interventions relevant and meaningful to this population.

The findings of the present thesis also generate avenues of future research regarding types of imagery that are suitable for generating a successful outcome in middle-aged and older adults. In Chapter 4, middle-aged and older adults reported using images of enjoying themselves being physically active, as a way of motivating themselves to be more physically active. The quotations support the notion that enjoyment is a prerequisite for participating in PA. Similarly, in Chapter 5 enjoyment emerged as the only direct predictor of PA. Taken together, these findings suggest that designing interventions that focus on boosting enjoyment of PA is essential. Although previous research has indicated that enjoyment imagery can significantly improve exercise enjoyment (Stanley & Cumming, 2010b), it is unknown

whether this is always direct or there are other factors that mediate this relationship. Future studies should test the relationship between enjoyment imagery and PA and see how it relates to other social-cognitive variables. Specifically, research could examine how enjoyment imagery increases enjoyment and levels of PA in middle-aged and older adults.

This thesis revealed the potential of multiple types of imagery for promoting PA in middle-aged and older adults, which include images of goals and plans. The novel finding from Chapter 5 that self-regulatory imagery has the potential to increase PA levels through a range of social-cognitive variables is encouraging and indicates that further research should be conducted on how to promote PA through self-regulatory imagery use. As discussed in Chapter 5, self-regulatory imagery can directly predict self-efficacy, outcome expectations, and self-regulatory behaviour. Further research is needed to confirm whether the same type of relationships hold true if more variables are added (e.g., social support).

## Conclusion

In conclusion, this thesis gave a greater insight into the problem of inactivity in middle-aged and older adults, by obtaining data from a variety of adults with differing levels of health, retirement duration, and PA level, and indicated the potential of imagery to promote PA in this population. The results revealed SCT as an important theoretical framework to explain PA behaviour (Chapter 2, 3) and imagery use (Chapter 5) in middle-aged and older adults and suggested that PA engagement is tied to certain contextual factors (Chapter 2 and 3). Thus, before implementing any PA intervention, individual characteristics should be taken into account.

With regards to imagery use to promote PA, RAMDIU model highlighted the interaction of the different components of the model (e.g., who, why and what) and suggested the importance of evaluating the personal meaning of the images (Chapter 4). Finally, self-

regulatory imagery emerged as a powerful tool to promote PA by impacting on affective outcomes through other social-cognitive variables and revealed a new set of relationships between social-cognitive variables and enjoyment that is currently overlooked and that needs to be further investigated in the future.

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## Appendix 1: Information letter for healthy older adults (Chapter 2 & 4)

***Investigating the Effectiveness of Imagery For Promoting Physical Activity Levels***

Dear Sir or Madam,

You are invited to participate in this research study, which has been approved by the University of Birmingham's Science, Technology, Engineering and Mathematics Ethical Review Committee.

***What is our study about?***

Imagery refers to an experience you can create or re-create in your mind using your different senses (e.g., seeing yourself going for a walk and how it feels to move your body). It is a popular strategy used by active or inactive individuals to learn exercise tasks, become energized, set appearance goals, and cope with exercise barriers.

The goal of our study is find out more about whether retired individuals or those just entering retirement use imagery for physical activity purposes and if so how they do this. A second aim is to investigate what this population think about physical activity (i.e., thoughts, feelings, perceptions) and how physical activity is incorporated into their daily life.

**What will I have to do if I decide to take part?**

If you decide to participate, you will be asked to attend a focus group along with about three or four other individuals to answer some questions about what you think about physical activity and whether you use imagery at all to try to help you become more physically active. The session should last no longer than 1 hour and 30 minutes. To ensure we do not miss anything you have to say, the focus group will be recorded. Following the focus group all participants will be provided with refreshments. You will also receive a £10 voucher for your participation.

**Will my responses be kept confidential?**

All your personal data will remain confidential and will be solely used for academic purposes. Consequently, we would be grateful if you were honest in the information that you provide. In accordance with the Data Protection Act (1998) raw and processed data from this investigation will be kept for a period of ten years following completion of the study. Questionnaires, audio recordings and computer files containing processed data will be kept securely on password protected computers and in a locked filing cabinet. These will only be accessed by the study investigators. After this time period, all the data collected will be destroyed. Our overall findings will be used to develop imagery interventions to improve physical activity levels, and will be published in an academic journal. You will not be individually identified in any publication and your confidentiality will be maintained. For example, we will give changed names if quoting your responses in any report or publication arising from the study.

***Do I have to take part?***

Please note, your participation in this study is voluntary and you may withdraw at any time up to 2 weeks after the focus group you attend, without explanation or any

negative consequences. If you choose to withdraw from the study please contact Ms. Maria-Christina Kosteli (contact details below) to inform us of your decision. At this point your data will be destroyed and not included in the study. You are also free to not answer any question your find distressing or do not wish to answer. The researcher will also provide you with potential sources of support if answering these questions lead you to feeling distressed in anyway. A brief summary presenting the results and findings will be available upon request at the end of the study.

Thank you very much for your time and assistance. If you have any questions now or after the study, or would like any more information about the study please do not hesitate to contact any of us:

Thank you,

Ms. Maria-Christina Kosteli

Dr. Jennifer Cumming

Dr Sarah Williams

School of Sport, Exercise, & Rehabilitation Sciences,

University of Birmingham, Birmingham, B15 2TT

**Appendix 2: Consent form for healthy older adults**
**(Chapter 2 & 4)**

***Investigating the Effectiveness of Imagery***
***For Promoting Physical Activity Levels***

**ID:**

| | Tick to consent |
|---|---|
| I confirm that I have read and understand the information sheet, and have had the opportunity to ask questions. | |
| All questions have been answered to my satisfaction | |
| I understand that my participation is voluntary and that I am free to withdraw at any time up to 2 weeks after my final visit to the lab has been completed without giving any reason or my rights being affected. | |
| I give consent for the data that I provide to be used for research purposes. | |
| I understand that this will be entirely confidential. | |
| I agree to take part in the above study. | |
| I agree to be audio recorded while responding to the questions | |

Print name .....

Signed .....

Date .....

Witness' Name .....

Witness' Signature .....

Would you like to be provided with a summary of the research results at the end of the study?

Yes ☐ No ☐

If yes please provide your email address or your postal address in the space Provided.....

**Appendix 3: Demographic Information -Healthy Older Adults (Chapter 2 & 4)**

**Demographic Information**

**ID:**

*Please provide the following information:*

**Part 1: Information about you**

Your age: _____ years

Your gender: Female ☐ Male ☐

Marital Status:

Currently married ☐ Never married ☐ In a relationship ☐

Separated ☐ Divorced ☐ Widowed ☐ Single ☐

**Ethnic Group:**

**A – White**

British ☐

Irish ☐

Any other white background; please specify ……

**B – Mixed**

White and Black Caribbean ☐

White and Black African ☐

White and Asian ☐

Any other mixed background; please specify ……..

**C – Asian or Asian British**

Indian ☐

Pakistani ☐

Bangladeshi ☐

Any other Asian background; please specify ……

**D – Black or Black British**

Caribbean ☐

African ☐

Any other black background; please specify ……...

**E – Chinese or other ethnic group**

Chinese ☐

Any other ethnic group; please specify …….

**Part 2: Information about your employment status and occupation**

A) Which of the following categories best describes you:

Employed full-time ☐

Employed part-time ☐

Retired ☐

Other: _____

B) What is your current/former occupation:

_____

C) Do you consider your current/former occupation to be physically demanding?

| Not at all physically demanding | | Somewhat physically demanding | | Very physically demanding |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

D) If you are currently employed, when do you plan to retire (give approximate date)?

__ __ (day) __ __ (month) 20__ __ (year)

***If you have not retired, please now proceed to Part 3 in the next page***

E) If you have retired, when did you leave work?

__ __ (day) __ __ (month) 20__ __ (year)

What is the main reason why you retired?

_____

**Part 3: Information about your physical activity levels**

A) Do you consider yourself as physically active?
Yes ☐ No ☐

B) How many hours per week do you spend overall in physical activity? _____

> ***Moderate-intensity physical activity** will raise your heart rate and make you breathe faster and feel warmer.*
>
> *Daily activities such as shopping, or housework count as moderate-intensity activity.*

C) How many times per week do you spend in **moderate-intensity** physical activity such as cycling, brisk walking, pushing a lawn mower, ballroom and line dancing, canoeing, and volleyball? _____

D) How long do you spend in moderate-intensity physical activity each time?_____

> ***Vigorous-intensity physical activity** means you're breathing hard and fast, and your heartbeats rapidly. If you're working at this level, you won't be able to say more than a few words without pausing for a breath.*

E) How many times per week do you spend in **vigorous-intensity** activity such as jogging, running, swimming fast, riding a bike fast, hiking, energetic dancing, football, tennis? _____

F) How long do you spend in vigorous-intensity physical activity each time?_____

G) What type of physical activity do you spend most of your time on?
_____

***Thank you***

**Appendix 4: Focus Group Interview Guide-Healthy Older Adults (Chapter 2 & 4)**

***Investigating the Effectiveness of Imagery For Promoting Physical Activity Levels***

**********

Focus group number: _____

Date: _____

Time began: _____ Time ended: _____

Moderator: _____

Other researcher(s) present: _____

**********

**Section 1 (Not Recorded)**

**WELCOME**

Thanks for agreeing to participate in the focus group. I appreciate your willingness to participate.

**INTRODUCTION**

My name is Maria-Christina Kosteli and I am a postgraduate researcher at the University of Birmingham. Before we start I would appreciate if you can read the Information Letter and complete the Consent Form. Please also help yourself to the snacks.

**PURPOSE OF FOCUS GROUPS**

The reason we are having these focus groups is to find out what people think about physical activity. For the purposes of this study physical activity has been defined as any structured activity with the goal of fitness and health such as going to the gym, running, brisk walking, using a stationary bike or participating in a fitness class but it also involves other lifestyle activities such as lawn mowing, washing the windows, vacuuming, briskly pushing a baby stroller. The information we gain in these discussions will help us to design an intervention intended to encourage people who are at the retirement age to be physically active. The idea of a group discussion is to allow you to share your views in a relaxed and informal environment. There are no right or wrong answers. Everyone's own experiences and opinions are important. Of course, what to say, how to say it, and how much you want to say is up to you. You should not worry about what you are expected to say, whether you are on the right track, or whether you should agree as a group.

I would like to audio record our discussion to make sure I do not miss anything you have to say. I have asked your permission to do this, as it will make our research more

accurate and easier to carry out. So that there is no interference in the recording I would be very grateful if you could turn off any other electronics or software that might interfere with the recording.

I would like to point out that your contribution will be kept confidential, and that any of your comments that are published will not contain your name. As we go I may make some notes. These are simply reminders and prompts for me and not an evaluation of your conversation.

Our discussion will last for approximately one hour and a half. During this time, I would like to explore a number of issues on this topic and hear everyone's responses. It would be better if you kept your questions about this research project until the end, but please feel free to ask questions relating to the topic throughout the discussion.

Just before we start, I would just like to tell you a couple of simple rules. They are important so that we get the best possible discussion, the best possible recording, and so that we keep everybody happy.

1) Please speak freely – your opinion is important!
2) Please make sure that you allow others to speak, you do not talk at the same time, and do not interrupt others.
3) Please turn off your mobile phone completely.

**Section 2: Opening Questions (Recorder Turned On)**

Please could you introduce yourself and tell us about your background such as where you live and what is your current job or the most recent one you had? (warm-up question).

**Section 3: Perceptions of Physical Activity**

***FOCUS GROUP 1: Physically active group (recently retired or just about to retire)***

1. What does being physically active mean to you? (INFO)
    a. What are the main reasons why you are physically active?
    b. In what ways does being physically active make a difference in your life?
    c. What are the main benefits to you being physically active?
        i. Are these benefits more physical (e.g., health, appearance) compared to psychological (e.g., well-being)?
        ii. How do these benefits outweigh the physical unpleasantness of Physical activity?
        iii. How do you interpret some physical activity outcomes such as sweating, heart beating, and muscle pain?

   d. What do you like best about being physically active?
   e. Is there anything you do not like about being physically active?

2. How does physical activity make you feel?
   a. What feelings and emotions do you associate with physical activity?
      i. Would you describe these emotions as positive or negative?
      ii. How helpful or unhelpful are these emotions to you being physically active?
   b. What kind of mood does physical activity put you in?
      i. How does your mood compare during to afterwards?
   c. How much enjoyment do you get from physical activity?
      i. What makes physical activity enjoyable?
      ii. How does your enjoyment compare during to afterwards?

3. What thoughts do you associate with being physically active?
   a. What kinds of things do you say to yourself?
      i. Would you describe these thoughts as positive or negative?
      ii. How helpful or unhelpful are these thoughts to you being physically active?

4. What are you going to do with all your free time when you retire or now you have retired?
   a. How much of your free time will be spent on being physically active?
   b. Do you usually schedule physical activity? How do you go about setting goals?
   c. What types of activities do you plan on doing?
   d. How do these plans compare to the physical activity you were doing whilst still working?

5. How confident are you that you can maintain a physically active lifestyle in retirement?
   a. Is there anything that will make it harder for you to be physically active after you stop working or now you've stopped working?

b. Is there anything that will make it easier for you to be physically active after you stop working or now you've stopped working?

c. What strategies will you use to remain physically active in your retirement?

***FOCUS GROUP 2: Physically active group (A few years post-retirement)***

1. What does being physically active mean to you? (INFO)
    a. What are the main reasons why you are physically active?
    b. In what ways does being physically active make a difference in your life?
    c. What are the main benefits to you being physically active?
        i. Are these benefits more physical (e.g., health, appearance) compared to psychological (e.g., well-being)?
    d. What do you like best about being physically active?
    e. Is there anything you do not like about being physically active?

2. How does physical activity make you feel?
    a. What feelings and emotions do you associate with physical activity?
        i. Would you describe these emotions as positive or negative?
        ii. How helpful or unhelpful are these emotions to you being physically active?
    b. What kind of mood does physical activity put you in?
        i. How does your mood compare during to afterwards?
    c. How much enjoyment do you get from physical activity?
        i. How does your enjoyment compare during to afterwards?
3. What thoughts do you associate with being physically active?
    a. What kinds of things do you say to yourself?
        i. Would you describe these thoughts as positive or negative?
        ii. How helpful or unhelpful are these thoughts to you being physically active?

4. What have you been doing with all your free time since you retired?
    a. How much of your free time have you been spending on being physically active?

b. What are the types of physical activity you have incorporated in your daily life since you stopped working?

c. How physically active are you now compared to when you were still working?

5. Looking back to the first couple of years after you stopped working, how confident were you that you could have a physically active lifestyle in retirement?

    a. Was there anything that made it harder for you to be physically active after you stopped working?

    b. Was there anything that made it easier for you to be physically active after you stopped working?

    c. What have been your most effective strategies for being physically active in your retirement?

***FOCUS GROUP 3: Less Physically active group (recently retired or just about to retire)***

1. What does being physically active mean to you? (INFO)

    a. What are the main reasons why you are (or not) physically active?

    b. What are the main reasons or barriers that prevent you from being more physically active?

    c. How would doing more physical activity make a difference in your life?

    d. Are there any benefits you would expect if you were to be more physically active?

        i. Would these benefits be more physical (e.g., health, appearance) compared to psychological (e.g., well-being)?

    e. What are the things you would enjoy about more physically active?

    f. Is there anything you do not like about being physically active?

2. How does physical activity make you feel?

    a. What feelings and emotions do you associate with physical activity?

        i. Would you describe these emotions as positive or negative?

        ii. How helpful or unhelpful are these emotions to you being physically active?

    b. What kind of mood does physical activity put you in?

        i. How does your mood compare during to afterwards?

    c. How much enjoyment do you get from physical activity?

i. How does your enjoyment compare during to afterwards?

3. What thoughts do you associate with being physically active?
    a. What kinds of things do you say to yourself?
        i. Would you describe these thoughts as positive or negative?
        ii. How helpful or unhelpful are these thoughts to you being more physically active?

*4.* What are you going to do with all your free time when you retire or now you've retired
    a. Do you have any plan for starting an exercise program or engaging in more physical activity?
    b. How much of your free time do you think that you will spend on being physically active?
    c. What types of activities do you plan on doing?
    d. How do these activities compare to the physical activity you were doing whilst still working?

5. How confident are you that you can become more physically active in retirement?
    a. What are things that will make it harder for you to be physically active after you stop working?
    b. What are things that will make it easier for you to be physically active after you stop working?
    c. What strategies can you use to become more physically active in your retirement?

***FOCUS GROUP 4: Less Physically active group (A few years post-retirement)***

a. What does being physically active mean to you? (INFO)
    a. What are the main reasons why you are (or not) as physically active?
    b. What are the main reasons or barriers that prevent you from being more physically active?
    c. How would doing more physical activity make a difference in your life and if yes how?

   d. What are the main benefits you would expect if you were to be more physically active?
      i. Would these benefits be more physical (e.g., health, appearance) compared to psychological (e.g., well-being)?
   e. What are the things you would enjoy about being physically active?
   f. Is there anything you do not like about being physically active?

b. How does physical activity make you feel?
   a. What emotions do you associate with physical activity?
      i. Would you describe these emotions as positive or negative?
      ii. How helpful or unhelpful are these emotions to you being physically active?
   b. What kind of mood does physically activity put you in?
      i. How does your mood compare during to afterwards?
   c. How much enjoyment do you get from physical activity?
      i. How does your enjoyment compare during to afterwards?

c. What thoughts do you associate with being physically active?
   a. What kinds of things do you say to yourself?
      i. Would you describe these thoughts as positive or negative?
      ii. How helpful or unhelpful are these thoughts to you being more physically active?
d. What have you been doing with all your free time since you retired?
   a. How much of your free time have you been spending on being physically active?
   b. Are there any activities you incorporated in your daily life since you stopped working?
   c. How physical active are you compared to when you were still working?

e. Looking back to the first couple of years after you stopped working, how confident were you that you could become more physically active in retirement?
   a. What were the things that made it harder for you to be physically active after you stopped working?

b. What are the things that will make it easier for you to be more physically active in your retirement?

c. What strategies can you use to become more physically active in your retirement?

**Section 4: Imagery Use**

In this next set of questions, I am interested to hear your thoughts on using imagery in relation to exercise. Imagery, also referred to as visualisation, is "an experience that mimics real experience. We can be aware of 'seeing' an image, feeling movements as an image, or experiencing an image of smell, taste or sounds without experiencing the real thing. It differs from dreams in that we are awake and conscious when we form an image." An example of imagery is when you do not remember where you left your keys and in order to find them you create a mental picture of where you usually put your keys. Let's try a simple exercise. Imagine holding a lemon in your hand: looking at it, can you see the colour? Smelling it and touching it. Can you feel the texture and the size of the lemon? Now imagine cutting this lemon and squeezing it. How do your eyes react when a lemon drop falls in your eyes?

1. Have you ever used imagery before?
2. If yes, what do you image?
   a. Would you be able to give me some specific examples?
3. Why do you image?
   a. What are your reasons for imaging?
4. What are the results of your imagery?
   a. What benefits do you notice from imaging?
5. Where do you image?
   a. What location(s) are you in when you image?
6. When do you image?
   a. What times of day do you image?
7. How do you experience these images?
   a. What senses are involved?
   b. What thoughts and/or feelings are involved?
   c. How easy/difficult is it for you to generate these images
8. Have you ever experienced images in relation to physical activity/exercise?

a. *D*oes imagery help you to be physically active in retirement and if it does how so? (Or for those not using imagery or less physically active): "Can you think of any ways of how imagery might be able to help you be physically active"?

b. What are the most and least helpful images?

**Section 5: Exit Question**

The interviewer provides a brief summary of the aims of the interview;

- During this discussion we were aiming to find out what people think about physical activity and asks;
- Is there anything we have missed?
  - Probe: Would you like to raise anything else at this point?

**Section 6: Closing**

I would like to again thank you for participating in this group interview and remind you that any comments that you made here today will remain confidential and for research purposes only.

In our next stage of this project, we will be conducting an intervention to help people to be physically active in retirement. If you currently engage in physical activity for less than 150 minutes per week and would like to become more active, we would like to invite you to participate in this intervention. If you are interested, please write your name on the sheet provided and we will contact you again in a few months.

**Appendix 5: Thematic Map - Physical Activity**
**(Chapter 2)**

| Theme | | Quote |
|---|---|---|
| **Internal enablers** Factors that can have a positive impact on PA behaviours and are under a person's control | **Time availability in retirement** It is defined as availability of time as a result of not having to work anymore | "I have more time for things now and other leisure to try out, things that I hadn't done before like the Tai Chi" |
| | **Self-regulation strategy** It is defined as commitment to an exercise routine (being bound by an agreement or promise or contract) | "But I've got a number of friends that I go for a walk with so I like to sort of get in my diary that I'm going for a walk with one friend or another and perhaps only once a month, but at least you know that's something I can look forward to" |
| | **Enjoyment of physical activity setting** It is defined as pleasure derived from the environment where exercise is taking place | "Part of my joy is actually being out in the countryside" |
| **External enablers** Factors that can have a positive impact on PA behaviours and are not are under a person's control | **Good weather** It is defined as lack of rain or summer weather | "it's much better in the summer than in the winter for walking or any outdoor activity, its far more enjoyable so that does play a part in it actually the weather and outside influences" |
| | **Having an exercise partner** It is defined as having social support because of having an exercise companion | "So there isn't any severe physical unpleasantness if you're just walking with one other person" |

| | | |
|---|---|---|
| | or being part of a group | |
| | **Positive Vicarious experience of PA**<br><br>It is defined as describing the experience of someone else who experienced positive outcomes as a result of exercise | "He's recovered and I'm sure it's because of him being physically fit, he's recovered from throat cancer, one of these transitory strokes and also heart attack, he had a heart attack and he's recovered from all" |
| **Personal Barriers** Factors that can limit engagement in PA under a person's control | **Lack of time** It is defined as limited amount of time due to having family or personal commitments that prevent them from exercising | "I have found my days filling up. I think well I'm free tomorrow and then all of a sudden I'm not free" |
| | **Pain**<br><br>It is associated with discomfort as a result of engaging in physical activity | "I try not to do anything that would give me pain and if I do something it means I've been silly, if I get a muscle strain" |
| | **Lack of motivation**<br><br>It refers to a difficulty at initiating physical activity | "I don't like the part when to start off it it's a bit difficult and oh I don't really feel like doing it" |
| | **Lack of structure**<br><br>It is defines as a discontinuation in daily routine and some disorganisation | "I think most of us have said it would be nice if we didn't have to work or that sort of thing. Now we've got it, it's more difficult to organize, because we are in total charge. Nobody tells us what to do or guides us, we have to work it out for ourselves" |
| | **Social comparison**<br><br>It is defined as comparing yourself | "It would stop me going to a gym because you see all these fit young people who are slim and not overweight" |

| | | |
|---|---|---|
| | to others who are younger or more fit | |
| **Social-environmental barriers** | **Adverse weather conditions**<br>It is defined as "rainy" weather or winter weather including snow and short days | "I think one of the problems that people may have with getting out and about is the atrocious weather sometimes" |
| | **Lack of exercise partner**<br><br>It is defined as exercising alone without company | "For me personally I like somebody to do it with and I find that difficult" |
| | **Financial constraints**<br><br>It is defined as lack of money as a result of retirement | "Obviously retired I've got less money than when I was at work so you know perhaps some more exciting activities you know you can't do" |
| **Outcomes of physical activity** | **Physical Outcomes** | **Good night's sleep**<br><br>"I find if I do a lot of walking I sleep a lot better at night" |
| | **Psychological Outcomes** | **Good mood**<br><br>"So it's a happy mood you would be in yes; feeling a lot better that you did than dossing around doing nothing" |
| | | **Sense of achievement/satisfaction**<br><br>"It gives you this feeling, this sense and I think even more so now that I'm retired and you need those purpose in your life and you think yes I've done something worthwhile and so on" |
| **Determinants of physical activity** | **Physical well-being**<br>It is defined as staying physically healthy and being in a good physical condition | It is defined as staying physically healthy and being in a good physical condition<br><br>"I think it helps my general physical wellbeing and I think that's important as you get older, you've got to stay mobile and… so you can get |

| | | |
|---|---|---|
| | | on and continue your life" |
| | **Psychological well-being**<br><br>It is defined as experiencing positive psychological outcomes or avoiding negative psychological outcomes | **Enjoyment**<br><br>It is defined as getting pleasure from exercise<br><br>"I don't do things because its good exercise and exercise is good for me, things I like to do happen to involve exercise. I like folk dancing, I'm in ramblers, I went on an eight mile walk yesterday because I enjoy the walking, the countryside and the company. I cycle places because it's the best way to get around Birmingham" |
| | | **Mood regulation**<br><br>It is defined as positive affect as a result of exercise or feeling good in general. It can also be negative affect as a result of lack of exercise<br><br>"If I'm not active psychologically it affects me and it makes me feel that I ought to be out doing something. I don't feel as well as if I have been out doing physical activities" |
| | | **Relaxation**<br><br>It is defined as feeling calm as a result of engaging in exercise<br><br>"It helps with stress relief and just general wellbeing" |
| | | **Purpose in life** |

| | | |
|---|---|---|
| | | It is defined as a feeling of accomplishment for successfully completing a physically demanding task<br><br>"It gives you this feeling, this sense and I think even more so now that I'm retired and you need those purpose in your life and you think yes I've done something worthwhile and so on" |
| | **Socialising**<br><br>Defined as getting in touch with other people as a result of exercise | Defined as getting in touch with other people as a result of exercise<br><br>"I play badminton by the way for physical activity and for social reasons, meets lots of people, and that's why I joined this club with these two people around as well" |
| | **Health perceptions**<br><br>It refers to whether an individual is satisfied or not with their health and how this influences their involvement in PA | Defined as having positive health perceptions<br><br>"If it's for a purpose I'm fine, but I don't see to just go to a gym for the sake of going to a gym, I don't see a point in it, you know if you're fit and healthy anyway" |
| | **Physical demand of previous occupation**<br><br>It refers to the nature of the previous occupation and how physically exhausting it was | "Well I was a carer so that's a physical activity, like Jane also was a nurse, so that is a lot of physical activity, so less I'd say, definitely less. Well its common sense, if you work for 40 hours doing it and you're not working now so it's a lot less but of course then I wasn't doing as much walking and running and skipping" |

## Appendix 6: Thematic Map-Imagery (Chapter 4)

| | First Level | Second Level |
|---|---|---|
| **What** | **Execution**<br>Images of executing a task with the aim to master it | **Skills**<br>Imagine yourself using certain skills (e.g. playing badminton with back hand)<br><br>"I'll try to imagine my back hand in badminton because some of the players I play against thought that was my weakest area and if I don't get it right I don't win the game" |
| | | **Sequences/routines**<br><br>Imagine a sequence of steps (e.g. dancing) or a routine (e.g. gymnastics) or picturing the process of getting ready to exercise<br><br>"Imagery helped me thinking I've got to get into a routine and plan ahead two or three moves" |
| | **Goals**<br><br>Images focusing on the result you want to achieve | **Physical appearance**<br><br>You see how you would like yourself to be as a result of exercise (Imagine yourself losing weight)<br><br>"Sometimes I've visualised that I've lost all my weight" |
| | | **Avoidance Imagine**<br><br>negative health outcomes (e.g. in a wheelchair) or see yourself in a way you do not want to be (e.g. fat)<br><br>"I can imagine using the negative image, I don't want to be a fat boy, that's an image I definitely wish to avoid" |
| | | **Process**<br>Images of task-related goals (e.g. where you are going to serve the ball)<br><br>"Well I've imagined myself being better at a sport…I always imagine that I can be better or what it would feel like to be better, to achieve a better…say golf for instance to make sure I get fewer strokes around the golf course. So I imagine it but it doesn't happen but that is a goal to a sport/activity because you always want to do better." |

| | | |
|---|---|---|
| | | **Reward**<br>Imagine getting an incentive after achieving a goal (see yourself enjoying a cup of tea at the end of exercise)<br><br>"I can see the bar and I can see on a hot day like this I've got the image of the beer with it all cold down the outside of the glass and me having my first sip, I can imagine that, I can even taste it now" |
| | **Affect**<br>Images related to mental health and psychological affect | **Relaxation**<br>Imagine feeling calm and relaxed<br><br>"You can drop your blood pressure by imagining yourself in a nice pool" |
| | | **Enjoyment**<br><br>Imagine yourself enjoying exercise<br><br>"I just thought about the possibility of seeing myself there and changing and enjoying the water" |
| | **Scenery**<br>Images of an escape place that you would like to exercise at or an actual place<br><br>"You can drop your blood pressure by imagining yourself in a nice pool. You're told to imagine this walking down the beach and going under the water and you can breathe under the water, which is absolutely fantastic because you can't breathe up top without the water." | |
| **Why** | **Cognitive** | **Memory**<br>Use imagery in regards to exercise to memorize steps or to remember non-exercise related things<br><br>"In Tai Chi I use imagery to keep my mind in it, remember how it was, how it goes so I don't forget" |
| | | **Planning**<br><br>Use imagery in an exercise setting to plan ahead of time their moves<br><br>" (If you physically can't do it), you'll find a way to do it and you use imagery perhaps to plan it. You draw on the past experiences and for me that's remembering what you did back then and those pictures come forward and help you progress with whatever you're doing" |
| | | **Skill execution and improvement** |

| | | |
|---|---|---|
| | | Use imagery to execute a skill and improve. |

| | | |
|---|---|---|
| | **Motivational** | **Initiate or complete**<br>Use imagery to motivate themselves initiate or complete an activity.<br><br>"Possibly if there's something that you really want to do, like you want to walk as well as play golf and you want to go back to your woodwork and you would love to play your saxophone to help you go back to doing that" |
| | | **Preparing for challenging situations**<br><br>Use imagery to overcome different types of barriers with imagery such as bad weather, fear, and concern for the unknown.<br><br>"It gives a little bit of motivation towards going out into the pouring rain" |
| | | **Self-efficacy**<br><br>Use imagery to get confidence to do certain things such as attending an exercise class<br><br>"Well it can be a form of preparation for what's to come. It's a form of comfort. It gives you a little bit of confidence when you go to that class" |

## Appendix 7: Audit Trail for Healthy Older Adults' Focus Groups (Chapter 2 & 4)

| TASK COMPLETED | DATE | SPECIFICS |
|---|---|---|
| Constructed Interview Guide | 03/11/2013 | |
| 1st Revision of interview guide | 22/4/2013 | All the researchers gave their input |
| 2nd Revision of interview guide | 13/5/2013 | Some of the questions were rephrased |
| 3rd Revision of interview guide | 29/5/2013 | Overall agreement with the other researchers |
| Pilot Tested interview guide | 07/03/2013 | The pilot test took place with a group of post-graduate students |
| Ethics approval | 04/07/2013 | |
| Recruitment started | 05/07/2013 | Post flyers in notice boards |
| 4th Revision of interview guide | 08/07/2013 | Changes were made based on the feedback from the group. An example of physical activity was added & some questions were simplified to fit the needs of older adults |
| 5th Revision of interview guide (Final format) | 21/08/2013 | Revised Interview Guide & updated demographics form |
| Conducted Focus Group 1 | 22/08/2013 | Physically active & Retired for 2-5 years |
| Conducted Focus Group 2 | 23/08/2013 | Physically active & Retired for 2-5 years |
| Conducted Focus Group 3 | 27/08/2013 | Physically active & Recently Retired |
| Conducted Focus Group 4 | 09/09/2013 | Physically active & Recently Retired |
| Conducted Focus Group 5 | 19/9/2013 | Insufficiently active & Recently Retired |
| Focus group audio sent to professional transcriber | 19/9/2013 | KATTS professional transcription |
| Transcription | 20/9/2013 | 1st focus group transcribed |
| Transcription | 23/9/2013 | 2nd focus group transcribed |
| Transcription | 24/9/2013 | 3rd focus group transcribed |

| | | |
|---|---|---|
| Transcription | 29/9/2013 | 4th & 5th focus group transcribed |
| Conducted Focus Group 6 | 30/10/2013 | Retired for more than 10 years-active |
| Conducted Focus Group 7 | 4/11/2013 | Inactive & retired for 2-5 years |
| Transcription | 19/11/2013 | 6th focus group transcribed |
| Data transcription completed | 22/11/2013 | 7th focus group transcribed-Transcripts produced |
| Analysis by the main researcher | 25/11/2013 | Data familiarisation- (Transcripts were read and re-read multiple times) |
| Organisation of data | 10/12/2013 | Use of NVIVO to create codes |
| Analysis continued | 10/01/2014 | Coding generation, and themes |
| Analysis | 18/01/2014 | Review of codes and themes |
| Meeting with second and third researcher | 02/02/2014 | Discussion of definitions and codes |
| Further analysis by main researcher | 05/02/2014 | Changes to some of the lower order themes |
| Meeting with second and third researcher | 20/02/2014 | Themes further refined and simplified |
| Present themes and quotes in a group of people external to the process | 27/03/2014 | Devil's advocate meeting. Challenging questions to support choices made |
| Present themes and quotes in an audience of experts | 15/05/2014 | Further review of themes. Changes in the theme structure. |
| Analysis completed | 03/06/2014 | |

**Appendix 8: Invitation Letter for COPD Cohort (Chapter 3)**

Date…….

Dear…….

**A Focus Group Invitation for The Birmingham COPD Cohort Study**

You recently agreed to take part in our follow-up study of people with COPD and related lung problems. When you joined this you kindly indicated that you would be willing to be approached about further research.

We want to hear the views of people with COPD and related lung problems about their engagement with and experience of physical activity. In particular we would welcome your views about how we might help people to maintain their levels of activity and barriers to activity.

I am writing to ask if you would be willing to join a focus group to discuss these issues and I enclose an information leaflet with more details about the study. The group will be tape-recorded and all the information you give will be confidential. I enclose a reply slip and envelope and I would be grateful if you would complete it and return it to me. If you have indicated that you would like to take part, we will phone you to make suitable arrangements.

You can contact me on [redacted] or [redacted] if you have any questions about the interview.

I look forward your reply.

Yours sincerely

BLISS Research Fellow

**Appendix 9: Information Letter for COPD Cohort (Chapter 3)**

UNIVERSITY OF BIRMINGHAM

BLISS Birmingham Lung Improvement Studies

## COPD Cohort – Physical activity focus groups

You are being invited to take part in a focus group as part of a research study. Before you decide if you are willing to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends and relatives if you wish. Ask us if there is anything that is not clear or if you would like more information.

**What is the purpose of the focus group?**

We would like to hear the views of people who have COPD and related lung problems about their engagement and experience of physical activity, and their experiences of imagery in relation to physical activity.

**Why have I been chosen?**

We hope to interview about 30 patients who are part of The Birmingham COPD Cohort Study. We have identified your name as you indicated that you were willing to be approached to be invited to join research studies related to your condition.

**What do I have to do?**

We are asking you to take part in a focus group. This will involve about 6 to 8 people and the researcher will ask the group questions about their views about physical activity and the difficulties of keeping active. We expect each group to last between an hour and an hour and a half. The group discussion will be tape-recorded. Any travel costs you may incur will be reimbursed.

**Do I have to take part?**

It is up to you to decide whether or not to take part. If you decide to take part we will ask you to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. This will not affect the care you receive.

**What are the possible benefits of taking part?**

The information we get from this study will help us to design services to help people with COPD to keep physically active.

**Will my taking part in this study be kept confidential?**

Your name will not be on the tape and we will remove your name from the interview transcripts to keep your identity confidential. Direct quotes may be used in publications but these will be numbered and anything which could identify you will be removed. Nothing that you say will be fed back to the doctors and nurses involved in your care as coming from you.

**Data Protection Act 1998**

The information you give us in the focus groups will only be used for the purposes of the study. The information will be kept securely for a period of 10 years after the study ends and then will be destroyed.

**Further details**

If you would like more information you can telephone the BLISS study team on [redacted] or [redacted]

If you agree to be interviewed you will be given of copy of this information sheet and a signed consent form for you to keep.

**Appendix 10: Consent Form for COPD Cohort (Chapter 3)**

The Birmingham COPD Cohort study: Focus groups

Practice Number: Participant ID:

***Please initial each box and sign below***

| | |
|---|---|
| I confirm that I have read and understand the information sheet dated 10/04/2014 for the above study and have had the opportunity to ask questions. | ☐ |
| I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. | ☐ |
| I agree to this focus group being recorded. | ☐ |
| I agree to take part in the above study | ☐ |

…….. ……..... …..…….

Name of participant Date Signature

…….. ……..... …..…….

Name of person

taking consent Date Signature

## Appendix 11: Focus Group Interview Guide - COPD Cohort (Chapter 3)

### Focus Group Interview Guide

**********

Focus group number: _____

Date: _____

Time began: _____ Time ended: _____

Moderator: _____

Other researcher(s) present: _____

**********

**Section 1 (Not Recorded)**

**WELCOME**

Thanks for agreeing to participate in the focus group. I appreciate your willingness to participate.

**INTRODUCTION**

My name is …….and I work with the BLISS research team at the University of Birmingham. Before we start I would appreciate if you can read the Information Letter and complete the Consent Form.

**PURPOSE OF FOCUS GROUPS**

The reason we are having these focus groups is to find out what people who suffer from breathing problems think about physical activity.

The information we gain in these discussions will help us to help and encourage people who suffer from breathing problems to be physically active. The idea of a group discussion is to allow you to share your views in a relaxed and informal environment. There are no right or wrong answers. Everyone's own experiences and opinions are important. Of course, what to say, how to say it, and how much you want to say is up to you. You should not worry about what you are expected to say, whether you are on the right track, or whether you should agree as a group.

I would like to audio record our discussion to make sure I do not miss anything you have to say. I have asked your permission to do this, as it will make our research more accurate and easier to carry out. So that there is no interference in the recording I would be very grateful if you could turn off any other electronics or software that might interfere with the recording.

I would like to point out that your contribution will be kept confidential, and that any of your comments that are published will not contain your name. As we go I may

make some notes. These are simply reminders and prompts for me and not an evaluation of your conversation.

Our discussion will last for approximately one and a half hours. During this time, I would like to explore a number of issues on this topic and hear everyone's responses. It would be better if you kept your questions about this research project until the end, but please feel free to ask questions relating to the topic throughout the discussion.

Just before we start, I would just like to tell you a couple of simple rules. They are important so that we get the best possible discussion, the best possible recording, and so that we keep everybody happy.

- ❖ Please speak freely – your opinion is important!
- ❖ Please make sure that you allow others to speak, you do not talk at the same time, and do not interrupt others.
- ❖ Please turn off your mobile phone completely.

**Section 2: Opening Questions (Recorder Turned On)**

Please could you introduce yourself and tell us something about you (e.g., how did you travel here today) (warm-up question).

***FOCUS GROUP: COPD group***

1. What does being physically active mean to you? (Perceptions of PA)
    a. How do you personally define the term "physical activity"?
    b. How physically active do you consider yourself to be?
    c. How physically active are you now compared to the past?

| |
|---|
| For the purposes of this study, physical activity has been defined as any structured activity with the goal of achieving fitness and health such as going to the gym, running, brisk walking, using a stationary bike or participating in a fitness class. But, it can also involve other lifestyle activities such as lawn mowing, washing the windows, vacuuming, briskly pushing a baby stroller. |

2. What are the main benefits you would expect if you were to be more physically active? (Outcome Expectancies)

a. How much of your free time have you been spending on being physically active? Can you describe a typical day?
b. How would becoming or staying physically active help you to manage symptoms like breathlessness and coughing?
c. How would you expect your quality of life to improve if you were to become more active?

3. How do you feel during or after physical activity? (Feelings & emotions-Affect)

a. By using words such as happy, tired, refreshed, nervous, excited, irritable can you please describe your emotions after you engage in physical activity? Probe: Could you give a specific example? Can you talk about that more? Help me understand what you mean?
b. How much enjoyment do you get from physical activity?
c. Is there anything you do not like about being physically active?
d. How do you react to some of the things you may experience after undertaking PA such as fatigue or discomfort?

4. How do you motivate yourself when it comes to physical activity?

a. How do you go about fitting physical activity in your routine?
b. How important is it for you to set physical activity goals?
c. What strategies can you use to become more physically active?

5. What are the main barriers that interfere with you engaging in physical activity? (Perceived barriers to physical activity)

a. How confident are you that you can become more physically active despite all the barriers? (Self-efficacy)

b. What are the things that will make it easier for you to be more physically active? How may other people play a role? (Enablers)

c. Are there any activities you find easier to incorporate in your daily life? For example, are there any arm and upper-body movements that are easier to incorporate? (Enablers)

**Section 4: Exit Question**

The interviewer provides a brief summary of the aims of the interview;

- During this discussion we were aiming to find out what people think about physical activity and asks;

- Is there anything we have missed?
  - Probe: Would you like to raise anything else at this point?

**Section 6: Closing**

I would like to again thank you for participating in this group interview and remind you that any comments that you made here today will remain confidential and for

## Appendix 12: Thematic map for COPD Cohort (Chapter 3)

| Theme | | Example quote |
|---|---|---|
| **Personal Enablers** Personal enablers refer to factors that can motivate individuals with COPD to engage in physical activity that are under a person's control. | **Autonomous motivation** It is defined as pursuing physical activity because of personal interests and values reflecting autonomous motivation . | **Enjoyment of physical activity** It is defined as the feeling of pleasure from engaging in physical activity.<br><br>"While I'm doing it I'm in heaven, I'm on another planet, it make you relax" (Employed/MRC 1) |
| | | **Socialising**<br><br>It is defined as meeting other people through engagement in physical activity<br><br>"I'm motivated by the social side, the people I meet with or play. I'll play any sport just for the social side of it; yeah I do enjoy that, that's a motivation" (Employed/MRC 1). |
| | **Controlled motivation**<br><br>It refers to feeling compelled to engage in a behaviour because of external influences | **Caring responsibilities**<br><br>It refers to on-going obligations such as having to take care of another family member or a pet.<br><br>"If it was just me on my own sitting there with the dog, the dog wouldn't go anywhere end of story. So there's an element of that as well". (Mixed/MRC 3) |
| | **Attitudes/ Perceptions**<br><br>It refers to people's opinions of COPD and how it affects them | **Positive attitude of mind**<br><br>It refers to normalising their condition and aiming for a regular life |

| | | |
|---|---|---|
| | | "It never affects me; I might as well not have COPD because I don't think I've got it " (Mixed/MRC 2) |
| | | **Positive physical activity perception**<br><br>It refers to the belief that physical activity is beneficial can be aligned with their understanding that it will have a positive impact on their physical health and psychological wellbeing.<br><br>"I think if you're improving your cardiovascular health overall physical activity is bound to help you to manage the symptoms of COPD" (Newly diagnosed/MRC 1) |
| | **Self-regulation**<br>Self-regulation refers to the different strategies that people with COPD used to manage their symptoms and to control their behaviour. | **Self-set goals**<br>It refers to establishing a set of personal goals when carrying out physical activity<br><br>"I have the idea in my mind if its less than two miles or up to two miles I will walk rather than take the car or the bike " (Newly diagnosed/MRC 1). |
| | | **Routines**<br><br>It refers to establishing a habitual behaviour as a strategy to remain physically active<br><br>"Over the years I got in the habit of getting out of bed at 6 o'clock in the morning, going downstairs, making my and my wife a cup of teas and taking it back again and then going down and repeating the exercise. So that's sort of a very early morning routine which is something I don't think I can give up because its part of my life which has to be done." (Mixed/MRC 3) |

| | | |
|---|---|---|
| | | **Personalised exercise regime**<br><br>It is defined as identifying an exercise you feel comfortable doing was a way to facilitate initiation of physical activity.<br><br>" I use my weights. Because I'm not walking, I'm not moving, I can do my exercises and I feel comfortable with that, I do it every day*"(*Mixed/MRC 4) |
| | | **Pacing yourself**<br><br>It refers as a way to deal with their breathlessness symptoms was to adopt a slower pace when engaging in physical activity<br><br>"I do most of things that I used to do but I find that I do have to keep stopping because I get breathless with all the housework and things…I do try to do most things that I do just at a slower pace sometimes" (Employed/ MRC 1) |
| | **Achievement**<br>It refers to getting positive reinforcement as a result of engaging in physical activity | "I'll go somewhere where there might be a bit of walking in it as well and I feel as though I've achieved something, which is great"( Employed/ MRC 1) |
| **<u>Social Enablers</u>**<br>It refers to social and environmental factors that are somewhat beyond an individual's control and are summed up to the single theme of social support. | **Social support**<br>It refers to feeling understood and encouraged to be physically active from partners, friends and people with similar issues | "I also think that support from family, i.e. your partner, husband, wife or whatever, is pretty important on a day-to day routine. My wife might say to me, nice day out, so you fancy taking the dog for a walk in the park…there's a backing there." (Mixed/MRC 3). |

| | | |
|---|---|---|
| **<u>Personal Barriers</u>**<br>Personal barriers are related to the individuals themselves | **Physical limitations of COPD**<br>It refers to all the health-related issues that most individuals face as a result of having COPD | **Fatigue/Recovery**<br>It refers to the lack of stamina or slow recovery<br><br>"So I'd like to be able to be more active but I haven't got the energy basically" (Employed/MRC 3) |
| | | **Mobility problems**<br><br>It refers to getting out of breath as a result of engaging in certain types of activity<br><br>"Going upstairs for example, I find it really difficult to go upstairs even to go to the toilet but you know its one of the things you have to do" (Mixed/MRC 3). |
| | | **Weather conditions and potential impact on breathing**<br><br>It refers to adverse weather conditions and their effect on breathing. Specific weather conditions such as wet, hot, cold and damp air<br><br>"That affects me quite a lot, it makes me a lot more breathless and I seem to get more pain as well in my chest with the cold weather". (Employed/MRC 3) |
| | **Psychological distress of COPD**<br><br>It refers to the feelings associated with COPD and how their condition affected them emotionally | **Embarrassment**<br><br>It refers to feeling ashamed of experiencing symptoms such as breathlessness and immobility in front of others.<br><br>"They see you out of breath or you're on a rollator, people do come up to you and say are you all right. You do get kind of embarrassed because you're only taking a |

| | | |
|---|---|---|
| | | breather you know but they just see you're in distress" (Mixed/MRC 4) |
| | | **Fear**<br><br>It refers to feelings of concern in regards to experiencing symptoms such as breathlessness or pain<br><br>"When I first got the pains when I went up steps or walking up a hill, it used to actually frighten me a bit, I used to think oh god this is my heart or you know" (Employed/MRC3). |
| | | **Frustration/ Disappointment**<br><br>It refers to experiencing negative feelings and a lack of motivation to exercise due to the irreversible nature of their disease.<br><br>"You get frustrated to a very high degree. I've come home from work and I've played football with the kids and you know done all these things and suddenly you get to this point where you just cannot anymore and you feel as if it's the end of the road" ( Mixed/MRC 3) |
| | **Attitudes /perceptions**<br><br>The way people with COPD perceived their condition and their perceived ability to do something about it, defined their engagement in physical activity | **Learned helplessness.**<br><br>It refers to not being in control of their condition and the feeling of being unable to change their situation<br><br>"If your lungs are scarred, they can do nothing about that, so it's a state of mind so you think well its done now, its too late you know, I'm not going to get no bother, my lungs are getting no better, but you |

| | | |
|---|---|---|
| | | wont get better so there's no big incentive. (Mixed/MRC 4) |
| | | **Underestimation of physical activity importance**<br><br>It refers to undervaluing physical activity and comparing yourself to others who exercised but were less healthy than themselves<br><br>"I don't think they're any fitter. I have got a large circle of friends and a lot of them go to the gym. One is mad keen cyclist, he goes for miles and miles and as I say I don't do anything, but I'm the only one that don't take any pills, they're all on pills, blood pressure tablets, I am in better condition than they are (Recently diagnosed/MRC 1). |
| | | **Older age perception**<br><br>It refers to the perception that exercise is not necessary in older age<br><br>"So why do we need to do all this exercising at our age now, I don't really think you can get a massive amount of benefit at our age. Younger people yes, but our age no" (Recently diagnosed/MRC 1). |
| | **Motivation**<br><br>It refers to having a reason to stimulate the desire for physical activity | **Lack of drive**<br><br>This can be seen as one's inability to carry out exercise due to insufficient 'get up and go' or potentially a mental block that limits their self-belief in it being a worthwhile experience |

| | | |
|---|---|---|
| | | "I can't motivate myself to do physical exercise. I've done it when I was younger, yoga and things like that but now, I just don't want to" (Recently diagnosed/MRC 2) |
| **<u>Social barriers</u>**<br>Social barriers can be seen as external influences that affected people's involvement in physical activity | **Overprotective family members**<br>It refers to the negative effect of social support. | "My husband takes me everywhere and he does everything, he won't let me do anything though…It is a problem when somebody is over-protective" (Mixed/MRC 5) |
| | **Lack of time**<br>The perception that there is not enough time in their day to engage in exercise. | "If I didn't work so many hours then I'd have more hours to put aside for activity". (Employed/MRC 3). |

**Appendix 13: Audit trail for COPD focus groups (Chapter 3)**

| TASK COMPLETED | DATE | SPECIFICS |
|---|---|---|
| Meeting with the research team | 28/03/2014 | Project discussion |
| Meeting with the research team | 31/03/2014 | Jointly review the draft topic guide |
| Generation of a draft interview guide | 03/04/2014 | Based on a previous study with healthy older adults, topic guide adjusted for the needs of the study |
| 1st Revision of interview guide | 10/04/2014 | Overall agreement on the final topic guide |
| Ethics approval | 22/05/2014 | |
| Meeting with the research team | 20/05/2014 | Discuss about the details of the study & set a plan to move forward |
| Invitations sent out to participants | 13/06/2014 | 404 invitations sent |
| Participants got contacted for the 1st time | 30/06/2014 | After receiving 60 positive responses, phone calls were made to make arrangements |
| Conducted Focus Group 1 | 11/07/2014 | Newly diagnosed group |
| Conducted Focus Group 2 | 16/07/2014 | Employed group |
| Conducted Focus Group 3 | 18/07/2014 | Pulmonary rehabilitation group |
| Conducted Focus Group 4 | 18/07/2014 | Mixed group |
| Focus group audio sent to professional transcriber | 20/7/2014 | KATTS professional transcription |
| Transcription of focus groups completed | 06/8/2014 | Transcripts produced |
| Analysis started by the primary researcher | 08/08/2014 to 14/08/2014 | Data familiarisation (Transcripts were read and re-read multiple times) |
| Meeting with two of the researchers | 14/08/2014 | Discussion with other research members about coding. Overall agreement of what a code is. |
| Analysis by the main researcher | 15/08/2014 | Coding generation started |
| Analysis by the main researcher | 23/08/2014 | Generation of themes started |
| Overall analysis | 28/08/2014 | Definitions created for each theme |
| Meeting with the research group | 09/09/2014 | Initial discussion of definitions |
| Further analysis by the main researcher | 12/09/2014 | Review of the definitions, codes, themes |

| | | |
|---|---|---|
| Consensual validation- Meeting with the research group | 15/12/2014 | The themes were presented to the team for the 1st time-Discussion with the group |
| Meeting with the research group | 22/01/2015 | Further discussion about codes, themes. Structure of lower order themes changed |
| Meeting with the research group | 10/02/2015 | Discussion with the group- Revision of themes. Some coded were moved to different themes |
| Meeting with the research group | 25/06/2015 | Devil's advocate and decision about the final set of themes |
| Analysis completed | 10/07/2015 | |

## Appendix 14: Demographic Questionnaire (Chapter 5)

**Section A: Information about you**

Please give the following information for data coding purposes:

ID: __ /__ /__ -__ (enter date of birth in DD/MM/YY format, followed by the # of siblings)

Please provide the following information:

1. Gender

   Female
   Male

2. Ethnic Group:
   A – White
      British
      Irish
      Any other white background; please specify
   B – Mixed
      White and Black Caribbean
      White and Black African
      White and Asian
      Any other mixed background; please specify
   C – Asian or Asian British
   D – Black or Black British
      Caribbean
      African
      Any other black background; please specify
   E – Chinese or other ethnic group
      Chinese
      Any other ethnic group; please specify
      Indian Pakistani Bangladeshi
      Any other Asian background; please specify

3. What is your total household income?

   Less than £ 10,000
   £10,000-20,000
   £20,000-30,000
   £30,000-40,000
   £40,000-50,000

More than £50,000

4. What is the highest level of education you have completed?

   Less than high-school
   High-School
   Some College
   2-Year College
   3-Year College Degree
   Master's Degree
   Doctoral Degree

5. What is your current occupational status?

   Part-time work
   Full-time work
   Retired
   Unemployed

6. In general, would you say your health is?

   Excellent
   Very Good
   Good
   Fair
   Poor

## Appendix 15: Self-regulatory Imagery (Chapter 5)

The following questions deal with imagery and exercise participation. Imagery involves "mentally" seeing yourself exercising. The image in your mind should approximate the actual physical activity as closely as possible. Imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energised), staying focused (concentrating on an aerobic class and not being distracted), setting exercise plans/goals (e.g., imaging achieving a goal of losing weight), etc.

| ***Please answer the following questions with regard to how often you use mental imagery (never to often).*** | **0** **Never** | **1** **Rarely** | **2** **Occasionally** | **3** **Sometimes** | **4** **Frequently** | **5** **Usually** | **6** **Always** |
|---|---|---|---|---|---|---|---|
| *1.* I imagine making plans to exercise | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***2.* I imagine the exercise goals I have set** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***3.* I imagine keeping to my plans for exercising** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***4.* I imagine being more motivated as a result of setting exercise goals** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| *5.* I imagine making time to exercise | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| *6.* I imagine evaluating my progress towards reaching my goals | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***7.* I imagine exercising on specific days and/or at specific times each week** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| *8.* I imagine rewarding myself for achieving my exercise goals | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***9.* I imagine following my exercise plan/schedule** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| *10.* I imagine sticking to my exercise goals | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| *11.* I imagine reflecting on my exercise plans | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| ***12.* I imagine achieving my exercise goals** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

**Appendix 16: Exercise Planning and Scheduling Scale** (EPS; Rovniak et al., 2002)
**(Chapter 5)**

| ***The following questions refer to how you fit exercise into your lifestyle. Please indicate the extent to which of the statements below describes you:*** | **1** Does not describe me | **2** Describes me slightly | **3** Describes me moderately | **4** Describes me quite well | 5 Describes me completely |
|---|---|---|---|---|---|
| *1.* I never seem to have enough time to exercise | 1 | 2 | 3 | 4 | 5 |
| *2.* Exercise is generally not a high priority when I plan my schedule | 1 | 2 | 3 | 4 | 5 |
| *3.* Finding time for exercise is difficult for me | 1 | 2 | 3 | 4 | 5 |
| *4.* I schedule all events in my life around my exercise routine | 1 | 2 | 3 | 4 | 5 |
| *5.* I schedule my exercise at specific times each week | 1 | 2 | 3 | 4 | 5 |
| *6.* I plan my weekly exercise schedule | 1 | 2 | 3 | 4 | 5 |
| *7.* When I am very busy, I don't do much exercise | 1 | 2 | 3 | 4 | 5 |
| *8.* Everything is scheduled around my exercise routine—both classes and work, etc. | 1 | 2 | 3 | 4 | 5 |
| *9.* I try to exercise at the same time and same day each week to keep a routine going | 1 | 2 | 3 | 4 | 5 |
| *10.* I write my planned activity sessions in an appointment book or calendar | 1 | 2 | 3 | 4 | 5 |

**Appendix 17: Exercise Goal-Setting Scale** (EGS; Rovniak et al., 2002)
**(Chapter 5)**

| ***The following questions refer to how you set exercise goals and plan exercise activities. Please indicate the extent to which each of the statements below describes you:*** | **1** Does not describe me | **2** Describes me slightly | **3** Describes me moderately | **4** Describes me quite well | **5** Describes me completely |
|---|---|---|---|---|---|
| *1.* I often set exercise goals | 1 | 2 | 3 | 4 | 5 |
| *2.* I usually have more than one major exercise goal | 1 | 2 | 3 | 4 | 5 |
| *3.* I usually set dates for achieving my exercise goals | 1 | 2 | 3 | 4 | 5 |
| *4.* My exercise goals help to increase my motivation for doing exercise | 1 | 2 | 3 | 4 | 5 |
| *5.* I tend to break more difficult exercise goals down into a series of smaller goals | 1 | 2 | 3 | 4 | 5 |
| *6.* I usually keep track of my progress in meeting my goals | 1 | 2 | 3 | 4 | 5 |
| *7.* I have developed a series of steps for reaching my exercise goals | 1 | 2 | 3 | 4 | 5 |
| *8.* I usually achieve the exercise goals I set for myself | 1 | 2 | 3 | 4 | 5 |
| *9.* If I do not reach an exercise goal, I analyse what went wrong | 1 | 2 | 3 | 4 | 5 |
| *10.* I make my exercise goals public by telling other people about them | 1 | 2 | 3 | 4 | 5 |

**Appendix 18: The Outcome Expectations for Exercise Scale** (OEES; Resnick et al., 2000) **(Chapter 5)**

| ***Please read the following statements about exercise and choose the number that represents how you feel about exercise*** <br> ***Exercise:*** | **1** <br> Strongly agree | **2** <br> Agree | **3** <br> Neither agree or disagree | **4** <br> Disagree | **5** <br> Strongly disagree |
|---|---|---|---|---|---|
| *1.* Makes me feel better physically | 1 | 2 | 3 | 4 | 5 |
| *2.* Makes my mood better in general | 1 | 2 | 3 | 4 | 5 |
| *3.* Makes me more tired than usual | 1 | 2 | 3 | 4 | 5 |
| *4.* Makes my muscles stronger | 1 | 2 | 3 | 4 | 5 |
| *5.* Is an activity I enjoy doing | 1 | 2 | 3 | 4 | 5 |
| *6.* Gives me a sense of personal accomplishment | 1 | 2 | 3 | 4 | 5 |
| *7.* Makes me more alert mentally | 1 | 2 | 3 | 4 | 5 |
| *8.* Makes it easier for me to do daily activities (personal care, cooking, shopping, light cleaning, taking out the garbage) | 1 | 2 | 3 | 4 | 5 |
| *9.* Helps to strengthen my bones | 1 | 2 | 3 | 4 | 5 |

**Appendix 19: The Perceived Barriers to Exercise** (PBE; Salmon et al., 2003)
**(Chapter 5)**

| ***In general, how much does each barrier interfere with you engaging in physical activity?*** | **1** Is not a barrier | **2** Very little | **3** So-so | **4** Quite a bit | **5** Very much a barrier |
|---|---|---|---|---|---|
| *1.* Cost | 1 | 2 | 3 | 4 | 5 |
| *2.* Weather | 1 | 2 | 3 | 4 | 5 |
| *3.* Personal safety | 1 | 2 | 3 | 4 | 5 |
| *4.* Pollution | 1 | 2 | 3 | 4 | 5 |
| *5.* No access to facilities | 1 | 2 | 3 | 4 | 5 |
| *6.* No sidewalk | 1 | 2 | 3 | 4 | 5 |
| *7.* Age | 1 | 2 | 3 | 4 | 5 |
| *8.* Disability or injury | 1 | 2 | 3 | 4 | 5 |
| *9.* Tired | 1 | 2 | 3 | 4 | 5 |
| *10.* Lack of time | 1 | 2 | 3 | 4 | 5 |
| *11.* Work or volunteer commitments | 1 | 2 | 3 | 4 | 5 |
| *12.* Family commitments | 1 | 2 | 3 | 4 | 5 |
| *13.* Other priorities | 1 | 2 | 3 | 4 | 5 |
| *14.* Short-term illness | 1 | 2 | 3 | 4 | 5 |
| *15.* Chronic illness or condition | 1 | 2 | 3 | 4 | 5 |
| *16.* Lack of equipment | 1 | 2 | 3 | 4 | 5 |
| *17.* Lack of transportation | 1 | 2 | 3 | 4 | 5 |
| *18.* Nobody to exercise with | 1 | 2 | 3 | 4 | 5 |

**Appendix 20: Barriers Specific Self-Efficacy Scale** (BSSES; McAuley, 1992)
**(Chapter 5)**

The following items reflect situations that are listed as common reasons for preventing individuals from participating in exercise sessions or, in some cases, dropping out. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

| **Please indicate the degree to which you are confident that you could exercise in the event that any of the following circumstances were to occur by circling <u>the appropriate %.</u> I believe that I could exercise 3 times per week for the next 3 months if:** | Not at all Confident | **%** | | | | Moderately Confident | **%** | | | | Highly Confident |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *1.* The weather was very bad (hot, humid, rainy, cold). | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *2.* I was bored by the programme or activity. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *3.* I was on vacation. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *4.* I was not interested in the activity. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *5.* I felt pain or discomfort when exercising. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *6.* I had to exercise alone. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *7.* It was not fun or enjoyable. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *8.* It became difficult to get to the exercise location. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *9.* I didn't like the particular activity programme that I was involved in. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

| **Please indicate the degree to which you are confident that you could exercise in the event that any of the following circumstances were to occur by circling <u>the appropriate %.</u> I believe that I could exercise 3 times per week for the next 3 months if:** | Not at all Confident | **%** | | | | Moderately Confident | **%** | | | | Highly Confident |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *10.* My schedule conflicted with my exercise session. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *11.* I felt self-conscious about my appearance when I exercised. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *12.* An instructor does not offer me any encouragement. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| *13.* I was under personal stress of some kind. | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

**Appendix 21: The Exercise Enjoyment Subscale from the Intrinsic Motivation Inventory** (EES; Ryan, 1982) **(Chapter 5)**

| ***Please indicate how much you personally agree, or disagree with each statement by choosing the appropriate response.*** | **1** Not at all | **2** Very little | **3** Slightly | **4** Moderately | **5** Quite a bit | **6** Very Much | **7** Extremely |
|---|---|---|---|---|---|---|---|
| *1.* I enjoy exercise very much | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *2.* Exercising is fun to do | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *3.* I think exercising is a boring activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *4.* Exercising does not hold my attention at all | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *5.* I would describe exercising as very interesting | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *6.* I think exercising is quite enjoyable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *7.* While I exercise, I am thinking about how much I enjoy it | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Appendix 22: International Physical Activity Questionnaire** (IPAQ; Craig et al., 2003) **(Chapter 5)**

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions are about the time you spend being physically active in a typical week. They include questions about activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Your answers are important.
**Please answer each question even if you do not consider yourself to be an active person.**
**THANK YOU FOR PARTICIPATING.**

**Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal like heavy lifting, digging, aerobics, or fast bicycling

**1a.** During a typical week, on how many days do you do **vigorous** physical activities? Think about *only* those physical activities that you did for at least 10 minutes at a time.

Days per week (Circle One): 0 1 2 3 4 5 6 7

**1b.** How much time did you usually spend doing vigorous physical activities on one of those days?
(Write number in box, or mark X for Don't know/Not Sure)

Hours per day ☐ Minutes per day ☐ Don't know/Not sure ☐

**Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

**2a.** Again, think *only* about those physical activities that you did for at least 10 minutes at a time. During a typical week, on how many days do you do **moderate** physical activities

Days per week (Circle One): 0 1 2 3 4 5 6 7

**2b.** How much time do you usually spend doing moderate physical activities on one of those days?
(Write number in box, or mark X for Don't know/Not Sure)

Hours per day ☐ Minutes per day ☐ Don't know/Not sure ☐

**Walking** includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

**3a.** During a typical week, on how many days do you **walk** for at least 10 minutes at a time?

Days per week (Circle One): 0 1 2 3 4 5 6 7

**3b.** How much time do you usually spend walking on one of those days?

Hours per day ☐ Minutes per day ☐ Don't know/Not sure ☐

The last question is about the time you spent **sitting** on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

**4.** During a typical week, how much time do you spend sitting on a week day?

Hours per day ☐ Minutes per day ☐ Don't know/Not sure ☐

**Many thanks for completing the questionnaire!**