

DEVELOPING A PERSON- CENTRED, MULTI-LEVEL PHYSICAL ACTIVITY INTERVENTION FOR OLDER ADULTS

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Abstract

Physical inactivity in older adults presents a significant problem within contemporary society. Governments around the world are recognising this importance and the large impact of physical inactivity on health and health-related expenditure, yet interventions promoting physical activity have typically produced only small or short-lived behaviour change. Through three related studies, this thesis aims to develop a person-centred, multi-level physical activity intervention within a residential estate of older adults. The first study used qualitative methods to develop a person-centred understanding of the multi-level influencers of physical activity engagement within the targeted individuals. These findings were then applied within study 2, which implemented a 12-week physical activity intervention within the residential estate and used a mixed-methods approach to assess its implementation and explore personal experiences of the intervention strategies designed by the person-centred approach. The final study explored the transitions associated with older adults to develop an understanding of purpose, meaning and identity in later life, and how this can influence physical activity behaviour. The findings of the third study were presented within a composite vignette of the transition experiences of 4 older adults within the residential estate. The thesis presents an effective and appropriate strategy for developing person-centred, multi-level physical activity intervention for older adults. Contrary to the health-focused emphasis that is predominantly adopted by public health initiatives, the findings of this thesis highlight the importance of purpose, and related constructs such as meaning and identity for understanding and promoting physical activity behaviour in older adults. The findings suggest that future person-centred physical activity interventions for older adults should take into consideration the changes in sense of purpose as individuals become older and design intervention strategies to maximise a sense of purpose in life, and to provide more meaningful sources of physical activity.

Declarations and statements

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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STATEMENT 2

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1. Introduction

The purpose of this chapter is to present background information regarding the area of research and to outline the rationale for researching the topic of interest. The chapter first introduces the research topic and then outlines the purpose of the present thesis.

1.1. Introduction to the research topic

There is considerable evidence to suggest that regular engagement in physical activity (PA) has physical and psychological benefits for individuals of any age (Lee et al., 2012; Heath et al., 2012). Higher intensity and a greater frequency of PA are associated with a reduced risk of chronic disease and improved health (WHO, 2010; Cavill et al., 2006), along with positive changes in well-being and cognitive functioning (Falkingham et al., 2010; Angevaren et al., 2008; Department of Health, 2009). In older adults, there is current evidence to suggest that PA can reduce the risk of cardiovascular disease, various cancers, osteoporosis, cognitive decline, sarcopenia and falls (Reiner et al., 2013; Vogel et al., 2009). Despite the well-documented health benefits of an active lifestyle, many older adults do not achieve the PA guidelines of 150 min/week of moderate intensity PA (Department of Health, 2011; NHS, 2015; WHO, 2016). Therefore, health policies have sought to increase PA levels in older adults through providing guidance (Ministry of Health, 2013), and supporting those who work with older adults to integrate greater levels of PA into their daily lives (WHO, 2010).

1.1.1. An ageing population

Between 2000 and 2050, the number of adults over 60 years of age is expected to double from 11% to 22%, according to estimates by the WHO (United Nations, 2013). Similar to the rest of the world, the UK's age profile is progressing towards older ages. According to ONS statistics, by 2050 it is expected that one in four people will be aged 65+ years, rising from one in five in 2018 (ONS, 2018). Furthermore, it is expected that by 2066 there will be an additional 8.6 million adults aged 65 years and older. This shift in age profile has several implications for public and health services. The United Nations have developed guidelines on standard international age classifications, defining older adults as 65 years and older (United Nations, 1982).

The Health Survey for England (2016) identified that the likelihood of disability and/or experiencing multiple chronic health conditions increases with age, and as life expectancy increases, so does amount of time an individual will spend living with such health conditions.

In 2016, 29% of older adults aged 60-64 years had two or more chronic health conditions, which results in increased healthcare requirements, with individual healthcare costs significantly increasing from the age of 65 years old (ONS, 2018).

1.1.2. Physical activity patterns

Although research has shown PA to have significant benefits to our health and well-being as we age, older adults tend to be less active than younger age groups, with 47% of individuals aged 75-84 years within the UK being classed as inactive. This number then rises to 70% for those over the age of 85 years (National Institute for Health Research, 2019). Sport England (2018) also reports that over 50% of all inactive individuals within England are over the age of 55 years. These surveys use self-report measures of PA, which have previously been shown to yield higher estimates of PA than objectively measured PA (Tucker et al., 2011; Hurting-Wennlof et al., 2010). Therefore, the number of physically inactive older adults may be higher than reported by Sport England. This is supported by Sun et al. (2013) who highlighted that there is a lack of reliable data for assessing PA levels and trends in older adults. Nevertheless, this systematic review suggests that, based on objective measures of PA, within the existing literature older age groups were less likely to be physically active than younger age groups, with women less likely to achieve sufficient PA levels than men.

Along with having low levels of PA, older adults are also the most sedentary age group (Rezende, et al., 2014). Sedentary behaviour consists of activities that do not increase energy expenditure much above resting levels, for example, sitting, lying down, sleeping, watching TV and reading. Therefore, sedentary behaviour is not only a lack of moderate-to-vigorous PA and can be reduced through increasing standing time and/or light PA (McGowan et al., 2020). Along with low levels of PA, high levels of sedentary behaviour can also impact the health of older adults through negative influences on physical functioning, psychological well-being, and social components of life, such as feelings of loneliness (Dogra & Stathokostas, 2012). Previous research also indicates that sedentary behaviour is a risk factor for obesity, diabetes, heart disease, cancer, and premature mortality (Thorp et al., 2011; Wilmot et al., 2012). Harvey et al. (2015) states that older adults on average engage in 9.4 hours of sedentary behaviour per day, with much of this time spent on leisure activities within the home. Due to low levels of PA in older adults, along with the increased physical barriers to MVPA they may experience, reducing sedentary behaviour can be a viable strategy for improving the health and well-being in older individuals.

1.1.3. Physical activity definition

PA is described as movement that is produced by the skeletal muscles, resulting in energy expenditure. There are several types of PA. For example, exercise, which is a common form of PA, is a more structured form, with the main objective to improve or maintain physical fitness levels (Caspersen et al., 1985). PA is also carried out in our general daily activities. For example, using the stairs, getting in and out of chairs or doing the shopping. Other forms include walking, sports, and home and occupational activities (NHS, 2017).

1.1.4. Physical activity guidelines

The World Health Organisation (WHO) works alongside governments throughout the world to try and facilitate the highest level of health for people, and in 2010 created the guidelines for recommended levels of PA. The guidelines state that children aged 5-17 years should accumulate 60 minutes of moderate to vigorous PA per day. Age groups 18-64 and 65+ years should aim for at least 150 minutes of moderate to vigorous PA over the course of a week. 300 minutes of either intensity is advised for additional health benefits. For older adults, it is advised that they ‘move more’ and ‘sit less’ throughout the day, aiming to increase PA and reduce sedentary behaviour, with some PA being better than none. Older adults are also advised to do muscle strengthening and balance exercises 3 times per week (WHO, 2010). The recommendations acknowledge that older adults may be more likely to be affected by declining health conditions and advise that all individuals should aim to be as physically active as their condition allows.

1.1.5. PA, health and well-being in older adults

Physical inactivity is one of the five leading causes of death, along with high blood pressure, smoking, diabetes and obesity (Blair et al., 2012). The WHO (2013) report that approximately 3.2 million deaths each year are a result of physical inactivity. Although there is strong evidence to suggest that moderate intensity aerobic and strengthening exercise are necessary for maintaining good health in old age, PA levels are declining, and the amount of chronic health conditions is increasing. Blair et al. (2012) highlighted the direct link between physical inactivity, low cardiovascular fitness, and the presence of chronic health conditions. Other physical and psychological conditions are associated with physical inactivity in older adults, such as sarcopenia (loss of muscle mass), poor balance, a reduction in muscle function (Sakuma & Yamaguchi, 2012), and a decline in cognitive performance (Salthouse, 2003). PA has also been shown to prevent certain forms of mental illness in older adults, such as depression, dementia, and Alzheimer's disease (Fox et al., 2007). All of these conditions contribute

significantly to the health and well-being of older adults. Although extending life is an important factor, it is just as important to maintain functional independence and quality of life in older adults.

1.1.6. The economic impact of low PA in older adults

Pratt et al. (2014) state that physical inactivity has a direct cost of around 1 to 2.6% of total health care costs. From 2006-2007, physical inactivity cost the NHS an estimated £0.9 billion (Scarborough et al., 2011). National bodies must also factor in the indirect healthcare costs of physical inactivity, which include chronic disease and disability. These indirect costs may far exceed those of direct health care costs (Maresova, 2014). Public Health England report that physical inactivity costs the NHS in England more than £455m (Public Health England, 2016). This figure only considers the impact of PA on five related diseases due to a lack of population attributable fractions. The diseases included within the analysis were ischaemic heart disease, ischaemic stroke, breast cancer, colon/rectum cancer and diabetes mellitus. Other diseases related to physical inactivity, such as obesity, musculoskeletal health, mental health and functional health were not included, therefore these estimates are expected to be significantly lower than the true cost of physical inactivity in the UK. More specifically, Public Health England reported that physical inactivity of older adults cost the NHS £103m in 2018, and if not addressed, may cost over £1.3 billion by the year 2030. Therefore, there is a need for effective and sustainable ways to promote the uptake of PA and to support long-term engagement in PA as people age. The current literature on PA interventions for older adults has shown some effectiveness in achieving increased PA behaviour, although these changes are often short lived (Chase, 2013) and more research is needed to identify the most effective intervention strategies, such as the delivery, setting and specific intervention components (Zubala et al., 2017).

Given the rising levels of older adults around the world, and the vast majority not meeting the current PA guidelines, national health policies have focused on improving PA engagement by providing PA guidance and by highlighting to those working with older adults the need to incorporate increased amounts of PA into everyday life (World Health Organisation, 2010). This attempt at increasing PA behaviour in older adults is to avoid the potential health and financial implications associated with physical inactivity (Public Health England, 2016). Therefore, interventions to increase PA behaviour in older adults are of prime importance. However, there is a lack of interventions targeting specifically older adults (Chase, 2013) and existing interventions showing short-lived increases in PA (Zubala et al., 2017).

1.2. An overview of the thesis

Chapter 2 presents a review of the literature with a focus on the topic relevant to this thesis, whilst providing a critical discussion of existing studies and how they contribute to the rationale of this research project. Chapter 3 is comprised of 3 studies. Study 1 aims to identify barriers to, and facilitators of, PA in older adults, and identify intervention strategies that address factors on multiple levels of the social ecological model (Sallis & Owen, 2015). Study 2 aims to design and assess the implementation of a person-centred, multi-level PA intervention within a residential estate of older adults. Study 3 then looks to qualitatively explore the transitions into later life and their influence on PA participation through changes in meaning, purpose, and identity. In Chapter 4, final conclusions are drawn regarding the implications of the findings for a better understanding of PA behaviour in older adults. Finally, limitations of the research project and future research questions that should be considered are identified.

1.3. Chapter summary

This chapter has introduced the research area and provided an overview of the content of this thesis. The next chapter will present a review of the existing literature relevant to the topic of research.

2. Literature review

The aim of this chapter is to review the existing literature related to PA engagement in older adults. The chapter first explores the research on the benefits of PA and the barriers to, and facilitators of, PA that older adults experience. The chapter then considers the current literature on PA interventions in older adults and their influence on PA levels. Finally, this chapter then discusses psychological theories that have been used in previous research on PA in older adults.

2.1. The benefits of physical activity

Research has identified several benefits of PA to older adults, such as physical health, mental-wellbeing (Bishop et al., 2010) and giving opportunities for social interaction with others (Sirven & Debrand, 2008). Although the WHO recommends 150 minutes of moderate-vigorous intensity PA per week, both physical and psychological benefits can be achieved at all intensities, with research showing even light-intensity PA reduces the risk of mortality (Chastin et al., 2019), which is why any increase in PA levels is advised.

2.1.1. Physical activity and physical health

The WHO (2010) states that older adults who are physically active, when compared to inactive older adults, have lower rates of all-cause mortality, coronary heart disease (CHD) hypertension, type 2 diabetes and colon/breast cancer, as well as having better functional fitness and BMI. This is supported by Reiner et al. (2013), who carried out a systematic review of longitudinal cohorts >5 years and associated PA with several physical benefits, such as reduction of obesity, CHD and diabetes.

Older adults participating in regular bouts of moderate intensity PA could potentially increase their life expectancy by 3.7 years (Franco et al., 2005). Another longitudinal study also found that for every 15 minutes of PA per day, there was a 4% decrease in mortality from any cause (Wen et al., 2011), which shows that short periods of PA performed consistently over time can have an impact on all-cause mortality. This supports previous work by Hakim et al. (1998) who identified that males (61-81 years) who walked over 2 miles per day, had a lower mortality rate than those who walked 1 mile or less.

Functional fitness is '*having the physiologic capacity to perform normal everyday activities safely and independently without undue fatigue*' (Rikli & Jones, 1999, p. 25). Functional fitness is evidenced to be a key factor in older adults being able to maintain their independence (Paterson & Warburton, 2010). The improvements to strength and endurance that PA can bring

to older adults can provide them with improved functional independence (Liu & Latham, 2009). In a systematic review by Tse et al. (2015), the physical benefits of low intensity PA to older adults include improved range of motion and mobility, endurance, gait speed, lower limb strength, reduced pain, enhanced balance and oxygen consumption. Research has shown consistently that even small increases in PA can result in several physical benefits for older adults.

2.1.2. Physical activity and psychological well-being

Research has also demonstrated psychological benefits from an active lifestyle. Previous research has associated PA with psychological benefits, such as the reduction of age-related cognitive diseases like dementia and Alzheimer's (Reiner et al., 2013). A recent longitudinal study examined the rate of regular exercise and risk of dementia and found that older adults who participated in more exercise were at a reduced risk of dementia (Zi et al., 2017). Finally, a systematic review and meta-analysis of longitudinal studies conducted by Guure et al. (2017) found that PA can protect against all-cause dementia and has an even greater protective effect against Alzheimer's disease. As older adults are far more predisposed to these cognitive diseases than younger age groups, it is important to maintain adequate PA levels as we age.

PA has also been shown to have psychological benefits related to cognitive function in older adults. A cross sectional study conducted by Lochbaum et al. (2002) showed that memory and fluid intelligence tests were better performed by those who engaged in aerobic activity than those who were deemed sedentary. A longitudinal study by Colcombe and Kramer (2003) which examined memory, processing speed and executive functioning in older adults who participated in a 6-month exercise programme, found that participants in the exercise programme for the whole 6-month period made improvements in all measures of cognitive functioning. This is supported by Angevaren et al. (2008) who conducted a systematic review on the effect of aerobic exercise on cognitive functioning in older adults (aged 55+ years) and found a positive association with aerobic exercise and cognitive processing speed, as well as improved auditory attention. Therefore, it is evident from the literature that PA can both maintain and enhance cognitive functioning in older adults.

The WHO (2017) identifies depression as the most common mental health disorder amongst older adults, with 7% of this age group suffering from depression. Systematic reviews have shown that exercise is a form of evidence-based treatment for this neurological disorder (Schuch et al., 2016). In addition, Vance et al. (2017) discovered that PA helped improve

cognitive function in older adults through the mediation of depressive symptoms. The literature also shows that both mental and physical health have an impact on one another (Ohrnbergera et al., 2017). For example, older adults with poor physical health are more likely to suffer from poor mental health, such as increased risk of depression (WHO, 2017). Thus, the literature shows that participating in PA as we age can result in several psychological benefits.

2.1.3. Measuring physical activity in older adults

Much of the early literature on PA behaviour use questionnaires to develop an understanding of the factors that impact PA levels, the effectiveness of interventions and PA trends over time. These self-report questionnaires are easy to use, low cost when compared with other forms of PA measures and are useful when collecting data from large groups of participants. They also have disadvantages and limitations. For example, previous research has identified limitations such as the impact of subjectivity and recall bias when older adults self-report their PA, as many of their activities are low intensity (walking, household chores, getting in and out of a chair), which can make them difficult to quantify as PA (Arnardottir et al., 2013). Higher intensity activities (running, physical sports and vigorous exercise) are easier to quantify, yet as noted, these types of activities tend to be less common in older adults (DiPietro et al., 1993), whose daily activities often consist of lower intensity and less structured forms of PA, such as walking for transport or household chores (Lee & Shiroma, 2014).

Although PA has traditionally been quantified with self-report measures, recent advances in technology have resulted in the development and use of accelerometers since the 1990s, which allow for accurate objective measurements of PA (Migueles et al., 2019). These monitors are usually worn on the wrist, hip, thigh, chest or ankle of the individual and monitor many factors related to PA including raw acceleration, bouts of energy expenditure, METs, steps, PA intensity, seated time, sleep (time and quality), sedentary time and heart rate. This extensive number of measures can provide researchers with far more information on an individual's PA than that provided by questionnaires. Although the hip is commonly used as the location site of the accelerometer due to its increased measurement accuracy when compared with other sites (Matthews et al., 2012), the wrist is a popular alternative, due to higher compliance in older adults, resulting in an increase in wear time, and, the wrist site is evidenced to be suited to measuring the kinds of activities that are performed by older adults such as low intensity walking and household chores (Hildebrand, 2014), making the wrist a more suitable and favoured area for adults over 65 years.

There is evidence to suggest that an individual's ability to recall past behaviour declines with age (Barnett et al., 2016), supporting the use of accelerometers in the measurement of PA in older adults. Once collected, accelerometer data can then be interpreted relative to PA guidelines through the application of cut-points (Ekelund et al., 2017). Cut-points allow for raw-accelerometer data to translate into information such as moderate-to-vigorous PA and the time spent in activity at such intensity. Although, due to multiple cut-points available for use, it is difficult to compare PA from datasets if researchers have employed different cut-points to interpret their raw accelerometry data (Brazendale et al., 2016; Migueles et al., 2019). There is also a lack of research that has calibrated accelerometer cut-points for older adults, with studies opting to use cut-points which have been calibrated in younger adults (Falck et al., 2016). Therefore, Rowlands et al. (2019) advise reporting raw acceleration over a fixed time period (e.g., M30 = most active accumulated 30 minutes of the day). This metric is easily generated through the open-source GGIR package (Hildebrand et al., 2014) and reflects directly measured acceleration, which minimises any prediction error that may occur when applying unsuitable cut-points.

2.2. Barriers to, and facilitators of, physical activity in older adults

Research has identified that adults over 65 years of age are likely to experience a greater number of barriers to PA than younger members of society (Centers for Disease Control and Prevention, 2010). Hays and Clarke (1999) suggest this is largely due to the added physical barriers to PA that we may face as we age, such as limited movement and joint pain. Our motives for PA are also subject to change throughout different ages (Weinberg & Gould, 2015). For instance, Steinberg et al. (2000) identify that older adults' motives to take part in PA are more for health, pleasure and enjoyment rather than competition and self-image. Facilitators are factors that increase the likelihood of a behaviour or result in us carrying out the behaviour. For example, having a pleasant walking environment located close to an individual's home may increase the likelihood of the individual achieving the recommended 7,000 to 10,000 steps per day (Tudor-Locke et al., 2011).

2.2.1. Barriers to physical activity

A systematic review of reviews was conducted by Olanrewaju et al. (2016) to provide a comprehensive evidence synthesis of preventive interventions in older age, focusing on healthy behaviours. One of the three key topics explored was barriers and facilitators to PA (PA) on older adults (aged 55+ years). The review categorised barriers and facilitators into predisposing factors and enabling factors. Predisposing factors include poor health status, previous PA

habits, fatigue, low self-efficacy, low value of recreational PA and preference for more meaningful forms of PA, low motivation, poor body image, fear of falling or injury, low levels of social support, other commitments, social stigma, attitudes towards PA, negative previous PA experiences, cultural differences and underlying beliefs about personality type. Facilitating factors included environment (e.g., facilities, light and safety), time, poor access/awareness and cost of participation.

Bethancourt et al. (2014) carried out focus groups with 13 older adults to identify the barriers and facilitators to PA programme use in older adults, which revealed barriers at the intrapersonal/individual, interpersonal, physical environmental and structural/organisational levels of the social ecological model (SEM; Sallis et al., 2006). Social ecological models provide a framework to understand people's interactions with their physical and sociocultural surroundings and highlight behavioural influencers at multiple levels (Stokols, 1992). The qualitative study identified key barriers to be physical limitations as a result of health conditions or the ageing process, lack of professional guidance and improper distribution of information on available and appropriate PA programmes (Bethancourt et al., 2014). Participants of the study were predominantly well-educated and relatively active, therefore barriers for these individuals may differ from those individuals who are less educated and less active.

Bauman et al. (2010) carried out a two-study investigation to identify barriers to PA in older adults and understand how previous PA experiences impacted the individual's activity levels in later life. The first study used semi-structured interviews to identify barriers to PA and how experiences across a lifespan can impact perceptions of PA. Previous traumatic experiences, fear of injury, cost and time management were the key barriers that were highlighted in the initial study. The second study included individual interviews with 2 males and 4 females, which allowed the older adults to fully elaborate on the experiences that had impacted their beliefs and perceptions surrounding PA. The participants all mentioned that they desired to be physically active at one point in their life, although other time-consuming activities, such as looking after a child, impacted their ability to do so. Other issues were, PA not being a priority, PA conflicting with other activities, health problems and recognition of declining physical capabilities. These barriers all seemed to be influenced by previous experiences, which may have a negative impact on older adults' PA and may be a key area to target in interventions seeking to increase PA levels within this sub-group.

2.2.2. Facilitators of physical activity

In addition to exploring barriers of PA, Bethancourt et al. (2014) gained further understanding of the facilitators to physical participation in older adults (aged 66-78 years). Facilitators of PA participation were increased motivation to maintain physical and mental health and having access to PA programmes that were low cost, convenient and stimulating for older adults. These findings suggest that health care providers may need to provide more information on PA opportunities and increase the support given to older adults if they are going to increase levels of PA in this sub-group. Bethancourt et al. (2014) also highlight the need to consider person-centred approaches to PA interventions, due to the variability of barriers that different individuals face.

Olanrewaju et al. (2016) also identified barriers and facilitators to PA participation in the age group 55+ years. The facilitators were split into three categories. These were predisposing factors, enabling and needs factors (intrinsic factors, which necessitate the access or uptake of PA). Predisposing factors included personal challenges, improved health, experiencing enjoyment during the activity itself, previous experiences, social support from friends and family, social interactions, positive role models, group activities and instruction from a professional. Enabling factors included effective communication, time, personalisation of interventions, enjoyment in fun and social activities, motivation, convenient scheduling, affordable activities, easy access to facilities, transport, and feelings of ownership of the intervention. Finally, the need factor identified was the referral from health care professionals, more importantly their doctor, as older adults tend to value the advice given by their physician (Taylor, 2013).

Older adults who are socially disadvantaged may have even lower PA participation compared with less socially disadvantaged older adults. Socially disadvantaged individuals are those who are physically disabled, socioeconomically disadvantaged, are from different cultures and live on their own (NHS, 2012; WHO, 2013). Older adults may be more susceptible to becoming socially disadvantaged due to the increased likelihood of living on their own and physical limitations that often develop as we age. Qualitative interviews and focus groups with PA programme providers and socially disadvantaged older adults conducted by Nau et al. (2019) looked to explore facilitators of PA programme participation. Strategies to facilitate PA participation in socially disadvantaged older adults include identifying activities of interest, communicating benefits, facilitating gentle entry into PA environments, using significant others for promotion of activities, creating bonding opportunities, facilitating transport and

improved access to PA opportunities, minimising fees, and making adaptations for any special needs. It is likely that increased efforts need to be made to support socially disadvantaged individuals than those of the general population (WHO, 2013).

2.3. Physical activity and self-efficacy in older adults

Self-efficacy is conceptualized as one's beliefs in one's capabilities to successfully carry out a behaviour (Bandura, 1986), or more simply put, a situation specific form of self-confidence. Self-efficacy is subject to internal and external influences, which can be targeted through intervention (McAuley et al., 1994). By creating a change in self-efficacy, we can encourage a change in behaviour. Bandura (1997) states that sources of self-efficacy include performance accomplishments, vicarious experiences, social persuasion and interpretation of physiological and emotional states. Self-efficacy influences the activities that an individual pursues along with the effort they give in pursuit of these activities, when faced with challenges and obstacles. Therefore, making it a key influencer of PA behaviour. This is supported by McAuley et al. (2007) who identified that self-efficacy was a predictor of long-term PA engagement in older adults. Additionally, self-efficacy is also theorised to be reciprocally related to PA behaviour. For example, older adults with higher exercise self-efficacy are more likely to be physically active, whilst successful engagement in PA behaviours is likely to result in increased self-efficacy for exercise behaviours (McAuley et al., 2011).

The literature also supports the claim that self-efficacy is a mediator of behavioural outcomes associated with PA. For example, self-efficacy is reported to be one of several potential mediators in the effects of PA on the enhancement of psychological well-being in older adults, through improvements in anxiety (Taylor, 2000), depression (Craft & Landers, 1998) and quality of life (McAuley et al., 2007). There is also evidence to suggest that self-efficacy mediates the relationship between PA and reduced functional limitations, and increased physical functioning in older adults (Keysor, 2003; Stuart, 2003).

2.4. Outcome expectations and physical activity in older adults

Outcome expectations are a set of beliefs that an individual has about a behaviour, in that the behaviours will produce a specific outcome. Previous research has shown outcome expectations to be associated with PA behaviour (King, 2001; Williams et al., 2005). Without belief that participating in PA will result in the desired benefits, the likelihood of engagement in PA will decrease. But, if a health professional highlights the benefits of PA behaviours for the health of an older adult, this can act as a strong motivator for engaging in PA. Regardless,

Bandura (2000) states that for a behaviour to be initiated, one must believe that they can sustain the behaviour and continue to receive its benefits. Therefore, although outcome expectations can act as a strong motivator, without sufficient self-efficacy for the behaviour, initiation may be unlikely (Bandura, 2001).

Older adults have shown to be less successful when attempting to increase their PA levels when compared to younger age groups (Klusman et al., 2016). These authors found that older adults had lower outcome expectations for PA, as well as lower outcome expectation fulfilment. Thus, their expected outcomes of PA engagement were sometimes unsatisfied. Previous research has also found that older adults have stronger negative outcome expectations of PA (Fuchs, 1994; Toscos et al., 2011), increasing the likelihood of PA avoidance. Therefore, targeting outcome expectations may be needed to encourage PA engagement in older adults.

2.4.1. Importance of self-efficacy and outcome expectations in physical activity behaviour of older adults

Due to the losses that occur as we become older, such as the loss of physical function, individuals can suffer from a decreased self-efficacy for PA (Lachman et al., 1997). However, previous research has shown that engaging in PA can help maintain self-efficacy for PA in later life (Li et al., 2001). Whilst older adults may understand the health benefits of PA, low levels of self-efficacy for PA contribute greatly to the decision of whether to engage in such behaviours, as it is a powerful predictor of PA in older adults (Du et al., 2012). A recent systematic review by Notthoff et al. (2017) aimed to identify which individual characteristics are consistently linked to high PA levels in older adults and found self-efficacy, along with motivation and perceptions of one's health, consistently linked to higher PA levels. This is supported by a previous systematic review that identified self-efficacy as one of the most consistent correlates of PA behaviour in adults across all ages (Bauman et al., 2012). However, a longitudinal study also found that there is a stronger association between self-efficacy and PA behaviour in older adults than younger adults (Schwarzer & Renner, 2000). This supports the assertions of Bandura (2004) that engagement in health behaviours is part due to the individual's personal belief in their abilities to successfully engage in, and achieve the desired outcome of a behaviour. Due to the evidence that supports the link between self-efficacy and PA behaviour, targeting self-efficacy has been a focus for interventions aiming to increase PA in older adults.

Resnick et al. (2008) incorporated both self-efficacy and outcome expectations within an exercise-based intervention for older adults and found that the intervention group spent more time in structured exercise when compared with the control, although it is worth noting that these differences were not found to be significant. French et al. (2014) conducted a systematic review to identify which behaviour change techniques increased self-efficacy and PA behaviour in older adults aged 60 years or over. The findings suggested that many commonly used self-regulation intervention techniques that are effective for younger adults, such as behavioural goal-setting, prompting and self-monitoring of behaviour, and providing feedback on performance were not effective for older adults. This may be explained by older adults lacking motivation to increase PA. There is evidence to suggest that life goals and motivations tend to be more focussed on positive emotions and increasing a sense of meaning in older adults, rather than behaviours that have benefits in the future, such as PA for improved health (Löckenhoff & Carstensen, 2004). Therefore, if there is lack of motivation to engage in PA, then increases in self-efficacy may be ineffective for increasing PA behaviours.

Much of the research on social cognitive influences of PA in older adults to date has focussed on self-efficacy, whereas evidence exists to support its indirect relationship to PA through outcome expectations (White et al., 2012). White et al. (2012) tested the effectiveness of a SCT model of PA behaviour over an 18-month period. Findings from the study supported the use of SCT for explaining PA behaviour in middle-aged and older adults. Self-efficacy influenced PA both directly and indirectly via outcome expectations, which suggests that these variables may be targeted in PA interventions for middle-aged and older adults. More specifically to outcome expectations, physical outcome expectations were directly related to PA levels at baseline, and both changes in physical outcome expectations and social outcome expectations were related to changes in PA at follow-up. Whereas, self-evaluative outcome expectations did not show any relationship with engagement in PA, suggesting that physical and social outcome expectations become more prominent as individuals become older. This may be explained by the need for older adults to maintain independence, which may be a key motivator for engagement in PA behaviour.

Previous research has identified that associations between positive outcome expectations and PA are stronger among older adults than among young to middle-aged adults (Williams et al., 2005). However, although outcome expectancy is an important component of health behaviour, on its own, it does not provide sufficient motivation for PA behaviour. Therefore, one or more motivational variables, such as self-efficacy, may be needed to moderate the effects of outcome

expectancy on PA in older adults. More specifically, Gellert et al. (2011) aimed to test the effects of affective and health-related outcome expectancies on physical exercise in older adults. Findings suggested that there was a direct effect from affective, but not from health-related outcome expectations on exercise behaviour. Additionally, the indirect effect from self-efficacy on physical exercise via affective outcome expectancy was significant, whereas the mediation via health-related outcome expectancy was not. These findings emphasise the relative importance of affective versus health-related outcome expectancies in predicting PA behaviours in older adults. This further supports the findings from Löckenhoff and Carstensen (2004) suggesting that positive emotions and increasing a sense of meaning in older adults may be a more desired outcome of PA than the expected future health benefits which are often promoted by PA programmes. As evident within the literature, self-efficacy and outcome expectations play a key role in both the uptake and the long-term participation of PA in older adults (Clark, 1999; Conn, 1998; Nies et al., 1997; Dishman, 1994; Resnick & Spellbring, 2000), however, more evidence is needed to identify intervention strategies to encourage PA behaviour through increases in self-efficacy and outcome expectations in older adults.

2.5. Physical activity and health related quality of life in older adults

Health-related quality of life (HRQOL) is a multi-dimensional construct made up of physical, psychological and social functioning (WHO, 1995; Schwimmer et al., 2003). HRQOL has become of prime interest to researchers who work with older adults, as with the ageing population it is important that older adults not only live longer, but live better. Thus, ensuring that the time spent living is of high quality. There is extensive research that has examined PA and its association with HRQOL in older adults.

Previous research has shown a positive association between PA and HRQOL in adults and that PA interventions can have a positive influence on HRQOL scores (Bize et al., 2007; Gillison et al., 2009; Eaglehouse et al., 2016). A critical review by Rejeski and Mihalko (2001) on PA and QoL in older adults aged 50+ years of age and identified 3 randomised control trials (RCTs) that reported significant improvements in QOL after increasing PA, whilst 3 RCTs showed no improvements. Rejeski and Mihako (2001) stated that this is partially explained by both types of PA prescribed and measures of QOL used, as QOL relates to overall satisfaction with life, rather than health related constructs such as physical and mental health. For example, QOL and HRQOL are often used interchangeably as they refer to the same concept. However, QOL is a broad concept covering all aspects of human life, whereas HRQOL is connected to an

individual's health or disease status (Guyat et al., 2007). Therefore, the influence of PA may differ between studies dependant on the measures used.

When looking specifically at HRQOL and its constructs, PA was shown to have a consistent positive effect on physical function and mental health status in older adults. This is supported by a meta-analysis from Netz et al. (2005) who examined PA and its effect on psychological well-being in older adults. Their findings suggested that PA had its strongest effects on constructs related to HRQOL, such as well-being and physical symptoms, rather than overall satisfaction with life. McAuley et al. (2008) further examined the nature of the relationship between PA, HRQOL and QOL, identifying the key role of self-efficacy. The findings suggested that PA influenced self-efficacy, which in turn influenced physical and mental HRQOL, that increased overall QOL. Balboa-Castillo et al. (2011) also found that higher levels of leisure time PA and reduced leisure time sedentary behaviour are independently associated with better HRQOL in older adults. The association was also found to affect both the physical and mental scales of HRQOL. More recently, Yen and Lin (2018) explored how productive engagement in PA may influence older adults in maintaining their HRQOL when living within a long-term care facility and found that a positive perceived HRQOL can be maintained by consistently or increasingly engaging in productive PA, particularly when encountering a life event. Current research suggests that PA can improve key constructs of HRQOL, and that self-efficacy should be a key component of interventions that aim to elicit positive changes in HRQOL.

2.6. Physical activity and loneliness in older adults

One of the barriers to active ageing faced by older adults is loneliness. Loneliness is the subjective and negative experience of an individual's quality and quantity of their social relationships (Perlman & Peplau, 1981). Therefore, the measure of someone's loneliness is their own subjective feeling on their current social relationships and their comparison with their social needs. Older adults tend to experience increased feelings of loneliness due to the impact of changes in life that may come with increased age, such as retirement, loss of spouse, ill health and poor physical condition (Victor et al., 2000). Approximately one third of older adults will experience feelings of loneliness as some stage in their later life (Victor et al., 2005). The WHO (2002) reports that loneliness as we become older is increasingly becoming a public health problem and it has been reported to be linked to negative impacts on physical and mental health (Luanaigh & Lawlor, 2008). Age UK (2014) reported that 41% of older adults aged 65 and over felt 'out of touch' with the pace of modern life and 12% say they 'feel cut off from

society'. This is increasingly more alarming as Wilson et al. (2007) state that individuals who suffer from high levels of loneliness are more likely to develop Alzheimer's, and loneliness has been described as equally harmful to our health as smoking 15 cigarettes a day (Holt-Lunstad et al., 2010). Public Health England (2015) also reported that loneliness can result in high blood pressure, depression, heart disease, dementia, premature mortality and can be responsible for falls and suicide. Due to older adults being at high risk for feelings of loneliness, and the negative health implications resulting in additional pressure on public health services, reducing loneliness has become a priority for social care and public health organisations (Marczak et al., 2019). PA provides the opportunity to socialise with others and may help at reducing feelings of loneliness in some individuals (Public Health England, 2015). For example, Morgan et al. (2019) highlighted that PA can create opportunities to increase desired social contact with others, contributing to intimate relationships, and act as a source of support for older adults. Suggesting that by engaging in PA, older adults can establish meaningful social connections, which may in turn reduce feelings of loneliness.

In comparison with other treatments of loneliness in older adults, such as mindfulness, PA interventions that engage older adults in groups can help individuals build meaningful social connections with other who have similar or shared interests (Milligan et al., 2013). Although, there is limited evidence to suggest the effectiveness of PA interventions on reducing loneliness in older adults. Shvedko et al. (2020) conducted a randomised feasibility study to examine the feasibility of a physical activity intervention for loneliness (PAIL) in community-dwelling older adults (aged 60+ years) at risk of loneliness. The intervention included a once per week group walk and health education workshop up to 90min per session. The study found that older adults at risk of loneliness found the intervention acceptable and could safely participate. However, a more extensive and robust strategy would be needed to support adequate recruitment of lonely older adults and adherence into a definitive RCT. The challenge of recruiting lonely older adults is a result of difficulty accessing socially isolated older adults who may be less interested in joining a PA intervention than those who are more socially engaged. The study also reported no significant changes in measures of objective PA or loneliness after the 12-week PA intervention. Therefore, it is advised that a longer duration may be needed to allow participants to build meaningful social connections based on trust, which McAuley et al. (2000) suggests may take up to 5 months to occur.

A recent review of reviews by Fakoya et al. (2020) explored the range of interventions aimed at reducing loneliness and/or social isolation among older adults. Findings stated that there was

a wealth of interventions that had been developed to combat loneliness among older adults, some of which included PA components, however the findings highlighted the difficulty faced when designing interventions due to the individuality of the experience of loneliness, indicating that there is no one-size-fits-all approach to addressing loneliness, and suggest the need to tailor interventions to suit the needs of individuals, specific groups and the level of loneliness that is being experienced. These findings are similar to that of PA interventions, whereby current research highlights the need for tailored interventions that can be individualised to the specific needs and preferences of the targeted older adults (Zubala et al., 2017).

2.7. Purpose, physical activity, and older adults

Purpose in life has emerged as an important concept in psychology. Although definitions of purpose in life can vary, they all share three common components: commitment, goal directedness and personal meaningfulness (Bronk, 2014). Kashdan and McKnight (2009) define purpose as ‘a central, self-organising life aim that organises and stimulates goals, manages behaviours and provides a sense of meaning’ (p. 242). Purpose in life is a key feature of well-being and individuals who lack purpose in life may experience total meaninglessness within their life (Frankl, 1958). Frankl (1984) further suggests that the pursuit of a meaningful purpose in life is essential for human motivation and that purposelessness can result in ill health, boredom, hopelessness, depression and the loss of a will to live. Low sense of purpose in older adults has been attributed to decreased opportunities for purposeful engagement in activities and a loss of roles within society (Hedberg et al., 2010).

Current literature has demonstrated that purpose in life is associated with several physical and psychological outcomes. Physical factors include a stronger immune system (Bower et al., 2003), lower levels of inflammatory markers associated with age-related disorders (Friedman, 2007), lower blood pressure (Mezick et al., 2010) and has also been correlated with increased levels of high-density lipoprotein cholesterol (HDL; Ryff et al., 2004). Psychological factors positively associated with purpose in life include better cognitive reserve (Boyle et al., 2012), better stress management (Fogelman & Canli, 2015), increased optimism and positive affect (Kim et al., 2013), proactive coping (Prairie et al., 2011), life satisfaction (Souglers & Ranzijn, 2011) and higher levels of subjective well-being (Ardelt, 2003). Individuals can find a sense of purpose through relationships, roles in society (e.g., family, occupation, societal), personal goals, community engagement and/or participating in activities that hold meaning (Irving et al., 2017). Hooker and Masters (2016) identified that purpose in life was positively associated with objectively measured PA using accelerometer data, moderate to vigorous PA, and with

self-reported PA, suggesting that purpose in life is a reliable correlate of physical activity. More specifically to older adults, Ribeiro et al. (2020) state that individuals who have higher levels of purpose in life are often more resilient and have a greater active pursuit of personal goals. They also suggest that purpose in life is associated with several psychological states that can provide good health, such as self-efficacy, as well as being associated with health behaviours, such as PA. Morgan et al. (2019) also highlight the importance of PA for providing a sense of purpose in older adults, stating that PA can help regain feelings of purpose in older adults by giving habitual routine, structure to a day and responsibility to others.

2.7.1. Meaning, physical activity and older adults

Meaning is another concept related to purpose in life. A sense of meaning in life can give zest and vigour to one's life (Frankl, 2006) and is positively associated with increased subjective vitality and self-rated health in older adults (Mcmahan & Renken, 2011). Recent qualitative findings identify how older adults favour meaningful activities to accumulate PA in later life (Guell et al., 2018). For example, walking to socialise with friends or taking the dog for a walk. Previous research has also shown that participation in PA is positively related to the belief that one's life is meaningful, and goal directed (Brassai et al., 2015; Hooker & Masters, 2016). This is supported by Takkinen et al. (2001), whose longitudinal study found that participation in PA predicted a sense of meaning in life in older adults. More recently, Ju (2017) found that older adults who engage in more PA, had greater meaning in life. This may be explained by Frankl (1979) who suggests that PA can be used to overcome feelings of meaningless, which he refers to as an 'existential vacuum' whereby people need not walk or climb stairs in modern living. By maintaining PA in older age, we might prolong a sense of meaning in life through providing us with regular physical challenges. Older adults have previously reported social benefits as their key motive for their engagement in PA (Hirvensalo et al., 1998). Therefore, one of the ways that PA can help maintain a sense of purpose in later life is through providing a platform to help build and maintain meaningful relationships.

2.8. Physical activity interventions for older adults

Effective and sustainable ways to engage older adults in PA are necessary if we are to address the low PA levels identified earlier within this chapter. Identifying best practice strategies to increase PA in older adults is important in order to maintain functional independence. It is important that interventions meet the needs of older adults and can be implemented in a range of health, social care and community settings (Olanrewaju et al., 2016). There is a wealth of interventions and reviews of the literature that support their effectiveness at encouraging PA

behaviour in older adults (van der Bij et al., 2002; Chase, 2013; Bauman et al., 2016; Zubala et al., 2017). Current literature has identified a variety of different approaches that can be effectively used to increase PA in older people. These include exercise classes, walking groups, motivational interviewing, and goal setting (NIHR, 2019). A meta-analysis of PA interventions targeted at older adults conducted by Chase (2013) suggests that PA interventions can significantly improve PA behaviour in older adults, stating that interventions containing cognitive-based and cognitive-behavioural based content were more effective at significantly changing PA behaviour among older adults' than behavioural-only interventions. This is supported by Olanrewaju et al. (2016), who suggest that a combination of behavioural and cognitive interventions underpinned by theory may be effective for long-term maintenance of PA. The theoretical construct of self-efficacy was the most used theory to underpin intervention design and was also the construct that was the best operationalised among the current literature (Chase, 2013). Other common theoretical frameworks include social cognitive theory, trans-theoretical model, health belief model, Kanfer's self-control model and Pender's health promotion model (Olanrewaju et al., 2016). Chase (2013) suggests that the effective total amount of intervention delivered is difficult to determine due to inconsistent and inadequate reporting, this is supported by Olanrewaju et al. (2016) who state that there is more research needed to establish effective intervention dose-response.

Previous research has found that the method of delivery of PA interventions can vary and are often delivered by a range of professionals within the different fields, including GPs, counsellors, health and fitness professionals, and trained health educators. Olanrewaju et al. (2016) found conflicting evidence on the effectiveness of mode of delivery, such as face to face, contact with a professional and non-face to face. This was also supported by Zubala et al. (2017) who found no difference when interventions were delivered face-to-face or not. Zubala et al. (2017) state that multi-modal and multi-level interventions have the potential to encourage PA behaviour in older adults in the short term, however long-term effects beyond twelve months are unclear and there is a lack of understanding about the most effective intervention components. However, meaningful motivators such as enjoyment through PA, and social and environmental support were identified, and it is suggested that these may be important components of intervention design. The researchers suggest that a tailored and individualised approach to PA interventions is needed to meet the social, individual, and environmental needs of older adults. By individually tailoring interventions, we may be able to better address participants personal needs, motivations, and readiness to change. A previous

study by Stewart and colleagues (2001) provided an individually tailored PA intervention over 12-months on 164 older adults. The findings supported the effectiveness of the tailored intervention design, with the intervention group showing significantly increased caloric expenditure in activities at low, moderate, and high intensities, whereas the control group showed no significant changes in energy expenditure. An RCT by Kallings et al. (2009) also aimed to study the effect of a 6-month individualised PA intervention on PA, anthropometric parameters, body composition and cardiometabolic risk factors in 101 sedentary and overweight older adults. The intervention group received patient-centred counselling and individualised written prescription of PA. A registered physician provided a lecture about PA and health at a group session. A healthcare professional, trained in motivational counselling and PA, provided person-centred counselling, a written prescription for PA and an agreement form signed by both counsellor and participants, which contained PA goals. The patients were encouraged to gradually increase their PA level to meet the recommended level of PA set by the WHO (WHO, 2010) and to reduce their time spent in sedentary behaviour. Findings from the study showed the intervention group significantly increased their PA when compared with the control, supporting the effectiveness of the individualised PA intervention. However, self-report measures of PA were used, therefore interpretation of these results should be approached with caution and future individualised PA interventions may want to employ objective measures of PA to support the reliability of the findings.

Zubala et al. (2017) highlighted person-centeredness of intervention design as an important factor for enhanced benefits of PA engagement. Older adults' ability and physical capabilities can vary significantly, with many dealing with a range of comorbidities, disability, and a dependence on others. Therefore, a person-centred approach to intervention design can enable the collaboration between health professionals and the targeted older adult to ensure the strategies can be developed to suit the needs of the individual, and their abilities in relation to the surrounding environment's barriers to, and facilitators of, PA. A person-centred approach can enable interventions to be tailored and individualised to meet the individual, social, and environmental needs of older adults. Likewise, by adopting a socio-ecological approach to PA interventions for older adults, we may be more effective at encouraging increased PA, as this approach not only recognises the importance of the individual factors of behavioural change, but also includes consideration of influences at the social, environmental and organisational levels (Sallis et al., 2006).

2.9. Social ecological model

Due to the complex nature of understanding PA behaviours, models are often used to enable understanding of the potential facilitators of, and barriers to, PA participation. In recent years, ecological models have gained support in their use for the study of PA behaviour (Weinberg & Gould, 2015). The social ecological model allows for identification of the factors that relate to PA participation and that influence an individual's behaviour on different levels, which can be used to design effective interventions (Sallis et al., 2008). The ecological model encourages behaviour change at multiple levels, including intrapersonal, interpersonal, environmental, organisational, and public policy (Sallis et al., 2008). The intrapersonal level identifies biological and personal factors that influence behaviour. For example, an individual's self-efficacy for PA. Interventions strategies at this level may aim to promote attitudes, beliefs, and behaviours that positively influence PA. The interpersonal level recognises close relationships that may influence behaviour. This includes an individual's social circle, such as peers, partners, and family members, which all contribute to the individual's behaviour and behaviour experiences. The environmental level features the surrounding settings of an individual, such as schools, workplaces, and neighbourhoods. Intervention strategies at this level focus on improving the physical environment within these settings, making the environment more conducive to PA behaviour. Organisational factors relate to the social norms and the corporate climate prevalent at a worksite or organisation (Linnan et al., 2001). For example, Lier et al. (2019) found that strong organisational programme support and low employee co-payment were identified as facilitators of employee engagement in organisational health programmes. Finally, the public policy level includes factors related to national and local regulations and law. For example, government run initiatives to increase PA engagement within the general public, such as 'One You' is an online programme to help increase PA in adults ages 40-60 years of age (Public Health England, 2019). Social ecological models differ from other theories on health behaviour due to the addition of environmental, organisational, and public policy determinants, rather than focussing on purely individual and social factors (Sallis & Owen, 2015), giving a more holistic understanding of what influences our PA behaviours.

2.9.1. A social ecological approach to physical activity interventions

Social ecological models can successfully encourage PA behaviour as they address individuals, their personal motivations and their surrounding settings and contexts. Such models recognise the importance of multi-directional influencers of behaviour within different domains, including an individual's physical, social and political environments (Stokols, 1996). For

example, enjoyment in PA is an intrapersonal influencer of PA engagement, however, enjoyment can be influenced by several interpersonal and environmental factors related to PA, such as social interactions or nice weather conditions. Bethancourt et al. (2014) explored barriers and facilitators to engaging in PA programmes in older adults and identified several intrapersonal, interpersonal, environmental, and community level barriers and facilitators that influenced PA behaviour (see section 2.2). Highlighting the importance of multi-level interventions that address barriers of, and facilitators to PA in older adults. This is also supported by Thornton et al. (2017) who found correlates of older adults' PA within individual, social and environmental levels of the social ecological model, such as personal safety (intrapersonal), social support (social), number of parks within 1 km distance (environmental). This supports the need for multi-level interventions to increase PA behaviour in older adults. However, it is worth noting that intervention strategies extending to the organisational and policy levels of influence are considered to be large scale, as they implement and evaluate interventions which address larger numbers of people

Bethancourt et al. (2014) also stated that there are interactions between different levels of the SEM that influence PA behaviour of older adults. For example, participants with health problems (an intrapersonal factor) were likely to be more active when the environment was more supportive (environmental and interpersonal factors). Conversely, Boulton et al. (2018) stated that intrapersonal attributes such as poor health, mobility, and motivation to be physically active can be the primary driver for PA engagement, regardless of external/environmental influencers. Although providing a more supportive environment is necessary, targeting individual factors, such as motivation, may be key in encouraging greater PA behaviour. Nevertheless, the researchers also state that a social ecological approach to the promotion of PA to older adults is important. For example, whereas previous public health interventions promote the health benefits of PA, focusing on the intrapersonal level (WHO, 2010; Chief Medical Officers, 2011), by adopting a multi-level approach and promoting the social elements of PA engagement, along with providing easily accessible PA, we may be more successful at encouraging PA engagement in older adults. By promoting an outcome of PA that is more intrinsically valued by older adults, we may be able to tackle key barriers within an intrapersonal level. For example, previous research has identified key facilitators of physical activity in older adults, such as social interactions (Olanrewaju et al., 2016). By promoting the social experiences of PA, older adults may be more attracted to PA behaviours, as it offers outcomes that are intrinsically valued by them. These social relationships developed through

engaging in PA may also contribute to feelings of purpose in older adults (Irving, 2017), further enhancing the well-being benefits of PA engagement.

Kerr et al. (2018) conducted a cluster randomised control trial which implemented a 12-month PA intervention and assessed its effect on objectively measured PA within an older adults' community setting. The multi-level intervention components included techniques from the Social Cognitive Theory (Bandura, 2004) at multiple levels of the social ecological model. The components included goal setting (intrapersonal), group walks (interpersonal), improvements in walkability of the surrounding environment (community) and was delivered by peer leaders (interpersonal). The intervention group within the study increased moderate intensity PA per week by 56 min or 119 minutes of light intensity PA, with no change within the control group. These differences were greatest within the first 3 months but remained significant throughout the 12-month intervention. This study provides insight into an effective multi-level PA intervention implemented within an older adult community setting. The researchers note that the intervention within their study may not generalise to all older adults and differences may be found in groups which has differences in age, physical functioning, marital status and climate. Therefore, adaptation of intervention strategies may be needed to be implemented within another context.

As previously discussed in section 2.8, intervention strategies to elicit long-term changes in PA behaviour are unclear due to a lack of transparency about key intervention components, an absence of theoretical framework to underpin intervention design, and a lack of specific behaviour change techniques (BCTs) identified for older adults (Zubala et al., 2017), suggesting that future interventions may be improved by using theory driven intervention designs and tailoring programmes to cater to specific needs of the target individuals. Therefore, it is important that PA interventions are designed based on theory and using specific BCTs to address the needs and personal preferences of older adults.

2.10. Behaviour change

Improving public health is dependent on behaviour change through evidence-based practice. Thus, behaviour change interventions are fundamental to the management of public health issues, such as low levels of PA. To change an individual's behaviour, behaviour change techniques (BCT's) are used (Michie et al., 2011). Previous research has identified that a one-size-fits-all strategy to PA interventions aimed at behaviour change may not be effective, due to the complex nature of barriers to, and facilitators of, PA participation (Schutzer & Graves,

2004). BCT's must be selected to meet the needs of the individual and encourage behaviour in the target population, and within the context in which the intervention will be delivered. Therefore, intervention strategies should be underpinned by a model of behaviour and the factors that influence it, such as the SEM (Sallis, 2006).

Sallis and Owen (2015) state that interventions which look to change an individual's behaviour will typically need to be multifaceted and address behaviour change at different levels of the SEM, due to the difficult and complex nature of the behaviour change process. However, more complex strategies may not lead to more successful interventions in older adults. For example, Rejeski et al. (2009) achieved long-term behaviour change with 2 main intervention strategies, whereas Opdenacker et al. (2008) were less successful, even though they included 8 strategies. The complexity stems from human behaviour taking place at the individual level, but it is influenced by social, environmental, political, and economic forces, making it difficult to design interventions to address aspects at all levels of influence (Glasgow & Schrecker, 2015; Kelly & Doohan, 2012). The complex nature of these interventions can be difficult to apply in a research and practical setting and can also make it difficult to identify which components of the intervention are having an impact on its participants (Michie et al., 2013). Therefore, it is important to fully understand the effectiveness of such interventions, whereby effective and active components are identified through replication, application, and evaluation.

Recent research has provided strong evidence that interventions can increase PA levels in older adults past 12 months (Hobbs et al., 2013) showing that interventions to increase PA can result in long-term behaviour change. Interventions can be categorised as cognitive, behavioural or a combination of both. Cognitive-based interventions aim to change an individual's thought process in relation to behaviour. For example, motivational interviewing can be used to increase self-determined motivation to participate in PA. Behaviour-based interventions aim to promote behaviour change through the introduction of observable physical actions. An example would be to provide exercise classes supervised by a professional to increase exercise related PA. A review of the literature by Chase (2013) found that cognitive-based interventions and a combination of cognitive and behaviour-based interventions were more effective in achieving PA behaviour change in older adults than just behaviour-based interventions.

2.10.1. Behaviour change techniques

PA interventions are typically complex and identifying the effectiveness of individual components can be extremely difficult, due to the imprecise nature of interventions and vague

descriptions of behaviour change techniques (BCT) in reported studies. Michie et al. (2011) developed the 93-item CALO-RE taxonomy to enhance the reporting of, and future research into, behaviour change interventions, which provides researchers with a reliable format to report, evaluate and implement evidence for changing behaviours. The taxonomy has also enabled researchers to identify links between BCTs and theoretical constructs and enhance theories based on findings from intervention studies.

French et al. (2014) carried out a systematic review to identify which are the most effective behaviour change techniques for increasing PA and self-efficacy. From the literature, it was found that barrier identification/problem solving, providing rewards contingent on successful behaviour and demonstration of behaviour were significantly associated with higher PA. Other effective strategies were identified as providing normative information about others' behaviour, providing information on where and when to perform behaviour and offering social support.

Lack of social support has previously been identified as a barrier to PA in older adults (Schutzer & Graves, 2004). Intervention studies have also recognized the importance of social support for facilitating behaviour change in older adults. Baruth and Schlaff (2017) found that social support was an effective BCT at increasing PA levels and reducing weight in inactive older adults (age = 50+). Group based PA may be an effective strategy for older adults, as they address behaviour change techniques that have been successful at increasing PA in older adults, such as social support and barrier identification (French et al., 2014). These findings were also supported by Arnautovska et al. (2017) who carried out a mixed methods study to explore what behaviour change techniques are most effective in PA interventions for older adults. First, within the surveys, autonomy support, instruction to perform behaviour and having a credible source of information about PA were highlighted as effective BCTs within the surveys. The qualitative interviews also identified support for making informed choices, instruction on how to perform PA, information about health consequences, social support, goal setting, action plans, behavioural demonstration, and self-monitoring of PA. The current literature provides intervention designers with a range of the most effective BCTs which can be used within the design and delivery of the intervention. Another key finding from the study was factors related to intervention delivery. Key factors included face to face delivery which is then followed up with additional materials, low cost, age-appropriate PA and an individualised approach, such as the provision of appropriate activities. These additional factors should be considered when looking at the design and implementation of PA interventions for older adults.

2.11. Theories of behaviour change

Previous research suggests that theory driven interventions can increase PA and improve individual's health and well-being (Gourlan et al., 2016; Michie et al., 2009). Theories of behaviour change help provide guidelines for intervention development and illustrate how intervention strategies should work (Davis et al., 2015). By implementing theory driven PA interventions we can test the effectiveness of different intervention strategies, develop understanding on how to explain and predict behaviour and further develop current theories on PA behaviour. Thus, by applying theories to the design of PA interventions we can identify what works and why (Michie et al., 2009), which allows us to replicate or develop intervention strategies, further enhancing our knowledge of PA behaviour change in older adults.

Although initial attempts to promote PA in older adults lacked theoretical support, more recent research has used theories of behaviour change to understand health behaviours and how best to encourage individuals to be more physically active. The use of behaviour change theories has improved our understanding of what influences our PA behaviour and how best to design interventions to increase long-term PA (Buchan et al., 2012). Theories of behaviour change include Social cognitive theory (SCT; Bandura, 1986), The transtheoretical model (TTM; Prochaska and DiClemente, 1983), The theory of planned behaviour (TPB; Ajzen, 1985), Self-determination theory (SDT; Deci & Ryan, 1985) and Self-efficacy theory (SCT; Bandura, 1977). These theories have been widely used within the context of PA, each having their own strengths and limitations. Zubala et al. (2017) identified Social cognitive theory (SCT; Bandura, 1986) as the most common theoretical framework used to underpin PA interventions in older adults. A key principle of SCT is the belief in one's ability to successfully perform the desired behaviour, also known as self-efficacy (Bandura, 1997). Previous research has identified self-efficacy as a key determinant of PA behaviour, particularly in older adults (Conn, 1998). A meta-analysis by Young et al. (2014) identified that out of 44 studies containing 55 SCT models of PA. Findings revealed that SCT accounted for 31% of the variance in PA, with self-efficacy and goal-setting being consistently associated with PA behaviour, determining that SCT being a useful framework to explain PA behaviour. SCT aims to explain how people regulate their behaviour through control and reinforcement and to achieve specific behaviour that can be maintained over time, which is key goal for public health. Therefore, SCT will be used as the underpinning theoretical framework within the present thesis.

2.11.1. Social Cognitive Theory

Social cognitive theory (SCT; Bandura, 1986) proposes that personal factors (e.g., self-efficacy), environmental factors (e.g., the behaviours of our friends) and our behaviours interact and influence each other, which Bandura refers to as triadic reciprocal causation.

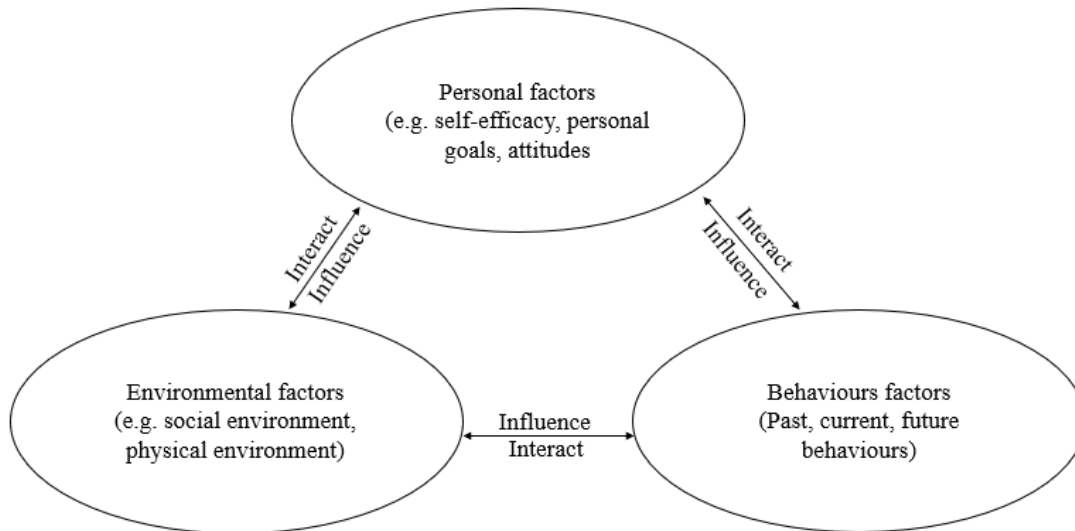


Figure 1. Social Cognitive Theory. Adapted from Bandura, A (1978) The self-system of reciprocal determinism, *American Psychologist*, 33 (4), 344-358

SCT considers the unique way in which individuals acquire and maintain behaviour, whilst taking into considering the social environment in which individuals conduct the target behaviour. Bandura (2004) identifies 4 key determinants of health behaviour, such as PA. First, self-efficacy, which refers to an individual's belief in their own capabilities to conduct a behaviour and achieve the desired end result. For example, someone who feels that they can confidently achieve the current PA guidelines has high self-efficacy for PA behaviour. Self-efficacy is a major foundation of behaviour. Unless an individual believes that they can achieve the desired outcome of their behaviour, they will have little incentive to persevere the behaviour, particularly in the face of obstacles and setbacks. Second, outcome expectations, which are described as the positive or negative outcome an individual expects as a result of a chosen behaviour. For example, if someone believes going for a daily walk will make them feel better for the rest of the day, this outcome will act as an incentive. Whereas, if someone feels that by carrying out exercise behaviours will result in unwanted muscle aches, they will likely avoid such behaviours. Therefore, anticipated positive outcomes act as incentives of the behaviour, and anticipated negative outcomes act as disincentives of the behaviour. Third,

cognitive goal, which can be referred to as proximal goals (immediate goals) and distal goals (long-term goals). These provide a self-incentive of health behaviours (Bandura, 1986). For example, to lose weight (long-term goal) I am going to start to exercise 3x per week (short-term goal). The final determinant of health behaviours a proposed by SCT is facilitators and impediments. These are perceived enablers of a behaviour, or an obstacle to a behaviour. For example, an individual may find that having a friend to go exercise with encourages her to engage in PA, whereas poor weather conditions act as a barrier to engaging in PA. Perceived barriers are an important factor when engaging in health behaviours, as if there were no obstacles to overcome, then targeted behaviours would be easy to engage in (Bandura, 2004).

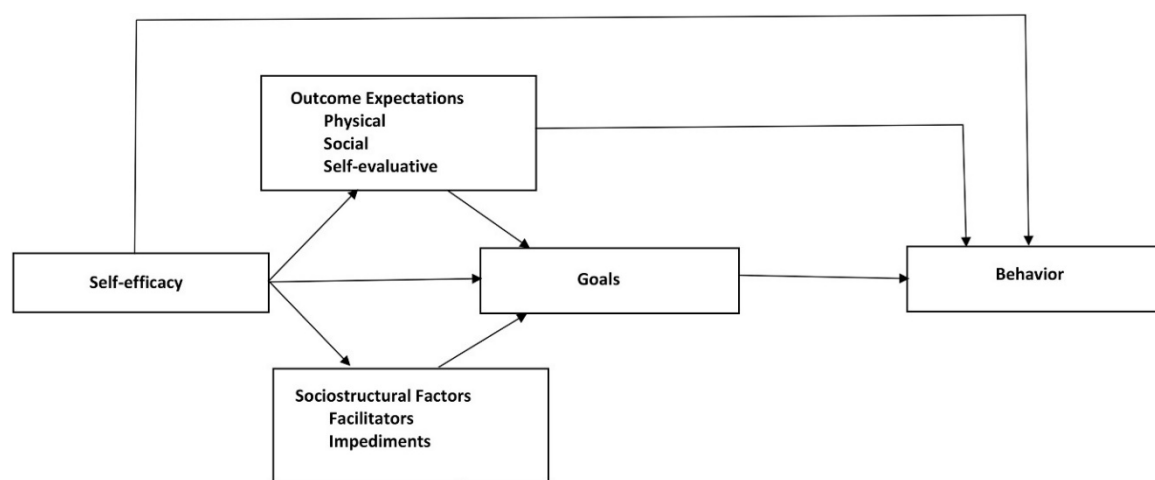


Figure 2. Structural paths of influence articulated within social cognitive theory. Source: Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behaviour*, 31, 143–164. Reproduced with permission by Sage Publishing.

The theory proposes that perceived self-efficacy is a key factor, due to its influence on motivation and action, both directly and through its impact on other determinants, such as our goals and outcome expectations. Self-efficacy impacts out personal goals, outcome expectations of a behaviour, and our perceptions of barriers to, and facilitators of, a chosen behaviour (Bandura, 2004). The theory also considers an individual’s past experiences, which also influence if behavioural action will occur. These past experiences influence determinants, such as self-efficacy and outcome expectations, which shape whether a person will engage in the behaviour, and the reasons why a person engages in that behaviour (Bandura, 2004). Areas of SCT overlap with some socio-cognitive determinants of some the most widely applied psychosocial models of public health. SCT considers many levels of the SEM (intrapersonal, interpersonal, environmental) in addressing behaviour change of individuals, which was

previously discussed within this chapter, which supports the use of this theory in the development of a multi-level PA intervention.

SCT has been more successfully applied to PA behaviour change than any other theory (ACSM, 2014) and has been regularly used for understanding PA behaviours in older adults. Anderson-Bill et al. (2011) investigated the effect of aging on social-cognitive characteristics related to PA in older adults. Results suggested PA levels and self-efficacy declined with age, whilst taking part in an intervention that featured social support and the use of self-regulatory behaviours (e.g., goal setting, planning, and self-monitoring) increased self-efficacy and PA behaviour, suggesting that interventions that utilise a theoretical framework of SCT to offset the effect of aging on self-efficacy may be successful in helping older adults become more physically active. The use of SCT within PA interventions was also supported by White et al. (2012), who measured the psychosocial determinants of behaviour highlighted by SCT and PA at baseline and over 18 months. They found that individual changes in older adults' self-efficacy were significantly related to changes in their PA, along with outcome expectations, disability limitations and goals. It was identified that self-efficacy influenced PA via outcome expectations, setting goals and limiting disabilities, and that PA interventions for older adults should consider targeting these psychosocial determinants. This is supported by the ACSM (2014), who suggest that an individual that increases their self-efficacy for a behaviour, will have a better ability to perform self-regulatory skills, such as goal setting and planning. Although it is worth noting that the White et al. (2012) study used self-report measures of PA, which can be inaccurate as previous research has identified self-report measures to be both higher and lower than objective measures of PA (Prince et al., 2008). A recent study by Kerr et al. (2018) used SCT to design a multilevel PA intervention for older adults, which successfully increased PA 12-month period. The intervention group had significantly higher objectively measured PA at both 6-month and 12-months, up to 119 min light PA and 56 min moderate-vigorous PA per week. It is worth noting that the intervention presented with the Kerr et al. (2018) study was conducted within a temperate climate, therefore the generalisability of these findings should be called into question. However, the study provides a multilevel intervention strategy that could be implemented within other community settings.

2.11.2. Self-efficacy theory

Self-efficacy is an individual's confidence or belief that they can carry out a behaviour successfully and it is proposed to have a direct impact on their decision on whether to carry out a behaviour (Bandura, 1997). For example, if an individual does not believe they can carry out

their new PA programme successfully, then they are unlikely to persevere to do this, when faced with impediments to the behaviour. SCT proposes that an individual with higher self-efficacy will have more positive outcome expectations, therefore will be more likely to demonstrate self-regulatory behaviours, which are of high importance if the individual is going to achieve long term behaviour change (Bandura, 2004). Conversely, individuals with low self-efficacy are more likely to give up, internalize failures and experience negative psychological disorders, such as anxiety and depression (Bandura, 1986). Older adults are more likely to suffer from increased barriers to PA, therefore increased self-efficacy is evidenced to be key for their long-term PA participation.

Previous research has shown self-efficacy to be a key determinant of PA participation (McAuley & Blissmer, 2000) and integral to the long-term maintenance of PA in older adults (Oman & King, 1998). This is supported by Weiss et al. (2007) who found that decreases in PA self-efficacy were associated with individuals becoming physically inactive. McAuley et al. (2003, 2007) also highlighted the importance of self-efficacy for long-term PA participation in older adults, with self-efficacy being a predictor of PA both 2 (McAuley et al., 2003) and 5 (McAuley et al., 2007) years following a 6-month PA intervention. Research currently shows us the importance of self-efficacy for both the uptake and long-term maintenance of PA in older adults, supporting Bandura's (1997) claim that higher levels of self-efficacy can encourage PA participation when an individual is faced with barriers and obstacles to the behaviour. Therefore, including components aimed at increasing self-efficacy such as goal setting, planning, and self-monitoring, within PA interventions may be a good approach for encouraging long-term PA engagement in older adults (McAuley et al., 2011).

2.12. Study rationale

2.12.1. Public policy rationale

Between 2000 and 2050, the proportion of adults in the population over 60 years of age is expected to double from 11% to 22%, according to estimates by the World Health Organisation (WHO; United Nations, 2013). Furthermore, it is expected that by 2066 there will be an additional 8.6 million adults aged 65 years and older. This shift in age profile has several implications for public and health services. Therefore, the WHO works alongside governments throughout the world to try and facilitate the highest level of health for people, including developing the guidelines for recommended levels of PA. Despite the well-documented health benefits of an active lifestyle, many older adults do not achieve the PA guidelines of 150 min/week of moderate intensity PA (WHO, 2016). Public Health England reports that physical

inactivity of older adults cost the NHS £103m in 2018, and if not addressed, may cost over £1.3 billion by the year 2030. Health policies have sought to increase PA levels in older adults through providing guidance (Ministry of Health, 2013), and supporting those who work with older adults to encourage greater levels of PA into their daily lives (WHO, 2010). However, despite the highly publicised benefits of PA, many older adults within the UK do not meet the minimum PA levels needed to maintain health (McPhee et al., 2016). Therefore, a greater understanding is needed of interventions to effectively increase long-term PA behaviour in older adults.

2.12.2. Research rationale

Interventions aimed at increasing PA behaviour in older adults appear to be effective in the short-term, with tailored and contextualised intervention strategies that address the barriers and facilitators to behaviour change being recommended (Olanrewaju et al., 2016). Social ecological models recognise the importance of multi-directional influencers of behaviour within different domains, including an individual's physical, social, and political environments (Stokols, 1996), therefore provide a promising framework for intervention design. Kerr et al. (2018) successfully implemented a multi-level PA intervention within an older adults' residential community, which increased residents' PA levels for up to 12-months. However, generalisability of the intervention strategy could be called into question given the context in which it was implemented, therefore a person-centred approach to multi-level PA interventions may be necessary.

The current literature highlights the need for a person-centred approach to PA intervention design for older adults (Zubala et al., 2017). The tailoring of PA interventions to meet the needs of the participants appears to be an important component of successful PA interventions. The literature also highlights the need for a multi-level intervention design, addressing influencers of PA outside the individual level, and addressing factors on interpersonal and environmental levels. However, there is little evidence providing suggestions for the development of person-centred, multi-level PA interventions for older adults. The current literature also identifies that PA is often perceived as a by-product of other purposeful activities, suggesting that the concept of purpose is crucial for the uptake and maintenance of PA in older adults (McGowan et al., 2017). However, more research is needed to explore the role of purpose in the PA behaviour of older adults, and how this may influence the design of PA interventions. Therefore, this thesis aims to implement a person-centred, multi-level PA intervention within a residential estate of older adults, taking into consideration the systemic and contextual factors that

influence PA behaviour within the targeted individuals, and using this information to provide a person-centred approach to intervention design.

2.12.3. Overall rationale

This thesis makes two novel contributions. The first novel contribution is to develop and implement a person-centred, multi-level PA intervention for older adults within a residential community. The second novel contribution of the thesis is to explore PA behaviours in older adults in the context of dynamic changes in purpose, meaning and identity throughout life transitions. Thus, the thesis aims to fill gaps in the research concerning PA interventions to support the health and well-being of older adults living within a residential community. To achieve this aim, the thesis comprises three studies. The first study aimed to (i) gain an understanding of the barriers to, and facilitators of, PA in older adults living within a residential estate, (ii) map these findings onto the SEM (Sallis & Owen, 2015) and (iii) provide recommendations for a multi-level PA intervention to be implemented within the residential estate. The findings from study 1 were then used to design an intervention aimed at increasing PA, which was implemented within study 2. Study 2 employed a mixed-methods approach to (i) conduct an implementation trial using an intervention strategy designed using the findings of study 1, and (ii) use qualitative and quantitative data to assess the implementation of the intervention using the RE-AIM framework. Study 2 highlighted the need for meaningful PA and how PA was often accumulated through activities associated with a daily purpose. Therefore, the third study explored changes in purpose, meaning and identity through lived transition experiences in an attempt to better understand PA behaviour in older adults and the challenges that stakeholders face when trying to encourage an active later life. It is hoped that the findings from this thesis will be able to develop our understanding of the complex and dynamic concept of PA behaviour in older adults and how best to encourage engagement in PA behaviour to support physical health and psychological well-being.

2.13. Chapter summary

The purpose of this chapter was to review the literature that concerns the research into older adults and PA behaviour. First, the chapter identified the ageing population, trends of PA behaviour, and current and potential effects on health care systems. The chapter also discussed the effectiveness of interventions that aim to increase PA in older adults, especially within the social ecological framework. Finally, the chapter went on to outline and discuss the use of psychological theory within the field of PA and outline the rationale for the current thesis.

3. Philosophical assumptions

This chapter introduces the philosophical assumptions that underlie the research process. It is important to understand these as they guide and influence the researcher's approach when conducting the research project and their interpretation of the key findings.

An interpretivist (Berger & Luckmann, 1966) approach was adopted within this thesis. Thus, the researcher's view is that there are multiple realities and that we can only seek to understand real-world phenomena by studying them within the context in which they occur. An interpretive approach was adopted as it is believed that this is the best approach to understand the complex nature of PA behaviour within the residential estate of older adults. As identified within the current literature on PA interventions for older adults, a person-centred approach is needed in order for interventions to address the individual, interpersonal and environmental factors that influence PA behaviour. This thesis aims to explore PA behaviour and implement a person-centred PA intervention within a group of older adults that is relevant to their specific context. Interpretive research considers the natural contexts in which individuals function and aims to provide an in-depth understanding of real-world problems (Creswell, 2007). Therefore, it is felt that an interpretive approach will provide the depth and type of data required to answer this research question.

Some researchers may criticise the interpretivist approach and claim that data collected in this method may be flawed due to the subjective position of the researcher (Goulding, 2002). Subjectivity is generally defined as the way in which research is influenced by the perspectives, values, lived experiences, and viewpoint of the researcher (Allen, 2017). However, the subjectivity of interpretivist research may not necessarily be a limitation, given that researchers are aware of its threats, and use subjectivity to fulfil the research aims (Bumbuc, 2016). Additionally, some researchers believe that subjectivity within research can benefit an investigation, as those who have lived through the experiences that are being researched have more authority and credibility to construct knowledge about a given topic than those who have simply read or pondered about such experiences (Allen, 2017). A subjective interpretation is one of the features of interpretivist research, with the researcher acting as a measurement device, who can view the phenomena 'from the inside' (Huberman & Miles, 1994). As the lead researcher, I carried out several research projects within the residential estate over a span of three years. This prolonged engagement with the target population provided an 'inside view'

into the lives of these individuals, strengthening my position to interpret the data that was being collected.

This thesis is underpinned by the philosophical assumptions of ontological relativism and a subjectivist epistemology. With a relativist ontology, I believe that reality is a finite subjective experience (Denzin & Lincoln, 2005), and that it is not distinguishable from the subjective experience of it (Guba & Lincoln, 2005). With a subjectivist epistemology I believe that knowledge constructed with this approach is developed through the multiple lenses of my life, including my lived experiences, gender, social class, and ethnicity (Denzin & Lincoln, 2005). As a researcher adopting the interpretivist paradigm, the objective was to develop knowledge and understanding specific to a phenomenon (Sparkes & Smith, 2014), focussing on understanding the meaning of human experiences and actions (Fossey et al., 2002). Thus, the studies featured within this thesis qualitatively explore the lived experiences of older adults to develop an understanding of phenomena related to PA behaviour. It is important to acknowledge that the findings presented within this study are interpretations of the older adults' experiences. Although there is no correct interpretation of reality (Slevitch, 2011), due to the prolonged engagement I had with the individuals within the residential estate, I was well poised to construct this knowledge with the participants being researched. By 'living through' the research process with the participants and spending extended periods of time within their specific context, it afforded me the opportunity to develop an understanding of their historical and cultural settings, which helped shape the interpretation of their lived experiences. Additionally, I employed a dual role as the researcher and deliverer of the intervention, which included frequent conversations with the residents. By frequently engaging with the residents throughout the 12-week intervention, it allowed me to experience the intervention with the residents. I listened to changes in confidence in relation to their physical capabilities and to them explaining how they were consciously making more effort to take part in daily activities to get their step counts up. By adopting the dual role, it gave me 'insider information' into the experiences of the intervention, which would not have been identified by an 'outsider' (Smyth & Holian, 2008). With 'insider' knowledge of the residential estate, older adults who were taking part and the intervention process, I was able to develop research questions based on rich understanding of the issues needing investigation, which led me to the exploration of 'purpose' within the final study.

The interpretivist approach aims to understand how individuals comprehend life experiences and construct meanings within their social and cultural contexts (Groleau et al., 2009).

Therefore, interpretivist research recognises perceptions of the social world, and the interactions between individuals and their context (Ormston et al., 2014). Thus, generalisability of findings is limited, as they are intrinsically linked to the research context (Davies & Dodd, 2002). However, making statistical generalisations has never been part of the agenda of interpretivism (Williams, 2000), and considering the research questions addressed within this thesis and the importance of context in this research, statistical generalisations of the findings would be neither possible nor required.

Quality is fundamental in any piece of research (Hallberg, 2013), with positivist researchers using terms such as reliability, validity and rigor to assess the quality of a research project. Interpretivist researchers have developed their own terms to assess quality. This thesis follows the trustworthiness criteria set by Lincoln and Guba (1985), which measures the quality of qualitative research through concepts such as credibility (quantitative internal validity), transferability (quantitative external validity or generalisability), dependability (quantitative reliability), and confirmability (quantitative researcher's objectivity and distance; Lincoln & Guba, 1985). Trustworthiness was sought through ensuring transparency, reflexivity, and accuracy of the research process, and by providing valid and rich descriptions of the context under scrutiny and the interactions that were experienced within it (Thorne & Darbyshire, 2005). These authors state that by providing these valid and rich descriptions, the research findings warrant a degree of generalisability, or, in relation to the concepts proposed by Lincoln and Guba (1985) that were followed within this thesis, transferability. By providing rich descriptions of the research process, context and interactions that were experienced throughout this thesis, the reader can consider the application of the findings to other settings, thus making transferability assumptions (Shenton, 2004).

Due to the subjective nature of interpretivism and the potential for bias on behalf of the researcher, interpretivist studies are often criticised for their lack of generalisability (Creswell, 2007). Therefore, reliability of research findings can be undermined to a certain extent. However, interpretivism is focussed on the understanding of human behaviour, rather than the prediction and generalisation of causes and effects (Macionis & Gerber, 2010). Therefore, interpretivist researchers turn to qualitative inquiries to better understand how people perceive life experiences through their narratives, constructing meanings within their social and cultural contexts (Groleau et al., 2009). Thus, it is important to acknowledge the differences between the generalisability of qualitative findings to that of quantitative findings. Qualitative research cannot generalise findings in ways that quantitative research can. We cannot identify

relationships within a single sample and apply these findings to larger groups of the population, nor are we meant to. Zubala et al. (2017) highlighted the need for PA intervention strategies to be tailored to suit the needs of the targeted individuals and their context, echoing the approaches of interpretivism. Findings from research within other contexts are not going to be specific to the needs of the individuals within the residential estate explored within this thesis. The methods employed within this thesis were used to develop a PA intervention designed specifically for the target population and their context. Additionally, the findings from this thesis can provide knowledge and understanding about older adults' lived experiences to researchers, policy makers, and other stakeholders of older adults, who can, where appropriate, apply qualitative findings to develop PA interventions for older adults who are in similar contexts to those within this thesis. Therefore, the findings from this thesis aim to offer a novel contribution to the literature, and to policy and practice, by offering a person-centred approach that can be used to develop PA interventions for older adults. By exploring the lived experiences of older adults and using this information to inform and implement intervention designs, we can generate a deeper understanding of this complex topic area (Tracy, 1995).

Study 2 used a mixed-methods approach to explore the implementation of a person-centred, multi-level PA intervention for older adults within a residential estate. However, collecting quantitative data as an interpretivist researcher can be contradictory to the foundations of the research paradigm (Hall, 2013). Hall (2013) states that many mixed-methods studies lack a robust philosophical foundation, as they do not identify the research paradigm that underlines the research process that was undertaken. This thesis adopted an interpretivist mixed methods investigation into the implementation of a PA intervention for older adults within a residential estate in Newport, Wales. The older adults' lived experiences of the intervention process being a key focus point of the data collection. Perceptions of whether the intervention could be implemented on a larger scale within the residential estate were also explored through an interview with a senior member of the health and well-being team at the housing association. The overarching aim of the study was not to provide an objective evaluation of the intervention strategy, due to the context specific nature of the study. But the study set out to explore the strengths and weaknesses of the implementation of a person-centred, multi-level PA intervention for older adults living within a specific context. This focus was consistent with the interpretivist stance, which highlights 'the situatedness' of knowledge and that it is not for generalisations (Willis, 2007). Due to the context specific nature of the study and a limited pool of participants available for recruitment, generalisations could not be made from the

quantitative data. Therefore, only initial trends in the quantitative data could be identified, with qualitative data being used to further explore the concepts related to the quantitative outcomes. The interpretivist approach was reflected by the aims of the study, interpretation of the findings and the quality considerations of the study (McChesney & Aldridge, 2019).

4. Identifying multi-level influencers of physical activity in older adults

Within this chapter, a qualitative exploration of the residents living within the residential estate will be conducted to identify influencers of PA at different levels of the SEM. Recommendations will then be given to develop a person-centred, multi-level PA intervention for the residents within the estate.

4.1. Introduction

The current literature indicates that PA can provide significant benefits to our health and well-being (WHO, 2010; Department of Health, 2004; Angevaren et al., 2008; Department of Health, 2009). Although the benefits of PA are well documented, many older adults do not achieve the recommended PA levels advised by the WHO (2010). Health surveys from populations around the UK indicate that older adults tend to be less active than younger age groups, with 47% of individuals aged 75-84 years being classed as inactive. This number then rises to 70% for those over the age of 85 years (NIHR, 2019). These low levels of PA in older adults contribute to the increasing number of non-communicable diseases reported by older adults (Lee et al., 2012), which adds to the financial burden on national health services (NCSEM, 2014). Therefore, it is a key focus point of national health policies to improve the health and well-being of older adults and reduce the prevalence of non-communicable disease by increasing levels of PA (Ministry of Health, 2013).

PA interventions for older adults are designed to maintain and/or increase long-term participation of physical activity as we become older. Therefore, interventions should be designed to meet the needs and preferences of older adults, supporting the need for person-centred approaches to intervention design, as this approach can address the personal factors directly related to older adults, such as poor physical function and lack of support (Zubala et al., 2017). Previous research has identified benefits in involving people in the design of health and well-being interventions (Hibbard & Green, 2013; Minkler et al., 2008), and by including older adults in the design of intervention strategies, we can develop a greater understanding of people's individual characteristics, goals and surrounding environments that underlie their physical activity patterns (Guell et al., 2018). A literature review by Boulton (2014) found that very few interventions aiming to increase PA involved older adults in the design, delivery, implementation, and promotion of the intervention itself. Taking a more person-centred approach and involving older adults within the design of intervention strategies may better

support PA behaviour change through the tailoring and individualisation of intervention strategies (Zubala et al., 2017).

The Socio-ecological model (SEM; Sallis & Owen, 2015) provides a framework to understanding people, their environment, and the context in which they exist, which can help design effective public health interventions (Stokols, Translating social ecological theory into guidelines for community health promotion, 1996). SEM's recognise the complexity of human behaviour, therefore consider its influences on intrapersonal, interpersonal, environmental, organisational and public policy levels (McLeroy et al., 1988; Conner & Sparks, 2009; Hawley-Hague et al., 2013). Boulton et al. (2018) previously used semi-structured interviews and focus groups to identify influencers of PA participation in older adults within all levels of the SEM (Sallis & Owen, 2015) and state that interventions should look to address influencers of PA on multiple levels of the SEM in order to create successful PA interventions for older people. This is supported by Kerr et al. (2018) who successfully implemented a feasible, multi-level PA intervention for older adults, which employed techniques from Social Cognitive Theory (SCT; Bandura, 2004) and addressed influencers on the individual (goal setting), interpersonal (group walks) and community levels (pedestrian advocated improvements in walkability) of the SEM. The intervention implemented with older adults from retired communities significantly increased objective measures of PA throughout the 12-month study and significantly reduced systolic blood pressure at 6-months post intervention. Improvements in physical function also occurred, but these were not statistically significant. These findings also support the notion that residential/retirement communities provide an ideal context for the implementation of multi-level interventions as it allows for strategies to be designed and implemented to cater for the needs of a group of individuals, within their current context, as well as the dense population of targeted individuals within one particular setting (Whitney et al., 2017). Whilst there is evidence to suggest interventions can successfully increase PA behaviour in older adults, context specific strategies need to be considered, as previous successful intervention strategies may not be generalisable to all older adults (Kerr et al., 2018). Moreover, Zubala et al., (2017) highlighted how current intervention strategies were theory-driven, but lacked the inclusion of interventions that are co-created with the target individuals, despite the growing evidence that supports the inclusion of older adults within intervention design, suggesting that this approach may be more supportive for long-term behaviour change (Durand et al., 2014; Galvagno & Dalli, 2014). Further studies are needed to enhance our understanding of how person-centered,

multi-level PA interventions can be developed, and implemented, to support the uptake and long-term PA participation, and improve the health and well-being of older adults.

The objectives of this study were to: (i) gain understanding of the barriers to, and facilitators of, PA in older adults living within a residential estate, (ii) map these findings on the SEM (Sallis & Owen, 2015) and (iii) provide recommendations for a multi-level PA intervention to be implemented within the residential estate. A qualitative methodology was used in order to obtain a person-centred understanding of the barriers and facilitators, so that interventions can be developed using a person-centred approach. This approach allows for an intervention to be tailored to the subjective needs and preferences of the targeted individuals, as advised by Zubala et al. (2017).

4.2. Methods

This study was approved by the College of Engineering Research Ethics Committee in March 2018. The research was carried out with residents of Derwen Housing association in Newport, Wales. Derwen provide housing for older adults within the South Wales area. They aim to encourage active ageing in the residents, therefore the study aimed to provide information as how best to improve the health and well-being of its residents by increasing physical activity. Derwen provided contact information for the residents in the area. They were contacted by the researcher who explained the purpose of the research and asked if they would like to take part. Individual, semi-structured interviews were used to gather information on barriers and facilitators to physical activity. Repeat interviews were used with two interviews per participant. Although single interviews are a more common practice in qualitative research, in order to seek *credibility* and *confirmability*, this study used repeat interviews as they allow more time for the researcher to build a relationship with the participant and provide a better opportunity for clarification and improved understanding, as well as enabling follow up on issues which may have been identified in the initial interview (Vincent, 2012).

4.2.1. Establishing trustworthiness

To establish trustworthiness within this qualitative study the researcher followed Lincoln and Guba's (1985) refined concept of trustworthiness, which introduced the assessment criteria of *credibility*, *transferability*, *dependability*, and *confirmability*. First, *credibility* was sought by using prolonged engagement with the participants and the data set. The interviewer carried out each of the interviews whilst making notes and using clarification techniques throughout to ensure clear understanding of statements made by the participants. *Credibility* was further

strengthened through repeat interviews with the participants, by further building rapport and the clarification of statements from preceding interviews. Data triangulation methods were also used, whereby themes and sub-themes were matched with direct quotes from the data set to ensure interpretation of quotes was agreed by both researcher and research supervisor, enhancing the credibility of the data set. *Transferability* is often explained by the finding's relevance to other contexts. This study provides various in-depth quotations and clear layout of the findings, so that they can be transferred to other sites by those who choose to do so. In order to achieve *Confirmability* is addressed as each stage of the data collection and analysis has been reported, providing a rationale as to why key decisions have been made. Whilst collecting data within the interviews, the researcher made efforts to clarify each statement made by the participants, to ensure they were being interpreted correctly and not allowing the interviewer to skew the response, resulting in researcher bias. The final stage of the trustworthiness assessment criteria (Lincoln and Guba, 1985) is *dependability*. This refers to the researcher providing enough information on the methodology and research process they followed, allowing other researchers to replicate the study, if they would wish to do so. A clear description of the methods used is also provided within this chapter.

4.2.2. Contextual information

Derwen is a housing association in Wales, which provides housing for older adults. It was developed in April 2014 with the aim to provide housing and related services, informed by the needs and wants of their residents. Derwen state that they have 'active ageing' at the heart of their ethos, aiming to enable their residents to live healthy, independent lives within their community. Derwen state that their 'active ageing' ethos is about ensuring quality of life within their residents as people grow older. The six pillars of their 'active ageing' agenda include *active minds, healthy bodies, family, friendships, money matters, being involved, and homes and places*. Derwen currently promotes healthful initiatives such as complementary therapy sessions, healthy eating clubs supported by nutritionists and dieticians, and a range of other projects which support people to live healthier and more active lifestyles.

In 2018, Derwen built a new residential estate within the Gaer, Newport (see Figure 3). The new development consisted of 39, one- and two-bedroomed apartments for older adults, adding to an existing estate of 70 bungalows within the surrounding area. Derwen has also included a large community hub as part of the design of the new development (see Figure 4). The facility has a large open plan flexible space looking out onto a terrace, incorporating a café area, and

two large rooms that are to be used for additional more private activities (i.e. health and wellbeing activities).



Figure 3. Image of the new residential estate located within the Gaer, Newport.



Figure 4. Image of the community hub within the new residential estate.

Newport is located in South Wales and has a population of 147,769. Older adults make up 17.47% of the population, with this percentage expected to increase to 23.5% by 2039 (Atlas, 2017). The percentage of older adults within the Gaer is higher than the Newport average, with an average of 17.5%. Black and Minority Ethnic groups make up 10% of the population in Newport with 7.6% in the Gaer. The estate is located in an area which is in the top 30% most deprived in the Welsh Index of Multiple Deprivation. The number of offences per 1,000 population within the Gaer has increased from 54.1 in 2013-14 to 73.5 in 2015-16. This is below the Newport average which has increased from 77.34 to 86.37.

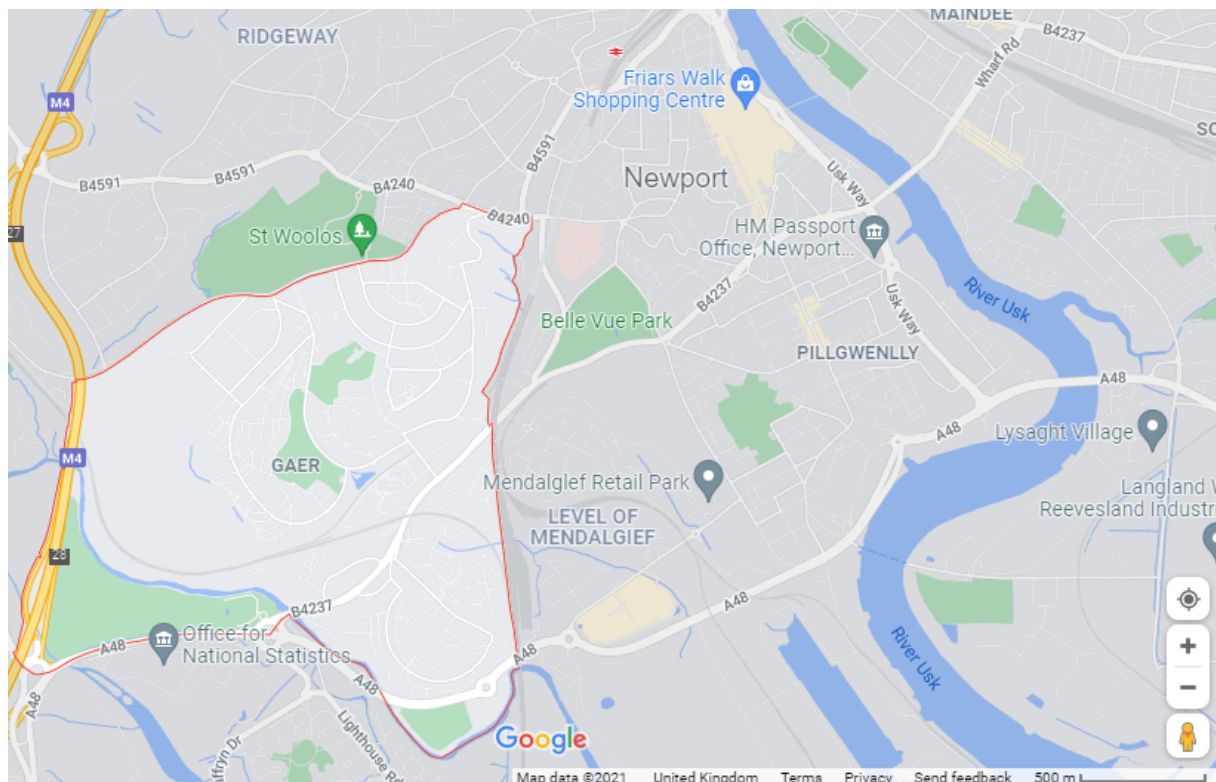


Figure 5. Map of the Gaer, Newport. Location of the residential estate of older adults.

According to the UNA (2015), recent PA data from Newport shows that between 2009 and 2014 the percentage of adults meeting the PA guidelines has fluctuated. However, the general trend has increased from 27% in 2009/10 (compared to the Welsh average of 29%) to 31% in 2013/14 (compared to the Welsh average of 30%). Therefore, previously this percentage was below the Welsh average, but has since surpassed it. The percentage of adults who were physically active on no days in the previous week has only been collected since 2012/13, so a trend is yet to be established. However, the percentage of adults in Newport who were physically active on no days of the previous week has decreased from 34% in 2012/13 to 32% in 2013/14, which is below the Wales average which has remained at 34%. It is worth noting

that this data was collected using self-report measures of PA, where previous research has shown that individuals may overestimate or underestimate their true energy expenditure and rates of inactivity (Prince et al., 2008).

The percentage of people that rate their health bad or very bad in Newport is similar to the Welsh average at 7.4%. However, in the Gaer, that percentage increases to 9.2%. The percentage of individuals who are limited in their activities by illness in the Gaer is 25.4%, which is higher than in Newport (20.8%) and Wales (22.7%) as a whole. There are currently 82 Derwen residents living within the Gaer, with 77 aged 65+ years of age (for more images of the context, see Appendix 9.1 p.197-217).

Table 1

Number of Derwen residents by age group living within the residential estate

Age group	Total
Under 50	1
50-55	1
56-60	3
61-65	13
66-70	16
71-75	21
76-80	10
81-85	9
86-90	6
91-95	2

4.2.3. Participants

Participants were recruited from within the Gaer, Newport. This is a housing estate owned by Derwen Housing where many of their residents live. The participants were given the option to take part in the interview within the comfort of their own home or at a nearby community centre. This allowed the participants to feel more comfortable in their surroundings. Participants were also ensured that anonymity would be maintained, as privacy may have an effect on response bias and strengthen the *credibility* of the dataset, particularly when collecting potentially sensitive information (Pridemore et al., 2005). The participants were required to meet inclusion criteria which included being 65+ years old, willing to share personal information related to PA and general life, a resident of Derwen Housing association and living within the Gaer, and able to converse in the English language. If participants did not meet the requirements of the inclusion criteria or were deemed unable to cooperate effectively by the interviewer, then they were excluded from the interview process. A total of 11 participants were interviewed (mean = 74.8 years, range = 65-89 years, SD = 7.7), 4 Males (mean = 72.3

years, range = 69-80 years, SD = 6.9) and 7 females (mean = 76.3 years, range = 65-80 years, SD = 8.3). Participants were predominantly female, which was a result of this being a volunteer sample. This may affect the *credibility* of the findings as the data may have some gender bias. All participants completed the interviews and were comfortable answering all questions.

Table 2
Participant profiles of those who took part in the repeat interviews.

Name	Gender	Age (approximate)	Ethnic background	Occupation	Disabilities (Yes/No)
Barbara	F	70s	White, British	Retired	Y
Margaret	F	60s	White British	Retired	Y
Roy	M	70s	White, British	Retired	Y
Mary	F	80s	White, British	Retired	Y
Diane	F	60s	White, British	Retired	Y
Ian	M	70s	White, British	Retired	N
Helen	F	70s	White, British	Retired	N
Russell	M	70s	White, British	Voluntary worker	N
Anne	F	80s	White, British	Retired	Y
Gavin	M	70s	White, British	Retired	N
Belle	F	80s	White, British	Retired	Y

Note: Pseudonyms are given and specific information has been withheld to ensure anonymity.

4.2.4. Data collection

Prior to the interviews, a pilot interview was carried out with fellow researchers to ensure questions were easily understood. Some minor adjustments were made to the wording of several questions to allow for easier understanding. At the start of the subsequent main interviews, the aims and objectives of the research were explained to the participants, who were then asked to provide written informed consent to participate. Interviews were carried out twice with each of the participants, strengthening the *trustworthiness* of the data. Two participants were unable to attend the follow up interview, so they only participated in the first interview. Taylor and Bogdan (1984) state that one interview may not be enough for in-depth qualitative data, and that repeated face-to-face interviews may produce a richer data set. By using multiple interviews, the interviewer and interviewee can develop trust and rapport. As the interviews can also take a long time, it can be tiring for the older participants, therefore breaking them up into two sessions can make it more manageable for them (Earthy & Cronin, 2008). Semi-structured interviews were used, which provided structure and guideline to the interview but allowed for other potential avenues to be explored (Creswell, 2007). The interview sessions also consisted of a photo elicitation task as multiple qualitative methods can be beneficial when attempting to gain a comprehensive understanding of a complex environment (Krane & Baird,

2005). Photo elicitation can be used to encourage conversation and make interview environments less daunting to the participant (Orr & Phoenix, 2015), resulting in a more honest and rich data set. The photo elicitation task was carried out during the initial interview session and first consisted of photos of the surrounding area, which were provided by the interviewer and used to help trigger responses on environmental factors. Subsequent photos were of a range of physical activities, whereby participants had to *identify how they felt about the physical activity? why they felt that way? what they liked or disliked about the activity?* etc. Visual methods can be added to traditional qualitative methods to enhance the richness of qualitative data by adding validity and depth (Glaw et al., 2017). Harper (2002) explains how using photo elicitation within qualitative research can prompt memory, reduce misunderstandings, and elicit higher quality and more comprehensive interviews. Once open-ended questions had been asked, follow-up questions and probes were used to gain further understanding on the issues being addressed. Once answers had been given, clarification techniques were used to ensure clear understanding of the participants' answers. The interviews generally lasted approximately 60-90mins for the initial interview and 30-45mins for the follow-up session. This strengthened the *credibility* of the data, as the researcher spent lots of time emerged in the data collection environment.

4.2.5. Data analysis

Interviews were recorded using a Dictaphone and transcribed by both interviewer and an external transcription company. Although transcribing interviews can be beneficial as part of the analysis process, as it can help familiarise the researcher with the data due to prolonged engagement, the external company was used to enable transcription to occur between interviews one and two, which allowed time for the researcher to review interview one and individualise the questions for interview two, exploring avenues specific to the participant being interviewed. Once an interview had been transcribed thematic analysis began, with the author reading over the transcription multiple times until he was familiar with the general trends within the dataset. Key quotations from the raw data were highlighted and labelled with a first order theme. First order themes were then grouped into second order themes. Finally, the second order themes were then matched with 4 levels of the SEM: *individual, interpersonal, environmental, and organisational*. This extensive process of creating themes and sub-themes strengthened the *transferability* and *confirmability* of the data through extensive analysis of quotations. Public policy was not included in the analysis process as this factor was not discussed within the interviews as it was not relevant to the participants. Investigator

triangulation was used to obviate bias within the data set (Archibald, 2016). Thus, we can increase our confidence within our conclusions (Bryman, 1988). The triangulation process involved using a secondary researcher to identify several quotes from the data and match them with the themes. This strengthened the *credibility* of the data analysis as it had been agreed on by multiple researchers. Inductive thematic analysis was used, to ensure the themes were data-driven (Braun & Clarke, 2006). The second aspect of analysis was a deductive approach. Whereby, once themes had been created, they were then placed into the pre-existing SEM framework for further analysis. This allowed each influencer of PA to be identified within its corresponding level of the SEM. Below, Fig 3 is an illustration of this process for intrapersonal influencers of PA. To ensure anonymity of the participants, pseudonyms are used within the presentation of the data.

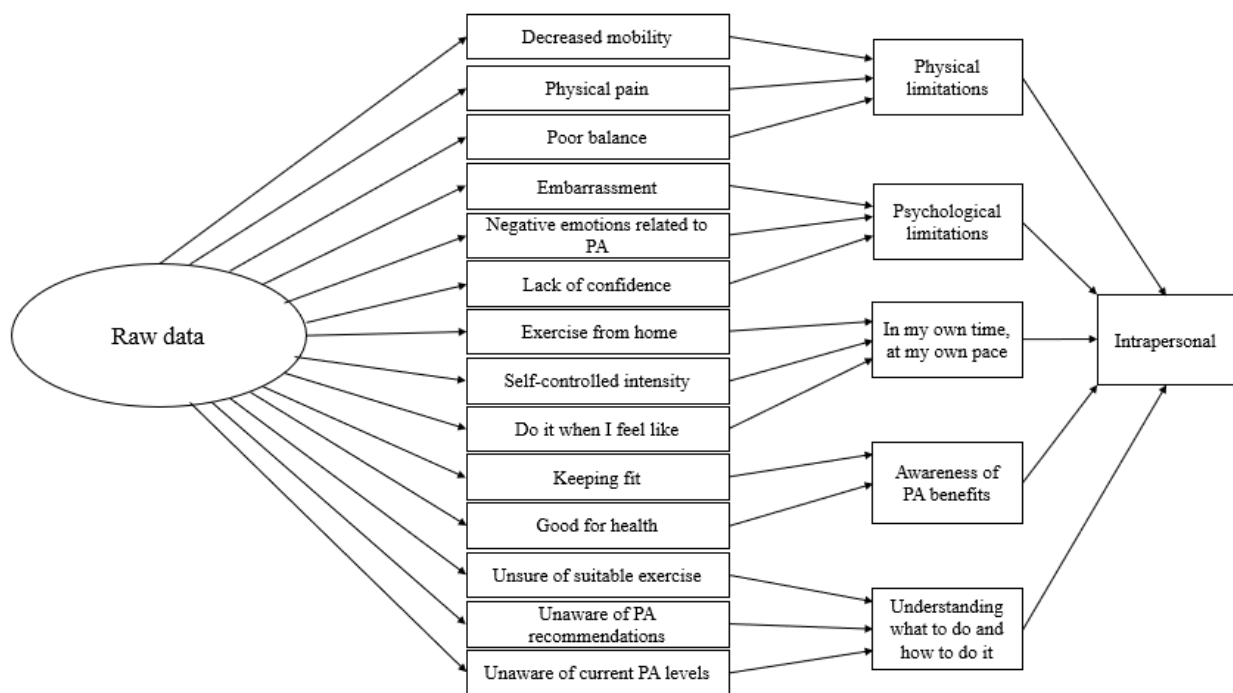


Figure 6. Barriers and facilitators developed from raw data to first order themes, to second order themes, before being placed into their corresponding level of the Socio-ecological model; PA = physical activity.

4.3. Results

The interviews produced 21 themes that influenced PA participation in older adults within 4 levels of the SEM. These levels were Intrapersonal, Interpersonal, Environmental and Organisational. The 4 levels, along with their corresponding themes, are presented in Figure 7.

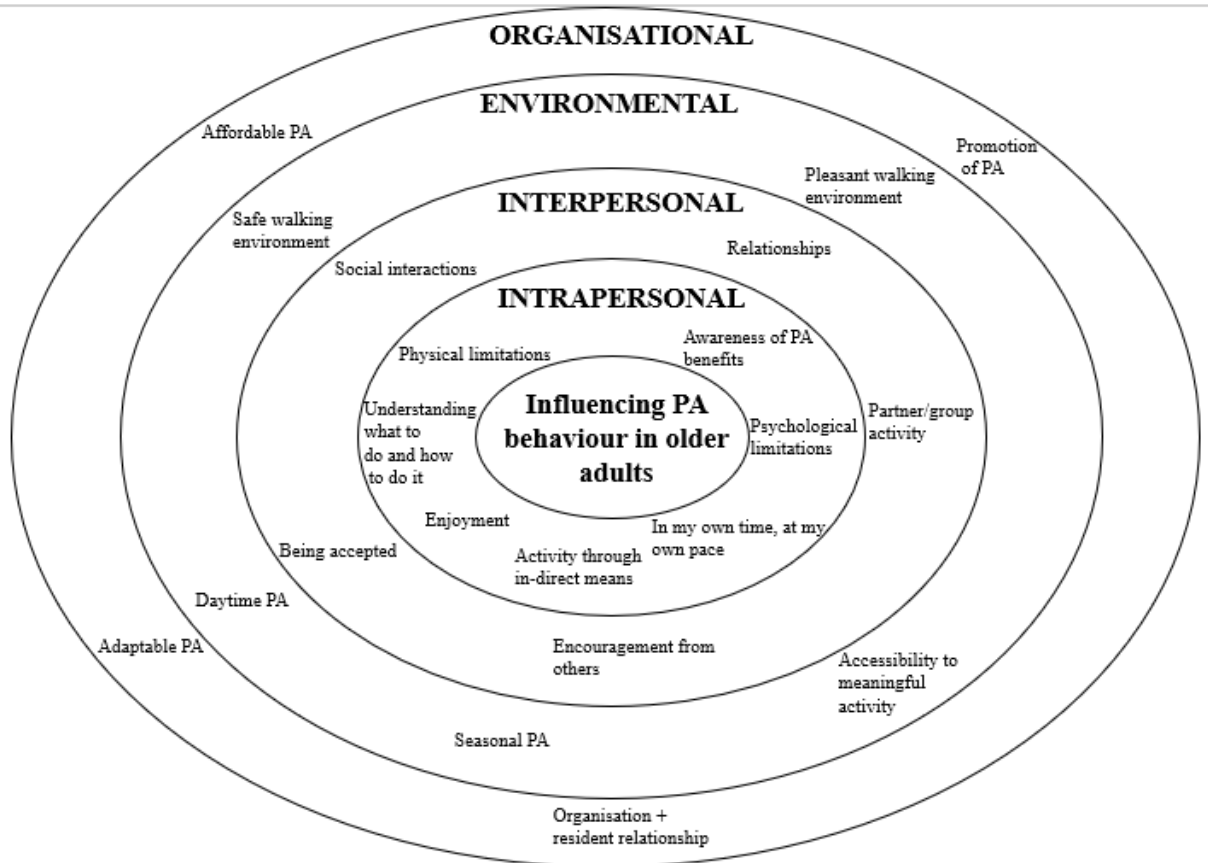


Figure 7. Socio-ecological model of the influencers of physical activity in older adults, living within a residential estate; PA = physical activity.

4.3.1. Individual/intrapersonal factors

4.3.1.1. *Physical limitations*

Physical limitations were common barriers to PA at the intrapersonal level of the SEM. These physical limitations included injuries, cardiovascular complications, age-related physical decline and poor vision. Regardless of the nature of the physical limitations, several of the participants suffered from one or multiple physical barriers to PA. Barbara, 78 years old, a participant who suffered from various physical limitations mentioned *'I'm all full of arthritis as well. I've got fibromyalgia, that flares up. So, when it does I am in trouble'*. The participant felt that the physical problems she suffers from make participating in PA more difficult, by increasing pain and discomfort.

Poor physical function was another barrier to PA highlighted within interviews. The loss of physical functioning was said to make it difficult to perform some physical activities. Margaret, 66 years old, spoke of having difficulty performing the types of activities that she enjoys, stating *'I love the walking. That was a big thing with me but, of course, I can't do it now. that's*

the problem'. The age-related physical limitations that she experiences prevent her from pursuing the activities which she enjoys most. Barbara, 78 years old, also reported difficulty performing activities that she once participated in, explaining '*I can't bend fingers, I can't use my hands properly anymore, that's another reason for not bowling*'. The participant used to bowl as her chosen recreational PA, but with her limited physical functioning she is unable to participate.

4.3.1.2. Addressing psychological limitations

Participants also reported several psychological barriers to PA, such as decreased confidence and an increased fear of falling. Barbara, 78 years old, explains how her poor balance has led to several falls in the past, which has resulted in lost confidence in her ability to walk outside of her home. She commented:

Barbara, 78 years old: I've lost my confidence while I've been walking yes.

Interviewer: Yes I think its.

Barbara, 78 years old: That's something I've got to work on myself that it, yes.

Interviewer: Is your confidence yes, confidence with walking?

Barbara, 78 years old: Going out and walking yes.

Interviewer: Yes, where did that change, your confidence with walking?

Barbara, 78 years old: Well I've had a few nasty falls.

Due to poor physical functioning, there was an increased element of fear around participating in PA. Participants frequently mentioned experiencing fear participating in PA, such as fear of falling and/or injury. Roy, 72 years old, discussed how he feels about exercise-based PA and its potential impact on his physical conditions:

'Some people, they run, and they will look at their watch all the time, that's setting themselves a pace. And the next day they may think, that wasn't as fast as I normally do it. They try harder. I wouldn't be doing anything like that, trying to sort of think, oh, I did 20 something today, I'll do 20 something tomorrow, I'd be afraid to do it. And that's honest'.

The fear of potential negative outcomes results in an avoidance of PA behaviours. Roy, 72 years old, continued to explain how he feels it would be safer for him to avoid PA, regardless of his preference to be physically active:

I feel uncomfortable. I think, I wish I could...and I know that if I go on anymore (walking for exercise), it's not going to benefit me. It would benefit me more to stop. It would benefit me more to stop. Otherwise, if I push it too far, I can end up falling down in the street.

He continued to speak about how, since he has become older, the physical difficulties he experiences have led to a change in 'drive' to be physically active. An upward social comparison to other who are more physically able than himself has a detrimental effect on his motivation to be physically active. He explains:

There was one time, going back years... if I saw a younger person doing it, I'd want to do it as well. I still had that inside me. I'm not saying I could do it then, I wouldn't have kept up with them, but I could still do it. But now, it's the opposite. I think, I won't bother trying that.

Participants also spoke of how PA would highlight the physical deterioration they had experienced in old age. This resulted in negative emotional responses to PA. Roy, 72 years old, spoke of the negative experience he has when walking, stating *'I can't walk like I used to years ago. I can only walk so far. To be honest, I have to stop every now and again'* and how this makes him feel, *'Bloody awful'*. Being physically active could also result in feelings of embarrassment. Being seen to have poor physical functioning, falling and having disabilities could result in feelings of humiliation. Mary, 84 years old, told a story of how she had fallen when out walking and explained *'I feel such a twit. She said, everybody has a fall. But I did I felt like a fool. I couldn't wait to get home and hide!'*. Falling over in front of others resulted in an intense feeling of embarrassment. A conversation with participant Roy, 72 years old, also stated how, due to their current physical condition, they would be embarrassed to participate in activities they once did:

Roy, 72 years old: to be honest, I used to be a good swimmer. But I would be too embarrassed to go in a pool now I would...

Interviewer: is that because of your (stomach issues)

Roy, 72 years old: yeah, yeah.

Participants also held several negative perceptions and beliefs towards physical activities. The participants felt that physical activities, such as exercise, were for younger generations and were not a concern of people of an older age. Diane, 69 years old stated *'We've done our bit. It's time for us to relax now. Why should we have to worry about bloody exercising'*. This participant felt that older people have 'played their part', therefore are no longer required to

participate in exercise. The same participant continued to explain how PA can make the symptoms of her physical condition worse, stating *'I suffer with fibromyalgia and I'm in absolute agony from morning until night. So physical activity is out for me because that makes it worse'*.

Although the desire to receive more support to be physically active was identified within the interviews, several of the participants also showed a resistance to help and support. When asked if they liked to receive help in regard to being more active, Roy, 72 years old, stated *'I'd rather do my own. I don't mind a little bit of help now and again. But I am of the old type, very independent'*. Barbara, 78 years old, also explained *'I just don't like not being able to do things myself'*. It seemed that asking others for help or support was something they avoided, as they felt it wasn't part of being an 'independent' older adult. Ian, 74 years old, explains *'A lot of people don't like asking for help. No, that's an old thing. We call it independent'*. Asking for help and/or support from others was potentially a threat to the individual's independence. It may be important to consider how much help and support is offered for older adults, so as to allow some autonomy in their decisions to be more physically active.

4.3.1.3. What to do and how to do it

Lack of knowledge and understanding was another barrier at the individual level of the SEM evident within the interviews. Participants were unsure of 'how much' or 'what types' of PA they should be doing. Roy, 72 years old, stated *'I feel a little bit better now I've had this done (his operation), but the thing is, I don't know what to do'* explaining how he would like to do more PA in the form of exercise, but he doesn't have the knowledge of what he should be doing. Another participant spoke of a similar problem, with poor health conditions causing her to question how much PA she should be doing:

Barbara, 78 years old: If I could get my physical being going a bit more. I'm afraid at the minute I'm afraid I don't know how far to push myself. Because having that fright with the old ticker (previous heart attack) is sort of up here (on her mind), oh you better, no, no.

4.3.1.4. Enjoyment

Enjoyment of PA was a key facilitator identified on an intrapersonal level within the interviews. When participants had to recall recent experiences of PA, enjoyment was often referred to as the key motivator for taking part. Helen, 72 years old, stated *'I'm trying to get back walking more. I'm quite enjoying it. I thought, I must walk up here a bit more and see what they're doing'*. Along with walking, gardening was another enjoyable PA that was reported by the

participants. Participant Ian, 74 years old, was asked why gardening was his chosen form of PA and he responded, *'Oh I love it, always have, from a kid, always doing gardening'*. Russell, 75 years old, explains how group exercise classes allow him to accumulate 'good exercise' and experience feelings of enjoyment, *'Good exercise and we, we make it so it's, it, a lot of people won't do it because they, they don't want to make a fool of their selves, so what we do is to make sure that you enjoy yourself and it's a, it's a good laugh'*. Ensuring that PA is enjoyable may encourage the participants to continue to pursue their chosen PA behaviours.

4.3.1.5. Active through indirect means

Participants often accumulated PA through in-direct means, or as a by-product of other meaningful activities such as walking the dog, transport and gardening. Several of the participants couldn't drive, therefore would walk when attending activities outside of their home. As previously mentioned, gardening was another commonly reported PA. Participant Helen, 72 years old, mentioned how she would grow produce throughout the year. She explained *'I'm growing tomatoes again this year, around the corner there, and I've got blueberries around there. I did grow potatoes here last year as well, because he had an allotment'*. Although her motive for gardening is not to be physically active and is motivated for other reasons, she still accumulates PA through this chosen behaviour. Thus, engaging in PA through an in-direct means.

4.3.1.6. In my own time, at my own pace

Having autonomy over how and when they were physically active was identified as an intrapersonal facilitator of PA. Belle, 88 years old, was asked about what activities that she liked to do and she responded *'As long as it's not too fast and it runs away with me, but I can get on with that at a pace, slowly, and I do the stepping thing in the gym down at the leisure centre'*. It seems to be the case than lower intensity activities were more appealing to the participants. This was also evident in a conversation with participant Barbara, 78 years old, who reacted to the photo elicitation task with *'Yes, swimming. Yes, I would be interested in that. I think the exercising in a pool as well, I find it is easier, yes.'*

Being able to participate in lower intensity activities was more appealing to the participants, as it was a more pleasurable experience. Although some participants spoke of exercise environments as their chosen form of PA, several participants felt uncomfortable in exercise environments and would rather exercise from home. Participants explained how they wouldn't go to a gym, but would be more inclined to exercise in their own home. Roy, 72 years old,

stated *'Yeah, if I am in the house that's fine, but I wouldn't go to a gym or anything like that. I can't'*. Anne, 89 years old, explained how when exercising from home, she can pick and choose exactly when she wants to do it *'I do it when I feel... I don't do it in the morning, but, now afternoons and evenings. More evenings, I do it. Course I watch the telly at the same time'*.

4.3.1.7. Awareness of physical activity benefits

The awareness of PA benefits was a facilitator of PA behaviour identified at an intrapersonal level of the SEM. Understanding of the health benefits, along with the negative impacts of a sedentary lifestyle, motivated participants to continue pursuing PA in their old age. Participant Anne, 89 years old, states how since taking part in some home exercise, she feels more comfortable walking in the outdoors. She explained:

'Oh yes, oh yeah. I'll tell you when I notice a difference, especially when I go out and when I got to go to bed and things like that, get ready for bed. I'm easy, you know what I mean? I haven't got this heaviness. Sometimes I find that I'm getting up with myself because I wonder if I am being too good, you know, and it makes you harder to get up but once I get going with that and walking I'm fine and I walk up and down now fine.'

Ian, 74 years old, also expressed how he feels sitting in the house is not good for him, so he decides to go for a walk several times a day, he stated *'I walk the dog like I said, four times a day, I can't say I overdo it. I think to sit in the house if I just laid back, that's the worst thing you could ever do.'* The participant chooses to go out for walks throughout the day, as he is aware of the negative impact of sustained periods of sedentary behaviour. Therefore, the participant expects to avoid these negative implications by participating in PA.

Participants also mentioned the psychological benefits of being physically active, and these benefits were often a key facilitator of future PA participation. The 'feel good' factor was another benefit that was experienced after taking part in PA. Ian, 74 years old, stated *'But the walking, whereas some people might say, 'Oh well if you go out now and walk -', or they think it, '- you'll feel worse', but you don't. You feel better'*. The benefits experienced when taking part in PA can encourage participants to maintain their PA behaviour in the future.

Participants also believed PA was a good way to 'keep fit'. Helen, 72 years old, stated her motive for aiming to be physically active was *'Just to keep myself fit. Know I'm still working alright, with my bones and things. Get the knees going'*. Keeping fit and mobile was a common motive shared by the participants for participating in exercise-based PA, as it was understood that exercise has health, fitness and mobility benefits in older age. As mentioned previously,

maintaining independence was considered an important part of life for the participants. Exercise based PA was believed to help maintain fitness and mobility, thus contributing towards the maintenance of their independence. Participant Helen, 72 years old, explained how maintaining her independence was of high importance and would be willing to try activities that would help her achieve this.

Oh, yes, I would listen. Anything that would help me, yes. Definitely. (Anything that would help me to get about easier, much better, oh, certainly, yes. There is no way I'm going in a home, that's it. End of story. I told the boys (her sons) that. I'm not going to live with them, either.

4.3.2. Interpersonal factors

4.3.2.1. *Social interactions and relationships*

Social interactions were identified as an interpersonal facilitator within the interviews. As previously mentioned, the social environment was important to the residents. Helen, 72 years old, stated '*I like socialising. It's as simple as that. I always have done*'. Participants often mentioned social interactions with family, friends and neighbours as valuable experiences in their lives. The companionship experienced when taking part in activities is potentially more important than the activity itself. The example below is from Barbara, 78 years old, who explained how it is the social side of an arts and crafts class that is of more importance to her than the activity itself:

Barbara, 78 years old: And then you know, some of the new patterns now are different to the older patterns and you can always ask them and they helped to sort it out.

Interviewer: Yes.

Barbara, 78 years old: Plus, they've been trying to help me to do crochet which I'm not very good at.

Interviewer: No.

Barbara, 78 years old: Yes, it's mainly the company.

An absence of meaningful friendships was a barrier identified on an interpersonal level of the SEM. The loss of meaningful friendships would be a result of relocation and being new to the area and a loss of exercise buddies through the age-related decline in physical health. Gavin, 77 years old, spoke of how he and some of his former friends would play golf, but since they

have become older, have stopped playing. He continues to explain how the activity isn't the same for him if he participates alone, *'We used to but they're too old now. We used to play every, every other day...but they, as they pack it in. It's, it's not a thing I, you can do on your own basically.'*

The participants also felt that there was lacking a sense of community and very little opportunity to socialise within the residential estate. Helen, 72 years old, spoke of the lack of social interactions with her neighbours as she stated *'I'm not used to this type of... not socialising and things. I'm the type of person... I've always said to (name), give me a ring. With (name), her son lives next door. She doesn't, because he's got cerebral palsy. But I've always been that kind of person. I miss that contact with people, when I'm up here a lot'*. The lack of social interaction means that much of the PA they do is carried out alone.

The respondents also reported a difficulty in settling into the new social environment when relocating to the residential estate. Many challenges discussed were due to 'cliques' that had formed within social groups, which made it difficult for new members to integrate themselves into the social environment. Rather than feeling inviting, the 'cliques' tend to make the environment uncomfortable and made the participants feel as if they were being judged. This was evident during a conversation with Roy, 72 years old:

Interviewer: Do you go up there?

Roy, 72 years old: No, I was. The women...there's certain ones there, they're watching everything... he shouldn't be in here, or... there was one person going around there with his girlfriend and it's like eyes on people, looking down at you..... You don't really want to go there. I have to be honest, it was alright when I was going there, but I used to walk in there and I was the only bloke in there. It's too much.

Interviewer: Not a nice environment to be in?

Roy, 72 years old: No, it's not, not at all. There is a bit of a clique there you see.

This discomfort experienced at social environments made them less appealing to the participants, who, in future, were more likely to isolate themselves from participating in such events. Although participants often expressed the desire to socialise more with other residents, they found they don't interact with anyone within their local environment. Diane, 69 years old, stated *'I said to her (new resident), they're not social up here. You don't see a soul'*. One

participant voiced how she would rather keep to herself rather than socialise with others. Anne, 89 years old, stated *'I'm a very private person, I don't like to be mixing with all sorts'*.

4.3.2.2. *Partner/group activity*

Another interpersonal theme identified was partner/group activity. For example, having someone to walk with offered company as well as safety whilst being physically active. Anne, 89 years old, stated *'I'm more safe with that, I'm alright if I've got to use that with (her son) or whoever's with me'*. Having someone to walk with offered the participant safety as she could use her partner for support as she walks. Another participant spoke about being more interested in walking if she was a member of a walking group. Helen, 72 years old, mentioned *'If I belong to a club and they walk just to walk I would do that'*. Walking was more appealing to her when being member of a group. Being part of a group offered camaraderie and social interaction, which were valued by the participants. The social components of the activity add to the experience and was often a major influencer of their decision to engage in PA.

In contrast, participant Roy, 72 years old, mentioned how he would avoid group physical activities. He feels seeing other individuals with physical disabilities is a reminder of how he has deteriorated as he has become older. This is something he would rather avoid. He explained *'it would depress me...you know, it would depress me...yes, because it reminds me of me...it reminds me of myself'*. Watching others who have physical issues like himself only reminds him what physical changes he has experienced, which has a negative impact on his psychological reaction to the PA. This effect of group activity must be considered and adapting activities, which emphasise what the ageing body can do, rather than can't do, may be best suited for older adults.

4.3.2.3. *Encouragement from others*

The final interpersonal theme identified was encouragement from others. Participants found it beneficial to have support to be physically active from people with whom they had a meaningful relationship. For example, being encouraged by their family members to exercise. Anne, 89 years old, mentioned how her son encourages her to use an exercise bike that he bought her, for her to use at home. The participant explained *'(Name of son) always says, 'And get on that', he says, which he says to me, which is right ...'*. The participant is regularly encouraged to be physically active by the people around her.

4.3.2.4. *Being accepted*

The participants also mentioned the positive feelings when being accepted into social groups by others. Anne, 89 years old, spoke of her experience of being accepted into a new social group *'There'll be another coffee morning, it's every Monday morning see, coffee morning, and I enjoy that. I like, they've got used to me now so they always ask if Anne is coming or where's Anne and I enjoy that, like Vera said, 'They've accepted you now', and another lady that she's friendly with but I like it down there, they're nice people'*. These interactions and experiences are of high value to the participants.

Being part of a social environment was meaningful to the participants but introducing themselves to new residents isn't an easy experience. Participants found it difficult to enter the new social environment. Mary, 84 years old, was asked how she would feel joining a new, unfamiliar social environment; she responded *'I'd feel strange. If there was just one face you know, just one, that's that door opened'*. Having someone you already know within the group made it more appealing to join. This concern was repeated by Anne, 89 years old, who was asked what would make her feel comfortable in a new environment, responded *'I don't know. Well, for a start I suppose if I went down with somebody I really knew. Like if Lee said to me, 'I'm thinking of going down there'. I might ask her one day'*. A familiar face eased the discomfort experienced when entering a new social environment, something that may need to be considered when organising group exercise for older adults.

4.3.3. Environmental factors

4.3.3.1. *A safe walking environment*

The participants felt that the physical environment was unsuitable for walking as a means of transport and/or PA. The participants frequently mentioned aspects of the physical environment, such as the steep hills within the area, being a problem. The difficult terrain made it difficult to walk and increased the likelihood of falling. Roy, 72 years old, was asked about one of the hills during the photo elicitation task and responded *'that is a difficult one that is, it is a steep one. I would be a bit, I don't know what to say...a bit apprehensive. If I was going to go down there I would take my car'*. The opportunity to be physically active in his daily activities was impacted by the perception of an unsafe environment. Likewise, participant Belle, 88 years old, spoke of a negative experience when walking on the hills in the surrounding area, explaining *'You see, so if you go downhill, it's that feeling, "I'm going to fall forward" which I have done, and broke my nose and things like that'*. The steepness of the hills causes the participants difficulty and increases the risk of falling. The photo elicitation task also

highlighted some problems with the pavement quality within the area. Damaged pavements increase the risk of falling by reducing stability underfoot. Roy, 72 years old, explained ‘*well I think that sort of thing there is an issue for anybody (broken concrete). I think anybody could twist their ankle if they stepped off something like that. You know*’.

With physical limitations and a fear of falling being key barriers to PA, it was important that the environment was suitable for the needs of the participants. This included handrails, areas to stop and rest and appropriate facilities for people with a disability, all offering a safer PA environment to the residents. In the photo elicitation task within the interviews, a conversation with Roy, 72 years old, identified areas to rest as important features when walking around the local environment:

Interviewer: again, what about these, how would you feel walking down here?

Roy, 72 years old: not too bad, as long as I could stop and rest.

Interviewer: is that important?

Roy, 72 years old: oh yes, I have to stop. I have to stop and rest.

Ian, 74 years old, was also asked ‘*You're pretty happy with the walking location?*’ he responded ‘*Oh yeah. It's not much of a hill around the back here, and in the middle they got long bars, so for anyone who thought it was a little bit, it's not, but if they did, they can hold on*’. The participant identified the benefits of having handrails placed where hills are slightly steeper. This was supported by Belle, 88 years old, who said ‘*Yeah, because they're going to have a lovely walk around there, aren't they? That'll be great, because I did say at the meeting that they need a barrier that they can, or a... well, it would have to be a barrier, wouldn't it, for them to hold onto if they wanted a rest*’. Adapting the physical environment to suit the safety requirements of the participants was necessary for them to feel comfortable walking as a method of PA.

Fear of crime and safety was another environmental barrier reported within the interviews. The participants spoke of recent crime within the area. Helen, 72 years old, explained ‘*I think it's the climate now. People are frightened of other people. I'm telling you, I've got a bit wary, because my friend lives over in (near location) and some woman tried to break in to her house a fortnight ago and her husband chased them off in the early hours of the morning with a baseball bat. There were three of them. It's unnerved me terrible*’. Many of the participants

accumulate walking as their main source of PA, but previous crime can cause the residents to feel uneasy and discourage them from walking within the local environment.

4.3.3.2. *Daytime and seasonal activities*

Poor weather conditions were also identified as a barrier to PA identified on the environmental level of the SEM. Extreme conditions of different weather, such as rain, hot and cold temperatures were all environmental factors that were barriers to PA. Helen, 72 years old, spoke of how extremely warm temperatures stopped her from being active in the outdoors, she explained *'I like to keep the garden nice. I do like reading. I like walking a bit. I haven't done as much lately, I must be honest, because of the heat'*. Ian, 74 years old, also spoke of the problem experienced with the intense heat, *'So now because of the sun and all of course, I've hardly been out. Miles too hot'*.

Participants also highlighted the time of day and visibility as environmental barriers to PA. As many of the participants would likely take part in outdoor PA, such as walking and gardening, participation in the hours of daylight were preferred and it was unlikely that people would be physically active in the evening hours. Barbara, 78 years old, stated, *'older people don't go out after dark'*. Helen, 72 years old, also described how she would walk more in nice weather conditions, but that it is more challenging to be physically active in winter, when the daylight is shorter and there are not many exercise opportunities in the surrounding area. She explained *'Well, I used to go afternoon, or I've gone to an evening. But I think when the dark nights are here, people don't do classes in the evening. I think if it's sunny, it's fine'*. Once daylight falls, outdoor PA participation is unlikely, which may result in decreased PA levels in the winter months.

4.3.3.3. *Access to meaningful activities*

In this study, the participants mentioned the lack of meaningful activities available to them. For example, gardening was an activity that was favoured by many of the participants, although they explained how the surrounding area offered little opportunity to participate in gardening activities. This was evident in the statement by Helen, 72 years old, who spoke of her poor-quality garden, stating *'I hate the garden because you can't grow anything up here'*. Another available opportunity for a range of social and exercise opportunities was the local community centre. Visiting this centre not only offers both social and physical activities but it is within walking distance for many of the residents, therefore frequent visits can facilitate increased PA levels. However, several of the residents felt that the aesthetics of the community centre made

it an unpleasant place to be, therefore they would visit very infrequently. Belle, 88 years old, explained:

‘Well, I went over there the other day for something or other it was, I can’t remember. I never go over there because it’s depressing. It’s just nothing nice. It used to be lovely over there, but they’ve got rid of stuff and it’s just shoddy to me and it’s overcrowded with this (unclear 00.25.06) and bits there and something else there. It’s not a nice opening when you walk in’.

4.3.3.4. Pleasant walking environment

The participants identified a pleasant walking environment as a key source of enjoyment in PA. PA became more enjoyable when conducted within pleasant scenery and/or new walking environments, such as visiting new places. Helen, 72 years old, discussed a recent experience when walking round the local environment. She explained *‘There was a notice at the gardens of Derwen saying there’s a lot of pretty gardens. Some of them are, mind, I’ve got to be fair, some of them... I had a good look at things yesterday as I was walking up. I should walk around here more really, but I usually walk down the hill. I’m trying to get back walking more. I’m quite enjoying it. I thought, I must walk up here a bit more and see what they’re doing’.* Walking in aesthetically pleasing environments increased enjoyment in PA. Participants also spoke of increased PA when visiting new places. Seeing new environments was an enjoyable experience and encouraged more walking. Diane, 69 years old, explained how her and her husband walk a lot more when on holiday, visiting new places, *‘Go out in the evening. And usually walk, we always walk on holiday. We do a lot of walking on holiday’.*

4.3.4. Organisational factors

4.3.4.1. Organisation and resident relationship

The participants highlighted the organisation and resident relationship within the interviews. The residents felt that the poor relationship between the two made it difficult to get the support needed to improve their health and well-being. Belle, 88 years old, explained how she rarely interacts with anyone from the housing organisation, therefore doesn’t feel she has the support to help her with any problems. She mentioned *‘We don’t see a soul, not from Derwen. Nobody from the off’.* She continued to explain how although there is some contact from a member of the organisation it is not enough to be constructive. She explained *‘We’ve got one lady coming here, there’s a group of three, she’s supposed to come around and anything wrong, tell her. But you only see her, if you see her maybe an hour a week. Well, that’s no good, is it?’.* Several

participants felt that the lack of communication with the organisation made it difficult when trying to get their voices heard.

4.3.4.2. *Promotion*

Organisational factors that were identified to have a positive influence on PA were promotion, affordable activities, organised activity and appropriate facilities for older adults.

Participants felt that opportunities in the surrounding area could be better promoted to the residents. Being better informed of what was going around them would increase participation in surrounding activities. Effective ways to promote PA were identified as leaflet dropping and accessible notice boards. Belle, 88 years old, mentioned '*I noticed they had a big notice board, Monday to Friday, and 10 to 12, I'm guessing times now, walk in. Then half past one to half past three, was bingo on a Monday, and I think there was something in the evening, and they had a notice board with times of what was going on all through the week. I think that's a good idea, a notice board, with all the activities that are happening, or forthcoming*'. Ian, 74 years old, also spoke of the importance of leaflet dropping for covering large areas, when asked about the best way to promote upcoming activities:

'Leaflet dropping. It's the only way really. Because as long as you've got people leaflet dropping and not going to stick them down a drain halfway down the road, you can cover quite a big area. Don't forget The Gaer is quite big mind.'

4.3.4.3. *Affordable activities*

Organised activities which are affordable to the participants were also discussed within the interviews. Organised activities included exercise instruction and transport to and from the activity location. Exercise classes with instructors were preferred as they have more structure and can add features such as 'exercise to music'. One of the participants also explained how many of the residents had 'given up' driving, so that if she doesn't attend some events, it makes it difficult for others too also, as she drives them to the exercise class. Therefore, she suggested that arranged transport may be needed to and from activity locations:

Barbara, 78 years old: No. A lot of people over seventy have given up. I know four people here because I run them round, like I'm one of the seventy. But I take them because they wouldn't go out otherwise and I'm still doing it.

Interviewer: So, you think if there was transport arranged to and from, that would be a good start.

Barbara, 78 years old: It would be a help I suppose yes.

4.3.4.4. *Adaptable physical activity*

Participants reported several barriers to organised physical activities, such as physical limitations which inhibited them from taking part, and the responsibility of caring for a partner. Several participants spoke of their responsibility to care for a spouse who needed extra support as they were suffering from ill health. Having to attend to the needs of a spouse inhibited the participants' ability to attend exercise classes held within the estate. Helen, 72 years old, spoke of the issues she has attending a class that she enjoys *'I said, I won't be coming every week, because I do go to my husband normally on a Monday. It's a very awkward time half past three for me, because they don't usually get him downstairs till about half ten. It would be a big rush for me to get out there and to come back and then get up there. But I definitely won't be going every Monday I don't think because of (husband).'*

Participants mentioned unsuitable activities being provided within the local area. Previous experiences taking part in exercise classes led to their discontinuation. One participant felt they could not keep up with the rest of the class, therefore decided to withdraw from the exercise sessions. Barbara, 78 years old, explained *'Yes, I tried yoga once and it was okay in the beginning and then they sort of speeded it all up the year after, so I had to back out because I was sat out because I couldn't do half of what they were doing you know, because it was too much'*. Belle, 88 years old, also explained how problems with her mobility make it difficult to participate in exercise classes, stating *'If I got on the floor, I can't get up. Somebody has got to pick me up, see.'*

Due to the range of physical limitations that were evident within the residential estate, participants acknowledged the need for adapting activities to cater for all individuals. Physical disabilities meant that exercise classes that can be done seated as well as standing may be suitable to encourage greater uptake in classes. Belle, 88 years old, spoke about the benefits of having adaptable exercise classes, to cater for a range of physical abilities. She explained:

'Yeah, yes. Well, we have these extend classes here and those who couldn't do it could sit down and do it. You see, with extend you can sit down and do it as well, they had exercises for that sort of thing you see.'

4.3.5. Interactions between multiple levels

It was also evident within the qualitative interviews that there were interactions occurring between influencers at different levels of the SEM. For example, intrapersonal level factors,

such as physical limitations, can be influenced by providing adaptable forms of PA which was identified as an influencer on an organisational level. A conversation with Gavin, 77 years old, highlighted the benefits of having opportunities to engage in exercise classes, which allowed him to take part irrespective of his physical limitations. He explained *'Well we got a guy comes in, he does exercise for them, and we do it sat in a chair. Everybody sits in a chair, and he does the exercises, People enjoy that, yeah. Because they're at an age where that's suitable'*.

Another example evident within the interviews was interactions between intrapersonal and environmental factors. Participants often mentioned accumulating PA through in-direct means, such as going shopping or doing household chores such as gardening etc. Poor weather conditions would inhibit the participants ability to engage in PA through an in-direct means as they would opt to use public transport or not take part in general daily PA. Often, these PA behaviours would be replaced by more sedentary activities within the home, such as watching TV. Ian, 74 years old, explained that the temperature in the summer results in leaving the house very infrequently. He explained *'So now because of the sun and all of course, I've hardly been out'*. Helen, 72 years old, also explained *'I like to keep the garden nice. I like walking a bit. I haven't done as much lately, I must be honest, because of the heat'*. Therefore, when designing intervention strategies, it is important to consider the interactions between different levels of the SEM. As targeting one influencer of PA may have an impact on other influencers within different levels of the model.

4.4. Discussion

The current study aimed to (i) gain understanding of the barriers to, and facilitators of, PA in older adults living in a residential community, (ii) map these findings onto the SEM and (iii) provide recommendations for a multi-level PA intervention strategy to be implemented within an older adults' residential community. The current literature suggests that multi-level interventions that target intrapersonal, interpersonal, environmental, and organisational influencers of PA may be best suited for encouraging long-term behaviour change amongst inactive groups within a larger population (Zubala et al., 2017). Qualitative methods were used to explore individuals' lived experiences, highlight key barriers to, and facilitators of, PA and identify potential strategies to encourage PA behaviour in older adults. The findings identified several key barriers to, and facilitators of, PA within the different levels of the SEM, highlighting several potential intervention strategies. It is important to acknowledge that different theoretical lenses may influence the findings from qualitative data in different ways. The findings of this study are relative to the individuals being researched and their context. It

is not clear if the intervention strategies identified within the present study would generalise to all older adults, and other contextual factors may need to be considered. Previous studies have been successful at implementing multi-level PA interventions in older adults (Rosenberg et al., 2012) and from the data it is clear that barriers and facilitators exist at all levels. Below, the factors identified at each level of the SEM are discussed and potential strategies are identified for intervention. Although each level will be discussed individually, it is important to recognise the dynamic, multidirectional relationship between different levels of the SEM (Stokols, Translating social ecological theory into guidelines for community health promotion, 1996), therefore there will be some overlap between levels within this chapter.

The first level of discussion within the SEM is the intrapersonal level. This level included factors such as physical and psychological limitations, awareness of PA benefits, understanding of how to be physically active, enjoyment, self-controlled activity, and PA through indirect means. Physical barriers included pain, injury, age-related physical deterioration, vision problems and the loss of physical functioning, which supports findings from previous research (Boulton et al., 2018; Buman et al., 2010; Costello et al., 2011; Schutzer & Graves, 2004). These physical barriers not only presented direct physical limitations but also resulted in psychological barriers, such as fear of falling and a decline in confidence. These negative associations with PA can result in total avoidance of the behaviour. Previous research has also identified fear of pain or causing damage when participating in PA (kinesiophobia) is significantly associated with lower PA levels in older adults (Larsson et al., 2016). Within the present study, the participants had a range of physical and psychological limitations that inhibited their ability to be physically active. This supports the findings from Brawley et al. (2003) who suggest that tailoring programmes to address the limitations of the individual is necessary for promoting PA in older adults. Zubala et al. (2017) also highlight the importance of tailoring interventions to participants' needs, stating this to be an 'important element' of successful PA programmes. This study took a person-centred approach by exploring influencers of PA within a group of older adults living within a residential community, therefore intervention strategies can be tailored to suit the needs of the individuals within this context. By allowing the participants share their personal experiences of PA, BCTs employed within the intervention will be more likely to meet the personal needs of the target individuals.

Lack of understanding was also another individual barrier identified within the individual level. Participants had little understanding on 'how much' or 'what types' of PA they should be doing. PA types were also linked to the physical limitations of the individual, such as not

knowing what form of PA is safe to do with their current physical disabilities. Larsson et al. (2016) suggest that increasing understanding of how to carry out PA safely and effectively may be an effective strategy for PA interventions for older adults with physical and psychological limitations, such as pain and fear. By increasing knowledge and understanding of PA that is suitable for the individual's needs, interventions may be more effective at encouraging PA behaviours in older adults. This is supported by Arnautovska et al. (2017), who suggest increasing knowledge and understanding of PA as a key BCT for interventions targeting older adults. Previous interventions have used information leaflets providing tailored information to enhance knowledge and understanding on PA (Zubala et al., 2017). The participants within this study also identified leaflet dropping as an effective way to promote PA within the area. Therefore, providing leaflets that can enhance participants knowledge and understanding of suitable PA types and volumes may be an effective intervention strategy to be incorporated within the residential estate.

On an intrapersonal level, many participants identified participating in PA through indirect means, such as when walking to a social event, or carrying out household tasks. This is supported by a review by McGowan et al. (2017), who suggest that PA is thought of as a by-product of other more meaningful activities for older adults, such as social activities. Therefore, encouraging more meaningful day-to-day activities may encourage older adults to accumulate greater PA levels through an indirect means. Enjoyment was also a key reason for PA participation within the residents. Devereux-Fitzgerald et al. (2016) state that older adults will be more interested in participating in PA that is more intrinsically enjoyable, therefore promoting enjoyment in PA rather than its health benefits may be more effective at increasing uptake of physical activities. This study suggests that whether it is enjoyment in PA itself, or enjoyment in an alternative activity that can encourage PA through indirect means, encouraging enjoyment is an important intrapersonal factor to consider when designing PA intervention strategies for older adults.

The present study identified PA was more enjoyable for older adults when they could participate at a time and intensity that suited their capabilities and daily schedule, making it difficult to take part in organised exercise classes as a form of PA. The older adults preferred lower intensity forms of PA, as it was more enjoyable for them. This is supported by Resnick & Spellbring (2000) who suggest lower intensity exercise (a structured form of PA) is more enjoyable and preferred by older adults. Although, increasing engagement in lower intensity PA may not enable the same health benefits as moderate intensity PA. However, a systematic

review by Tse et al. (2015) state that lower intensity PA still has both physical and psychological benefits for older adults, whilst having better compliance and greater sustainability. Therefore, by developing flexible interventions that allow older adults to take part in PA how, and when, it best suits them may encourage more enjoyment, thus supporting long-term PA behaviour change in older adults.

On an interpersonal level of the SEM, several factors were identified, such as relationships, being accepted, group activity, social interactions, and encouragement from others. Group activities allow for social interactions, assist in building meaningful relationships, and increase enjoyment in physical activities (Costello et al., 2011; Hardy & Grogan, 2009; Stathi et al., 2012). Boulton et al. (2018) also highlighted the importance of having a key individual to welcome new individuals to group activities. This was also evident in the present study, as participants found it hard to break into new groups and found that it was easier when they knew someone who was already part of the group. This study also highlights the challenges that face scheduling group activity sessions, as participants noted that attending a class on a regular basis may be difficult due to physical limitations, preference for PA on their own time and other commitments, such as looking after a spouse. Interventions may need to consider such challenges and allow older adults to be more flexible in their approach to PA participation. Our findings suggest that being able to incorporate PA behaviour into their daily life, such as walking as a means of transport or accumulating PA through indirect means, may be more suitable than a more structured intervention approach. The present study also identified another consideration that must be made when scheduling group PA for older adults. The present study identified how older adults can encounter negative vicarious experiences when being physically active, as it can act as a reminder of the difficulties they face in old age, such as their age-related physical limitations. These resulted in a negative emotional response to group PA. Future research may want to explore the impact these negative experiences can have on the PA participation of older adults.

Environmental level factors related to PA participation in older adults included a safe and pleasant walking environment, daylight and weather, seasons, and accessibility to meaningful activities. Walking outdoors was often a chosen form of PA by the residents, whether it was for exercise or a by-product of another activity, such as walking to a social event. This suggests that PA levels will be seasonal and decrease in winter months, when daylight is reduced, and poor weather conditions are more frequent. This has previously been shown to decrease engagement in PA in older adults (Conn, 1998; Belza et al., 2004; Stathi et al., 2012). Walking

outdoors was also dependant on the older adult feeling safe from crime within the area and if the physical environment was suitable to their walking needs, such as pavement quality and areas to rest. Being able to feel safe when walking in the environment, along with being in pleasant and aesthetically pleasing surroundings contributed towards an enjoyable PA experience. PA interventions may need to consider the safety of PA environments of older adults and how they can create enjoyable indoor activities to cater for the potential decreased PA levels during winter months (Nakashima et al., 2019).

At an organisational level, the present study identified the provision of adaptable, affordable, and effectively promoted activities. These findings are in line with previous research on organisational factors that influence PA in older adults (Boulton et al., 2018). Due to the variability in the physical, psychological, and environmental barriers to PA that older adults face, activities may have to be easily adapted to suit the individual needs of older adults, supporting the claims by Zubala et al. (2017) that PA interventions need to be tailored to the specificity of older adults' individual needs. The need for effective promotion was also highlighted within the present study, with participants supporting leaflet dropping and noticeboards as effective promotional tools. As previous research supports that many older adults engage in PA for enjoyment (Hardy & Grogan, 2009; Baert et al., 2011; Buman et al., 2010), rather than the health benefits it provides, then organisations may want to consider effectively promoting the enjoyable aspect of PA rather than the health benefits that it provides.

Finally, the participants highlighted the need for a stronger relationship between the organisation and residents, whereby greater communication can allow residents to report their issues to the members of the organisation. Thus, allowing the organisation to provide support to the needs of the individual. Brawley et al. (2003) suggest that interventions can use a collaborative approach whereby problems and corresponding solutions can be discussed between the participant and the interventionist to allow the programme to be tailored to suit the complex needs of individuals. This is supported within this study, which indicates that a stronger relationship between residents, and organisations responsible for their health and well-being, may be necessary if interventions are to be successful in addressing personal barriers to PA.

SEMs not only include a broad range of influencers from within different levels, but also recognise the importance of the dynamic, multi-directional interactions between people and their physical, social, and political environments (Stokols, 1996). Within the present study,

there were several interactions between different levels of the SEM evident within the data. For example, enjoyment in PA was a key intrapersonal influencer of PA in the participants. Feelings of enjoyment were often facilitated by intrapersonal and environmental factors, such as social interactions and a pleasant walking environment. Previous research has found that enjoyment in PA has been positively associated with engagement in objectively measured PA (Schwaneberg et al., 2017). By addressing older adults social and environmental influencers of PA, we may also facilitate greater enjoyment and further encourage engagement in PA behaviours. Within the data, it was also highlighted that partner/group activities were interpersonal influencers of PA participation, which has been highlighted within previous research (Bethancourt et al., 2014; Boulton et al., 2018). Although, the present study highlights how group activity can also have a negative impact on motivation for PA, through interactions with intrapersonal influencers. One participant spoke of how seeing other older adults try to be physically active whilst dealing with physical limitations only reminded him of the physical decline he had experienced in old age, resulting in negative emotions being triggered. Therefore, whilst group physical activities are appealing to some older adults, interactions between these interpersonal influencers and intrapersonal influencers must be considered when designing PA interventions for older adults. The multilevel influencers of PA identified within this study are presented in Figure 7. The figure illustrates four levels of influencers of PA engagement in the older adults within this residential estate, highlighting several factors that influence PA behaviour on all four levels. It is important for public health and policymakers to consider that factors at each level have dynamic, multi-level influencers, that can interact with other influencers on different levels.

4.5. Limitations

First, a limitation to the present study is the demographic profile of the participants. The participants were predominantly Caucasian and heterosexual, and female. This is due to the study being reliant on volunteers, therefore the researcher had little control over the demographic characteristics of the volunteers taking part. Therefore, samples with a larger proportion of people from different ethnic backgrounds and sexual orientations may identify different barriers and facilitators. The sample size in the present study is a reflection of the demographic of individuals living within the residential estate where the data was collected, so generalisation of the findings should be approached with caution. Although, researchers may want to adopt the methodological approach used within this study within other contexts for more context specific findings.

Another limitation of the study can be found within the methodological approaches used. Individual interviews were used to gain information from participants. However, some barriers to, and facilitators of, PA are difficult to recall within this setting as they are experienced sub-consciously. The photo elicitation task was used to take individuals on a PA experience, which enabled some participants to recall barriers and facilitators which they were unable to through conversations. This data collection method prompted memory and stimulated conversation within the interviews, resulting in deep conversation about PA experiences. Nevertheless, some experiences may be repressed into the unconscious mind, especially if they are painful or uncomfortable experiences. This may be more likely in older adults who have negative experiences in relation to PA. These experiences and memories may be stored in a less accessible area of the mind and other qualitative approaches may be needed if they are going to be accessed (Meek, 2003). Observational techniques may be effective at identifying barriers and facilitators to PA that older adults may not be consciously aware of.

4.6. Recommendations

The findings from the present study identify several barriers to, and facilitators of, PA in older adults at intrapersonal, interpersonal, environmental, and organisational levels of the SEM. Healthcare programmes and organisations which aim to improve the health and well-being of older adults by increasing daily PA may want to consider intervening at multiple levels to maximise the effectiveness of the programme. Within the discussion, several strategies were identified for organisations to intervene at each level of the SEM, such as improving knowledge and understanding (intrapersonal), encouraging social PA (interpersonal), adapting physical environment to suit the needs and wants of older adults (environmental) and providing affordable and adaptable PA options (organisational). Future research looking to further develop our understanding of barriers to, and facilitators of, PA in older adults may want to employ a combination of other qualitative data collection methods as shown within the present study. The addition of the photo elicitation task during data collection triggered responses within the participants that may not have been otherwise addressed within the interview sessions. Observational methods may also allow researchers to identify barriers and facilitators which participants are not consciously aware of. Finally, future interventions studies can use the findings of the present study to design multi-level interventions for increasing PA in older adults.

4.7. Conclusion

The present study has used multiple qualitative methods to enhance our understanding of the barriers to, and facilitators of, PA in older adults. The theoretical framework of the SEM was used to interpret these barriers and facilitators, which can then be used by health-care systems, organisations interested in the health and well-being of older adults and researchers looking to develop PA interventions for older adults. Programmes and interventions targeting PA in older adults should aim to address factors on multiple levels of the SEM, which may enhance its effectiveness through a more holistic approach. We have also provided practical recommendations as to which strategies may be more effective in targeting some of the factors identified within the interviews in relation to previous research, such as improving knowledge and understanding of PA in individuals, promoting enjoyment, catering for environmental needs and wants of older adults, and ensuring a range of affordable and adaptable PA opportunities, which can be tailored to address individuals' needs.

It is worth considering that barriers and facilitators may vary in type and significance between individuals and contexts, therefore health-care systems, organisations, and researchers may want to employ the methodological approach used within this study to identify barriers and facilitators within other groups of individuals, resulting in a more person-centred approach to intervention design.

4.8. Chapter summary

This study used a person-centred approach to develop an understanding of the influencers of PA on multiple levels of the social ecological model. The findings of the study identified multiple influencers of PA on intrapersonal, interpersonal, environmental and organisation levels. The findings from the present study will be used to inform the design of the intervention to be implemented within the next study. Below, Table 3 displays a clear outline of the influencers of PA that are being addressed within the intervention, the BCT used, and its corresponding intervention component that will be incorporated.

Table 3*Intervention components tailored to address the needs of the targeted older adults.*

Intervention component	Influencers of PA addressed	BCT
Bi-weekly check-ins	Encouragement from others (interpersonal). Organisation and resident relationship (organisational)	Review of behaviour goals. Discrepancy between current behaviour and goals. Review outcome goals. Feedback on outcome behaviours. Information from credible source.
Information leaflets	Understanding of what to do and how to do it, Awareness of PA benefits (intrapersonal), Promotion of PA (organisational).	Instruction on how to perform the behaviour. Information about health consequences.
Self-monitoring via pedometer and step tracking booklet.	Understanding of what to do and how to do it, At my own pace and in my own time (intrapersonal)	Self-monitoring of behaviour. Prompts/cues. Goal setting (behaviour).
Pull up banners of walking routes within the area.	Understanding of what to do and how to do it. Enjoyment (intrapersonal). Pleasant walking environment (Environmental). Promotion of PA (organisational).	Instruction on how to perform behaviour. Prompt/cues.
Walking based intervention	Enjoyment, In my own pace and at my own time, Activity through in-direct means (intrapersonal). Accessibility to meaningful activities, Safe walking environment, pleasant walking environment (environmental). Affordable PA (organisational)	N/A
Free access to tools and information	Affordable PA. Promotion of PA. Organisation and resident relationship (organisational).	N/A

Note. Intervention strategy to be implemented within study 2.

5. Assessing the implementation of a person-centred, multi-level PA intervention designed to improve physical activity, health related quality of life, loneliness, self-efficacy and outcome expectations in older adults within a residential community

This chapter will use the findings from study 1 to design the PA intervention implemented within the residential estate. This person-centred approach allowed for the intervention components to address the personal needs of the targeted individuals. The implementation strategy will also be assessed using a mixed-methods approach.

5.1. Introduction

It is estimated that the worldwide number of older adults is expected to double from 11% to 22% of the population between the years of 2015 and 2050 (WHO, 2015). Research has identified that old age is associated with an increased risk of non-communicable chronic diseases, such as type 2 diabetes and some cancers, and with a decline in physical and cognitive functioning (Jaul & Barron, 2017). As well as the physiological changes that may occur during the ageing process, the risk of feeling lonely and being socially isolated also increases substantially (Valtorta & Hanratty, 2012; Jylha, 2010; Cornwall & Waite, 2009), which has been described by researchers to be as harmful as smoking 15 cigarettes per day (Holt-Lustad et al., 2010; Steptoe et al., 2013). Increased levels of PA have been shown to have considerable benefits for physical and mental health, and can prevent the onset of chronic disease (de Souto Barreto, 2009; Paterson & Warburton, 2010; WHO, 2010). PA also provides individuals with the opportunity to build valuable social relationships, through group participation and the maintenance of physical function (Jopling, 2015). Therefore, it is a public health priority to encourage members of the public to live an active lifestyle, improve health and well-being and reduce the financial burden on national health systems that is expected to increase with the ageing population (Public Health England, 2016).

Successful health programmes are based on understanding health behaviours and their context. Thus, a socio-ecological approach can be used to understand health behaviours, such as PA, and the multi-level factors that impact them. The socio-ecological model (SEM; Sallis et al., 2008) focuses on an individual, and how they interact with influencing social and environmental factors. In order to design effective programmes aiming to increase PA, we must first understand the health behaviours of the targeted individual and the context in which they

interact (Glanz et al., 2002). The SEM suggests that to effectively change health behaviours, we must address the influencers at multiple levels (i.e., intrapersonal, interpersonal, organisational, environmental, public policy).

Residential communities provide an ideal setting for the implementation of a multi-level intervention as they are generally a site where many of the targeted individuals are located within close proximity (Whitney et al., 2017; Jancey et al., 2017). Kerr et al. (2018) implemented a multi-level intervention with 307 older adults (aged 65+ years) that employed techniques from the social cognitive theory (SCT; Bandura, 2004) and aimed to intervene at multiple levels of the SEM. Intervention components included counselling phone calls and goal-setting (intrapersonal), along with group walks and education sessions (interpersonal). The intervention also included pedestrian advocated improvements in walkability (community/environmental level). There were significant improvements in objective measures of PA and resting blood pressure at 6 months and 12 months, respectively. The participants also showed improved physical functioning, although these changes were not significant. This study supports the use of multi-level interventions to increase PA in older people. However, the study was carried out in San Diego, which has a temperate climate where PA may be less likely to be impacted by changes in weather when compared with areas with more inclement and often unpleasant weather, which has been shown to negatively impact the PA participation of older adults (Aspvik et al., 2018), reiterating the importance of context specific intervention design.

In order to encourage older adults to be more physically active in later life, research has sought to develop effective and sustainable ways to encourage long-term participation in PA for older adults within a range of health, social care and community settings. However, implementing PA interventions within real world contexts can be challenging (Estabrooks et al., 2011). This is due to the social-ecological differences between conducting a PA intervention under optimal or controlled conditions, and in real world contexts where multi-level factors such as the surrounding physical environment, resources, setting, and personal characteristics of participants are much more variable (Chaudoir et al., 2013). Due to the variety of barriers to, and facilitators of, PA older adults experience, as highlighted within study 1, PA interventions should be adaptable to meet the needs of older adults (Zubala et al., 2017). Likewise, as needs may change in relation to the settings in which older adults are situated, interventions need to be suitable for implementation in a range of health, social care and community settings.

A person-centered approach requires involvement from all parties concerned when making decisions and it is suggested that this approach is most suitable when designing health promoting activities (Ekman et al., 2011). A person-centred approach to PA intervention design can allow for interventions to be developed to meet the needs of older adults. By including individuals in the design of PA interventions, more appropriate intervention designs may be developed. Individualised interventions have previously shown positive effects in behaviour change interventions aimed at increasing PA behaviour (Noar et al., 2007; Patterson et al., 2007; Tang et al., 2014). By including targeted older adults in the design of interventions, we may more effectively tailor intervention strategies to participants' needs, and better influence PA behaviours (Zubala et al., 2017). Study 1 used qualitative methods to identify influencers of PA within several levels of the SEM, which was used to design the multi-level intervention strategy implemented within this study.

Ageing, health status, PA, and disability all affect quality of life in older adults (Pedersen & Saltin, 2006; Paterson et al., 2007; Svantesson et al., 2015). Quality of life relates to an individual's perception of their current position in life, within its current context and is influenced by the individual's physical and mental health, level of independence and social relationships (Orley & Kuyken, 1994). Health-related quality of life (HRQOL) can be defined as how well an individual functions in life and their perceived wellbeing in physical, mental, and social domains of health (Hays, 2010). Assessing HRQOL has become an important component of healthcare assessment (Coons et al., 2000). The SF-36 questionnaire has been shown to be a valid and reliable tool for the measurement of HRQOL in older adults. Previous research has shown strong associations between higher levels of PA and all dimensions of HRQOL in older adults (Halaweha et al., 2015). Therefore, increasing levels of PA in later life may contribute to higher levels of HRQOL in older adults.

Lack of quality social relationships can have a negative impact on mental health, quality of life and lead to feelings of loneliness (Masi et al., 2011; Netz et al., 2005). UK statistics estimate rates of loneliness in older adults to be between 6% and 22% (Office for National Statistics, 2015). This number is alarming as loneliness can result in a range of physical and mental health problems (Jaremka et al., 2014; Penninx et al., 1997). Previous research shows that PA programmes can contribute to a reduction in feelings of loneliness, with social support within the context of PA being a key moderator for this relationship (McAuley et al., 2000). A systematic review by Pels and Kleinert (2016) identified that social support to moderate or to mediate the relationship between PA and loneliness, suggesting that PA can contribute to

decreased feelings of loneliness. However, it is suggested that it is the quality of relationships within the context of PA that contribute to reduced feelings of loneliness. Therefore, future research is needed to explore how these quality relationships can be created within PA programmes. More specifically to older adults Shvedko et al. (2017) explored the effectiveness of PA interventions for reducing feelings of loneliness in older adults and stated that there is limited evidence that effective PA interventions at reducing loneliness in older adults are specific to particular settings, population sub-groups, intensity, amount or types of activity. However, it was suggested that healthcare medical settings and group exercise delivery may be beneficial, particularly for older adults with comorbidities.

Self-efficacy and outcome expectations are central constructs of Social Cognitive Theory (SCT; Bandura, 1977) and are psychosocial determinants of PA behaviour. Interventions to increase PA behaviour can target these constructs as they can be modified through intervention strategies. Self-efficacy relates to an individual's confidence in their ability to perform a given behaviour, even when faced with challenges and obstacles. It is a task-specific construct that influences an individual's efforts to overcome barriers to pursue a certain behaviour (Bandura, 1986). In the context of PA, an individual may consistently pursue exercise sessions, even when they feel tired after a day's work. Outcome expectations are the expected result of a given behaviour (Bandura, 1997), which influence behaviour through incentives, such as enjoyment in the behaviour, or disincentives, such as pain and discomfort when conducting the behaviour. There is a multitude of research that supports self-efficacy as a key determinant of PA behaviour (Keller et al., 1999; Rhodes et al., 1999; McAuley & Blissmer, 2000; Ashford et al., 2010), as well as outcome expectations having a strong relationship with PA participation (Pinto et al., 2001; Brassington et al., 2002; Conn, 1998; Resnick, 2001).

Mixed methods research can be defined as intentionally combining both qualitative and quantitative methods at some stage in the data collection, analysis, or interpretation of a given research study (Creswell & Plano-Clark, 2011) and can provide a unique opportunity to assess the implementation of PA interventions through both quantitative measures and personal experiences of the intervention procedures. The aim of this study was to evaluate the implementation of a person-centred, multi-level PA intervention within a residential estate of older adults using a mixed methods approach.

The current literature suggests that the implementation of effective and sustainable PA interventions needs a greater consistency of reporting and further insight is needed into their

application within real world settings (Harden et al., 2015). The RE-AIM framework has been used to evaluate the implementation of public health interventions, which assesses programmes on their Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) (Estabrooks et al., 2021). These five areas of assessment identify factors influencing the reach of the intervention for the target population, the effectiveness of the intervention on desired outcomes, the adoption of the intervention by setting, staff and organisations, the implementation of the delivery of the intervention as intended, and participant adherence, and the maintenance of intervention effects over time (Estabrooks et al., 2021). The RE-AIM framework has been successfully applied across a wide array of PA related research (Lee et al., 2017) and will be used to evaluate the implementation strategy within the residential estate.

The person-centred, multi-level PA intervention within this study aimed to improve PA behaviour within a group of older adults living within a residential estate. Therefore, this implementation trial looked to assess the implementation of the intervention within this context. The trial quantitatively measured outcomes that the intervention aimed to improve, such as objectively measured PA, health related quality of life, feelings of loneliness, self-efficacy for PA and outcome expectations of PA. Due to a small sample size, caused by the limited pool of residents available, these outcomes were not used to determine effectiveness, but to gain initial insight into the use of these measures with this sample and potential changes that might be suggested in a larger, fully powered trial. Qualitative data was collected with the older residents who took part in the programme and a member of the health and well-being team at the housing association to explore the participants' personal experiences when taking part in the intervention and to gain insight into organisational factors related to its delivery. This enabled deeper insight into the implementation of the person-centred, multi-level intervention, including the strengths and weaknesses of the PA programme. The mixed-methods approach was used to triangulate both quantitative and qualitative forms of data, providing a more well-rounded understanding of the impact of the intervention (Creswell & Plano-Clark, 2011).

5.2. Methods

5.2.1. Study setting and population

The study was approved by the Swansea University College of Engineering Research Ethics Committee on March 16th, 2019 (see Appendix 9.2). All participants had to provide written informed consent before taking part in the study after being provided with the study details, what would be required of them as a participant, what they could expect from the research team and how their data would be used. Participants were also informed that the personal information

they provided would be kept strictly confidential and that any reported data would be given a pseudonym, to ensure anonymity. The participants who volunteered for the study were informed that they would be randomly allocated to an intervention group (received programme – ‘Get Moving’) or a control group (would not receive programme) but were told they would all receive access to the programme once the study had taken place. The control group did not receive any formal intervention components (e.g. bi-weekly check-ins, information leaflets, self-monitoring equipment). However, changes to the environment, such as the addition of benches, would have been accessible to all residents due to the real-world nature of the study.

The ‘Get Moving’ programme was held in Newport, Wales. The site was provided by a housing association for older adults called, at the time of data collection, Derwen, which has since been renamed as Pobl due to a merger with another organisation. Therefore, from this point forward they will be referred to as Pobl. The site was located within the Gaer, Newport. The Gaer is located on the outskirts of the town and features a bus route with a frequently running bus service. The residential estate also has several shops within its proximity. The terrain around the local area includes a number of hills, which makes walking around the surrounding area challenging for the residents. In November 2018, Pobl opened a new housing facility which consisted of 39 new homes (33 two bedroom, 6 one bedroom) and apartments, housing a maximum of 72 residents. Attached to the facility is a communal area (The Curve), which can be used for activities such as exercise classes and social groups. This is available for all residents of Pobl, living both inside and outside the new housing facility.

5.2.2. Recruitment

Contact details of the residents were provided by Pobl and permission to contact residents regarding the study was granted. Recruitment strategies included leaflet dropping, pull-up banners placed within the communal area, telephone calls, door-to-door recruitment and conversations with passing residents when the researcher visited the estate. Participants were expected to fit the eligibility criteria of the study, which meant that they must be 65+ years of age, must be willing to co-operate with the research team for the duration of the study and take part in the proposed data collection methods, be living in accommodation provided by Pobl, must understand English and be able to complete questionnaires provided by the research team, and be able to walk (assisted or unassisted). Participants were excluded from the study if they were currently taking part in another PA intervention, suffered from any physical or psychological conditions that would put them at risk when taking part in the programme, would not share information on issues relating to PA or did not feel they could co-operate with the

research team for the duration of the study. Participants were required to pass a pre-health screening assessment (see Appendix 9.2) before being accepted onto the project. Three participants within the intervention group withdrew from the study after data collection had started due to health complications (2) and the passing of a family member (1). Therefore, recruitment was a continuous process until the intervention was complete. There were 21 volunteers (6 male, 15 female) initially recruited from the surrounding community, with 18 remaining in the study for the full duration (4 male, 14 female). The age range of the remaining 18 participants was 68 to 84 years, with a mean age of 75.4 years. All participants were living independently within the residential estate.

5.2.3. Intervention and control groups

Randomisation methods were used in order to eliminate group allocation bias and produce comparable groups between the intervention and control. Once participants had decided to take part in the study and provided informed consent, they were randomised into the intervention or control group. Due to the nature of the study, whereby recruitment and intervention implementation were ongoing processes throughout the duration of the project, once one group had a sufficient number of participants any additional participants were then automatically allocated into the group with fewer participants. However, participants were not informed if any of the groups were full and were informed that they would be randomly allocated regardless. The three participants who withdrew from the study were both from the intervention group, which resulted in recruitment for the intervention group running for several weeks longer than the control group.

5.2.4. ‘Get Moving’ intervention design

The objective of the ‘Get Moving’ intervention is to increase daily PA in older adults. To achieve this objective, the intervention aimed to address several barriers to, and facilitators of, PA at multiple levels of the Social Ecological Model (Sallis et al., 2006). The main focus of the intervention is to increase walking steps per day, with the target increase in steps being specific to the individual taking part. In order to achieve this PA behaviour change, information was collected from a qualitative interview study with residents from the residential community (see Study 1) and BCTs were selected in order to address factors that were identified within these findings. The BCTs and corresponding intervention components are as follows.

5.2.4.1. *Intrapersonal intervention components*

5.2.4.1.1. Information leaflet

Within the qualitative interviews, it became evident that the residents lacked knowledge and understanding on a range of topics related to PA. These included PA recommendations, dose, duration and intensity, risks, and benefits to health. Also evident within the interviews was the importance of ‘maintaining independence’. Several of the participants highlighted their independence as an important factor in their life and that remaining physically active may be key to maintaining their independence. Therefore, the first component of the intervention was an information booklet designed to both enhance understanding of PA and to increase the perceived importance of PA by highlighting its ability to help maintain our independence as we age (see Appendix 9.2). Information within the leaflets included *physical activity guidelines, how physical activity can help maintain independence, step counting, walking routes, walking and socialising, goal setting and strength and balance exercises*. The advice provided within the information leaflet was aimed at incorporating PA into everyday life. The focus on walking was also a result of the findings from the qualitative interviews conducted in Study 1, as walking was a common and enjoyed activity within the residents who took part in the interviews.

5.2.4.1.2. Goal setting and step tracking booklet with pedometer

Within the interviews, it was evident that the residents did not know how much PA they engage in, how much they should be doing, and that walking was one of their primary sources of PA. Therefore, participants who took part in the intervention were provided with a goal setting and step tracking booklet with an accompanying pedometer (see Appendix 9.2). The booklet featured an introduction on how to monitor and calculate average daily steps, by recording the total daily steps at the end of each day, then calculating the mean at the end of the week. By identifying the daily average over the course of a week it allowed participants to be more flexible with their approach to their step counts depending on barriers and facilitators on specific days. For example, if someone was feeling low on energy one day, they may not want to spend much time walking around. Therefore, they can rest more on this day and walk more on a day they are feeling more energetic. This approach gives the participants more autonomous control over their PA levels which was identified as important to this older adult group in the interviews conducted in Study 1. The booklet features 12 weeks of step tracking tables and is accompanied by a pedometer. The pedometer was ordered from a UK promotional goods company, which personalised each pedometer with the Derwen Housing Association (now

Pobl) logo. The pedometer was wrist worn with a coloured silicone strap (green or white) and featured an LCD display where the user had the option to display the time, distance travelled, calories expended or step counts (ranging from 0-99,999 steps).

5.2.4.2. Interpersonal intervention components

5.2.4.2.1. Telephone support (check-ins)

Within the qualitative study, it was identified that the residents lacked social support, with some residents stating that their primary sources of support (e.g., friends and family) had a negative impact on their PA levels. This negative impact was a result of a lack of support for PA and increased support for sedentary behaviours, due to the perceptions of significant others on what is suitable for older adults. Therefore, the interpersonal component of the intervention aimed to increase social support through telephone support sessions, which were referred to as ‘check-ins’ with the participants. The check-ins were carried out by the researcher and aimed to encourage participants to walk more by helping them to set goals, identify solutions to barriers to walking, increase motivation and confidence, and address any challenges/concerns that the participant had in relation to increasing their average daily step count. Depending on if the participant was achieving their current step goals, they were encouraged to increase the target step count of their current goal by 50-100 steps per day. This equates to a weekly increase of 350-700 steps, as previous research suggests that small and simple step goals may be more effective for long-term engagement in larger goals (Sullivan & Lachman, 2017). It was also evident in study 1 that activities that progressed too quickly could become less appealing, therefore it was important to set incremental and achievable goals. The check-in sessions were conducted bi-weekly (once every two weeks) over the full course of the 12-week intervention and lasted approximately 15-20 minutes. Agreements were made between the participant and researcher on the most appropriate time for the telephone support sessions to take place.

5.2.4.3. Environmental intervention components

5.2.4.3.1. Adaptations of the surrounding environment

Participants who took part in the qualitative interviews in Study 1 highlighted several environmental factors that may encourage increased PA behaviour. These environmental factors included handrails for walking support and benches for areas to rest. The participants also identified the need for gardens which are suitable for gardening, as this was an enjoyable source of PA for the residents. Therefore, the surrounding environment was modified to suit the needs of the residents living within the residential estate. First, handrails were placed around the estate so that residents were able to use them for added support when walking

outside. Second, benches were placed at different locations within the surrounding environment. A total of 4 benches were added to the area, some of which were placed at more challenging walking areas, such as the steep hill near to the estate. This steep hill was frequently highlighted as a problem during the qualitative interviews, due to the difficulty it presented to residents in walking both up and down the hill. Therefore, the inclusion of the benches provided an area to rest when embarking on more challenging walks. This was organised and implemented by Pobl themselves and was not the decision of the research team, although the research team were made aware of this prior to the environmental adaptations. The residents also played a role in the design of the benches. A workshop was held with design students from a local university along with the residents of the estate. The workshop provided the residents with an opportunity to discuss what parts of their life were important to them and how this could influence the design of the benches. For example, some of the benches were decorated with a wildlife and nature theme, whilst another was decorated with ideas related to the sea.

As well as the addition of handrails and benches, several gardening beds were also added to the area surrounding the residential estate. Gardening was a popular form of PA and lack of gardening facilities was an issue for several residents. Consequently, the housing association provided six gardening beds located around the estate. These were open for use by any of the residents living within the area. The gardening beds were also raised to ensure they catered for residents who had physical limitations which prevented them from bending down to reach the ground. The housing association worked with the local council to design the gardening facilities, aiming to encourage residents to actively engage in gardening, walking and growing vegetables.

5.2.4.4. Organisational

5.2.4.4.1. Pull-up promotional banners

The qualitative interviews from Study 1 identified how the appropriate promotion of suitable PA to older adults can help encourage residents to participate in physical activities. To promote the intervention the lead researcher designed and produced pull-up banners, which were positioned around the estate to communicate several messages to the residents (see Appendix 9.2). The messages included walking routes within the area and information about the intervention itself. The banners highlighted several walking routes located within the areas surrounding the residential estate along with their corresponding step counts, so that residents could incorporate these routes within their daily walking to achieve their step count goals. The banners also identified the difficulty of each walking route in relation to distance and terrain,

so that residents could make an informed decision on which walking routes were most appropriate for them, aiming to increase their confidence in their ability to walk their chosen route. By providing step count estimations within the context of the surrounding environment, it also increases participants' understanding of how many steps they are likely to achieve when walking around the area.

Another organisational component of the intervention is the prescription of the intervention itself. Improving organisation and resident relationship, and providing free tools and support to help encourage increased PA participation of the residents, were identified within Study 1 as potential barriers to PA. Therefore, the organisation is addressing this influencing factor by providing the leaflets, booklets, pedometers and telephone support free of charge to the residents. Although the organisation aims to provide housing for older adults, it is part of their ethos to support their residents. Therefore, they aim to contribute to the health and well-being of the older adults within their estate through encouraging a more active lifestyle.

5.2.5. RE-AIM framework

To assess the implementation of the person-centred PA intervention, the RE-AIM (Estabrooks et al., 2021) framework was used. RE-AIM provides a framework that can be used to improve the sustainable adoption and implementation of PA. The framework consists of five elements, being reach (participation rate and representativeness), effectiveness (impact on health outcomes), adoption (interest in the programme from other settings and programme deliverers), implementation (consistency of delivery of, and adaptations made to, intervention strategies), and maintenance (long-term effects of a programme on outcomes after a programme is completed). Four of these five elements were assessed using a mixed-methods approach, whilst effectiveness was not tested here given the fact that the study was underpowered (see Effectiveness section below). Quantitative and qualitative data was collected from the older adults who participated within the programme, and qualitative data was collected from a member of the health and well-being team within the housing association.

5.2.5.1. Reach

The reach of an intervention is described as the proportion of a target population that engages in an intervention (Glasgow et al., 1999). Reach was assessed using quantitative data from recruitment, participation rate and representativeness of the population. To calculate participation rate, the number of participants who took part in the baseline assessment, divided by the number of individuals who were living within the residential estate, who would have

been eligible to participate, was used. Additionally, qualitative data was collected to provide deeper understandings of factors related to the reach of the intervention, such as motives for participation in the intervention.

5.2.5.2. Effectiveness

Effectiveness of an intervention is defined as the success of an intervention in improving health outcomes (Glasgow et al., 1999). Due to the limited pool of participants available for recruitment within the study, it was expected that this would result in a limited sample size that was not large enough to achieve statistical power and mean that the study outcomes could not show the effectiveness of the intervention. Post hoc power analysis using the programme G*power confirmed this. The power ($1 - \beta$) of the test conducted to assess daily PA was 0.2 with the effect size being $d = 0.23$. Therefore, in order to obtain sufficient statistical power at the recommended 0.80 level (Cohen, 1988) a sample size of 100 participants would be needed. Thus, the outcomes of statistical comparisons were used only to make proposals about potential impacts in larger, statistically powered trials but not to suggest effectiveness.

Quantitative measures taken to allow observation of trends in variables of interest included device measured PA, HRQOL, loneliness, self-efficacy for PA and outcome expectations for PA. Additionally, participants were interviewed post intervention and were questioned on what they felt about the programme, the benefits they experienced and changes they had made since engaging in the programme etc.

5.2.5.3. Adoption

The adoption of an intervention is defined as the number, proportion, and representativeness of settings and intervention agents who were willing to deliver the programme (Glasgow et al., 1999). This was the first setting in which the programme was delivered. Therefore, assessing adoption within other settings will not be possible. However, a member of the health and well-being team at the residential estate was interviewed to explore their interest in the adoption of the programme on a larger scale than was used within this study. Questions included: Do the professionals at Pobl have time to carry out such a programme? Do you feel the current programme is financially viable? Do you feel the programme could be repeated without the need of the lead researcher?

5.2.5.4. Implementation

Implementation refers to the intervention deliverers' fidelity to the various elements of an intervention's key functions or components, including consistency of delivery as intended and

the time and cost of the intervention. This also includes adaptations made to intervention and implementation strategies (Glasgow et al., 1999). The intervention's implementation was assessed through field notes taken by the intervention deliverer regarding the consistency of delivery of intervention components and frequent engagement with the participants who were engaging in the study during and following the intervention to identify strengths and weaknesses of the intervention strategies. Intervention components would remain consistent throughout, however, through frequent communication with participants they could then be adapted to suit the needs of the individual. For example, making changes to the self-monitoring tools that were being used or adapting goal setting through the bi-weekly check-ins to be more suitable for the individual. Post interventions questions included: How did you find it engaging with the different elements of the programme? What did you find were the most effective elements of the programme? etc.

5.2.5.5. Maintenance

The maintenance of an intervention can be defined as the extent to which an intervention becomes institutionalised or part of routine organisational practices; maintenance also applies at the individual level to the long-term impact of a programme on health outcomes (Glasgow et al., 1999). This study focussed on individual level maintenance, exploring personal experiences following the intervention leading into the COVID-19 lockdown between both control and intervention groups. As such, therefore, this cannot be considered a full exploration of maintenance, but, as with effectiveness, follow-up data obtained after delivering the intervention, allows tentative suggestions to be made.

5.2.6. Measures

5.2.6.1. Objective measures of physical activity

Participants in the study wore the ActiGraph GT9X-Link[®] accelerometer on their left wrist for a total of 7 consecutive days, included both weekdays and weekends. The ActiGraph GT9X-Link[®] records high resolution raw acceleration data, which can be converted into several objective measurements of PA and sleep. Accelerometers are commonly used within PA research, and researchers provide meaning to the output data by using cut-points to calibrate accelerometer output into relative energy expenditure (Bassett et al., 2012). Cut points are often used due to their simplicity and interpretation into PA guidelines, such as the amount of time spent in MVPA (Ekelund et al., 2017). Although much of PA analysis using accelerometers uses raw acceleration cut points, there are no reliable published thresholds for older adults. Therefore, this study used a no threshold approach and acceleration is reported using the

minimum acceleration achieved for a given duration. Rowlands et al. (2019) refer to this as MX, where X refers to the duration. For example, this study reports M30, which reports the minimum acceleration for the most active 30 min of the day. As thresholds were not used, PA type, intensity and duration were not assessed and only trends in activity are reported. The accelerometers were used to calculate Daily PA (Average milli-g/mg/day) and Most active 30 minutes (Minimum acceleration for the most active 30 mins/M30), which was measured as a mean daily acceleration and the minimum acceleration for the most active 30 minutes. Milli-g is a gravitational unit used to measure acceleration, which is 1/1000 of a g. Measures were collected at baseline, 6 weeks (mid-intervention), 12 weeks (post-intervention) and at 6 weeks follow-up. Participants were asked to wear the device at all times and only remove it if it was essential, then re-apply when they were able to do so. Participants were required to wear the accelerometer for a minimum of 3 weekdays and 1 weekend day to be eligible for analysis. Previous research has identified 3-4 days of accelerometer monitoring to achieve 80% reliability for PA measurements (Matthews et al., 2002).

5.2.6.2. Questionnaires

Questionnaires were used to assess changes in several psychosocial components. The questionnaires were administered at four time points and included measures of health-related quality of life, loneliness, outcome expectations and self-efficacy for PA. Participants were requested to complete the questionnaires at baseline (pre-intervention), mid (6 weeks into intervention), post (after 12 weeks of intervention) and follow up (6 weeks after the conclusion of the intervention). The intervention group completed measures at all four time points, whilst the control only at the first three. The questionnaires were initially administered in person, with the researcher guiding the participants through the questionnaires to ensure questions were fully understood. On the 23rd March 2020, the UK government enforced lockdown rules as a result of the COVID-19 pandemic. Members of the public were required to stay indoors unless essential, remain 2m apart from others and could leave the house for 1 hour per day for exercise. Thus, by necessity, four participants from the intervention group completed the final questionnaire set through telephone calls. This was to adhere to lockdown restrictions.

5.2.6.2.1. Health related quality of life

Health related quality of life (HRQOL) was measured using the 36-item Short Form Health Survey (SF-36; Ware & Sherbourne, 1992). The SF-36 is widely validated (Lera et al., 2013) and popularly used in assessing the subjective quality of life (QOL) of patients and the general public and provides a direct quantitative indication of an individual's health status (Ware &

Sherbourne, 1992). The SF-36 has good internal consistency, with a Cronbach's alpha ranging from 0.76 to 0.90 for each subscale (Jenkinson et al., 1994). The survey is easy to administer and has been deemed suitable for use with older adults; as advised, the researcher conducted the survey with the participants as previous research has identified some difficulties with self-completion (Hayes et al., 1995). The SF-36 uses 8 different sub-scales to measure both physical and mental health. The sub-scales include physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health. The SF-36 offers a choice of recall format at a standard (4 week) or acute (1 week) time frame. Likert scales and yes/no options are used within the answer format. The subscales are each scored on a scale from 0-100, with higher scores representing higher HRQOL than lower scores. Previous research has successfully used the SF-36 within the older adult population, and it has been identified as a reliable and valid way to collect health related quality of life information from older adults living within the community (Walters et al., 2001).

5.2.6.2.2. Loneliness

Loneliness was measured using the 6-item de Jong-Gierveld Loneliness scale (de Jong-Gierveld scale; de Jong-Gierveld, 2006; see Appendix 9.2). The de Jong-Gierveld Loneliness Scale provides a valid and reliable measure of overall, emotional, and social loneliness. The internal consistency of the 6-item scale is good, with a Cronbach's alpha score of 0.76. Congruent validity of the scale was measured using correlations between the 6-item and original 11-item loneliness scales, which were very high, ranging between .93 and .95 (de Jong-Gierveld, 2006). The original 11-item scale was developed in 1987, which was then shortened to a 6-item scale to avoid problems with the length of the questionnaire and time taken to complete (de Jong-Gierveld, 2006). The 6-item scale contains 3 negatively formulated statements ("I experience a general sense of emptiness", "I miss having people around" and "Often, I feel rejected") and 3 positively formulated statements ("There are plenty of people that I can lean on in case of trouble", "There are many people that I can count on completely" and "There are enough people that I feel close to"). Participants are required to answer the 6 statements with 'yes' 'more or less' or 'no'. Another option of answers for the scale is 'yes!' 'yes' 'more or less' 'no' and 'no!'. For the purpose of this study the 3 set of answers was used due to the questionnaire being conducted by the researcher in an interview style setting, both in person and over the phone. This format is advised when the scale is administered by a researcher (de Jong-Gierveld, 2006).

5.2.6.2.3. Self-efficacy

To measure self-efficacy, the Resnick Self Efficacy for Exercise Behaviour scale (SEEB; Resnick & Jenkins, 2000) was used. The Resnick SEEB is a 9-item scale that was developed with older adults and measures self-efficacy for exercise. Although the title refers to exercise, the scale can be used for measuring self-efficacy for PA by rewording the question with ‘physical activity’ rather than ‘exercise’. The statements are related to someone’s confidence in their ability to be physically active. For example, I am confident I can be physically active *‘even when the weather is bad’* or *‘even when I feel depressed’*. The scale has a 10-point response scale with 0 representing *not confident* and 10 *very confident*. The score is calculated by summing up the responses from the 9-item survey, with the range of total scores being 0-90. A higher total score indicates higher self-efficacy for PA (Resnick & Jenkins, 2000). The scale has been shown to have high internal consistency with a Cronbach’s alpha score of 0.90, along with acceptable 12-month test-retest reliability ($r = 0.67$; Garcia & King, 1991).

5.2.6.2.4. Outcome expectations

Outcome expectations were measured using the re-designed Outcome Expectancy for Exercise Scale (OEE; Resnick et al., 2000). This 9-item scale was developed based on Bandura's (1997) theory of self-efficacy and the work of prior researchers in the development of outcome expectation measures, through both qualitative and quantitative studies that identified benefits of exercise to older adults (Conn, 1998; Melillo et al., 1996; Resnick & Spellbring, 2000; Schneider, 1997; Sharon et al., 1997). The OEE scale can help identify older adults with low outcome expectations for exercise. The measure was developed specifically for older adults, and validity and reliability were tested using a sample of 175 older adults, showing good internal consistency with a Cronbach’s alpha score of 0.89. Participants are asked to consider statements in relation to exercise and its impact on their physical and mental health. Similarly, for the purpose of this study, the term ‘physical activity’ was used in place of ‘exercise’. Example statements from the scale are *‘Physical activity makes me feel better physically’* and *‘Physical activity makes my mood better in general’*. Once they have considered and understood the statement, respondents are asked to provide an answer on a scale of 1-5. These numbers equate to strongly disagree= 1, disagree= 2, neither agree nor disagree= 3, agree= 4, or strongly agree= 5. The total score is the sum of the 9 items ranging from 9-45. The higher the score, the greater the outcome expectations of the individual.

5.2.6.3. *Physical functioning*

The Senior Fitness Test (Rikli & Jones, 2001) is a validated fitness testing battery which was developed to measure physical functioning in older adults. The assessment is used to measure physical parameters (e.g., speed and balance) in relation to the functions (e.g., walking and lifting) and activities (e.g., housework and gardening) relevant to the daily lives of older adults. The assessment requires participants to carry out 7 different tests. Rikli and Jones (2013) used the testing battery to develop and validate a criterion-referenced clinically relevant set of physical fitness standards for maintaining physical independence in later years. The tests were designed to provide valid and reliable physical function tests in a safe environment for older adults. Within this study, only 1 of the first 6 participants was open to take part in the physical functioning test. This was due to several reasons including not feeling comfortable due to surrounding environment, lack of readiness, along with a personal preference not to. Therefore, this test was discontinued from that point forwards. For the full range of tests and scoring, please see Appendix 9.2.

5.2.6.4. *Semi-structured interviews*

Semi-structured interviews were conducted with participants from the intervention group following the completion of the intervention. The aim of the interviews was to explore the individual's experiences during the intervention and to identify its strengths and weaknesses from the perspective of the participants. Questions were asked about how the participants felt about the intervention, what they found useful/not useful, what they enjoyed/didn't enjoy, if they found the intervention beneficial, if they had noticed any changes in their PA/health and wellbeing, and, what they might change about the intervention to identify potential changes to the strategy for future implementation (Patton, 2015). Although predetermined questions had been set (see Appendix 9.2), probes and follow-ups were used to dig deeper into participants' responses (Creswell & Plano-Clark, 2011). Post intervention interviews lasted between 20 and 40 minutes and were recorded using a Dictaphone, which were later transcribed. The semi-structured approach allowed for the participants to identify avenues that may not have been considered when the researcher was designing the interview schedule. The interviews were carried out by the researcher who had been formally introduced to the residents through a short presentation at an event run by the health and well-being team at Pobl. The researcher also led the design and delivery of the PA intervention and had previous experience conducting qualitative research with older adults.

Qualitative data was also collected throughout the intervention (intervention group only) and at follow-up. Throughout the intervention, qualitative data was collected at the bi-weekly check-ins, which were also one of the intervention components. The lead researcher took notes throughout the check-in conversations and provided feedback and support with any of the challenges experienced by the participants. These notes, along with a personal log from the researcher, were maintained at each check-in, for continued evaluation of the intervention through the experiences of the participants. Check-in calls varied in duration ranging from 3-4 minutes up to 20 minutes, depending on the level of support/help the participant required. Each participant from the intervention group had 6 check-in calls in total (54 check-in sessions).

Finally, once the intervention was complete the lead researcher conducted an interview with a member of the health and well-being team to develop a better understanding of how the present intervention could be implemented within the residential estate in the future, including discussion of organisational challenges and opportunities for implementation. This interview lasted a total of 60 minutes and was also recorded using a Dictaphone, and transcribed for further analysis.

5.2.7. Inclusion of COVID-19 lockdown experience

Due to the pandemic occurring soon after the conclusion of the intervention, the follow-up semi-structured interviews also included questions related to individual experiences of the lockdown. People over 65 years of age were informed by the government that they were to stay indoors at all times. This impacted the daily lives of the residents taking part in the study, therefore questions relating to the lockdown experiences were included within the intervention group interviews, as well as contacting the control group participants for insight into the experiences of those who didn't take part in the intervention. Participants were asked several questions related to the lockdown experience, such as, *how do you feel you have managed the lockdown experience? What has been the most challenging aspect about staying indoors? What has helped manage the lockdown experience?* etc. Both intervention and control groups were interviewed about their lockdown experience. Intervention group interviews were longer, as they also included questions related to the intervention. Intervention group interviews lasted approximately 30-60 minutes, with the control group interviews lasting approximately 20-30 minutes.

5.2.8. Analysis

The qualitative and quantitative data were initially analysed independently at the raw data level. Therefore, the analysis of each data collection component was conducted independently of the results of one another. Then the results were integrated to provide a full and holistic interpretation of the intervention and participants' experiences of it. The Results chapter presents this integrated perspective of the findings, using the qualitative data to illustrate and provide context to the quantitative findings (Creswell & Plano-Clark, 2011).

5.2.8.1. *Quantitative data*

Objective measures of PA were analysed using the GGIR package, using standard procedures described by Migueles et al. (2019). The GGIR tool is used to process and analyse data collected with wearable raw acceleration sensors and are currently widely used in research on human daily PA. Daily PA (average acceleration per day) and Most active 30 minutes (average acceleration from participants' most active 30 consecutive minutes) were calculated in mg. Reporting directly measured acceleration maintains the continuous nature of accelerometer metrics, which minimises prediction error (Rowlands et al., 2019). Quantitative data (Objective PA, HRQOL SF-36, Loneliness 6-item measure, SEES and OEES) were analysed in SPSS for windows (v26). Descriptive statistics were calculated for all variables and the data was then screened for normal distribution and outliers. Normal distributions were obtained as all skewness and kurtosis values ranged from -1 to 1. Changes from pre- to mid- to post-test were estimated with analysis of variance (ANOVA) for repeated measures with a significance level of $p=0.05$. Mixed repeated measures ANOVAs were used to test for differences between the control and intervention groups in Daily PA, Most active 30 mins, HRQOL, Loneliness, Outcome expectations and Self-efficacy for PA at the three time-points (within-subjects factor). As the study did not explore the interactions between dependent variables a multivariate analysis was not appropriate. The within-subject variable Time had three levels (Pre vs Mid vs Post). The between-subject variable Group had two levels (Intervention vs Control). The interaction Time \times Group was used to identify differences between groups over time. Greenhouse–Geisser values are reported to handle possible violations of sphericity. Post hoc tests using Bonferroni correction were applied, where appropriate, to explore significant outcomes obtained in relation to the within-subjects effects of Time.

5.2.8.2. *Qualitative data*

Qualitative data and quantitative data were analysed independently so that each form of analysis was not influenced by one another. Qualitative interviews were transcribed verbatim

and analysed using thematic analysis (Braun & Clarke, 2006) to identify and report key ‘themes’ from the data set, describing the data set in rich detail. Inductive thematic analysis was used, to ensure that the themes were strongly related to the data itself (Patton, 2015). Bi-weekly check-ins and post-intervention interviews were analysed together, to develop a thorough understanding of the personal experiences from the intervention throughout and immediately following taking part in the programme. Data from within the post-intervention interview which referred to participants’ lockdown experiences was analysed separately and compared to interviews with the control group to identify different experiences of the lockdown between the two groups.

The researcher immersed themselves within the data, by repeatedly reading through each of the bi-weekly meeting notes and interview data, to ensure they had a deep understanding of the breadth of the content and overall experiences of the participants. This is referred to by Braun and Clarke (2006) as ‘repeated reading’. Throughout the repeated reading, notes were taken alongside highlighted key quotations before a summary of each transcript was made. Once key quotations had been highlighted, they were then labelled with a summarising theme (1st order themes). Themes were then grouped into 2nd order themes, which were made up of several 1st order themes which reflected similar ideas. Analytic rigour of the qualitative analysis was ensured through analyst triangulation (Creswell & Plano-Clark, 2011), where a random sample of quotations and themes was provided to a second analyst, who categorised quotations into the corresponding theme. Matches were then checked and any disagreements about the themes and data allocation were discussed to come to an agreement on the final themes. These final themes were then used to report the key outcomes from the qualitative data.

5.3. Results

5.3.1. Reach

Within the residential estate and the surrounding area, there are 109 bungalows available for adults aged 55+. At the time of the research project there were 65 older adults aged 65+ living within the area. 18 older adults started and completed the intervention after the recruitment process. This is 27.68% of the total group of older adults living within the residential estate. Due to time and resource limitations, recruitment was limited. Recruitment strategies were conducted partly based on the findings from study 1. Leaflet dropping, pull-up banners and face to face conversation with residents within the communal area of the new facility were used to recruit older adults for the intervention. Qualitative data collected with the residents showed that many of the individuals who took part in the intervention already had an interest in

improving their health, which drew their attention to taking part in the intervention. Graham, 72 years old, explained:

‘Yeah, well I have always had an interest in sort of health and exercise. Um, ever since I can remember I have had an interest in that. And at my age now it was just a way of getting it out.’

This residents reported several reasons for their interest in health and fitness. These included healthy ageing, improved fitness, an interest in health markers, and an opportunity for personal development. Therefore, the reach of this programme may be limited to those who already have an interest in improving their health and fitness levels. Even if resources were greater than within this intervention, and more time was available for recruitment, it may be more difficult to attract older adults to the intervention who don’t have existing interests or motivations related to improved health. This is supported by qualitative data collected from a member of the health and well-being team at the residential estate. She explained:

‘But they have always been extremely hard. We have always gone door knocking, to literally every single customer we had in Derwen, to try and find out what their interests are, to try and spark some kind of motivation and they would give you a list, you would put something on and they wouldn’t come.’

This member of the health and well-being team highlights the difficulty they have engaging some older adults in activities within the estate, even when the activities are designed based on the preferences of the target population. She continues to explain her experiences trying to reach older adults within the residential estate with similar health and well-being schemes:

‘The problem with loneliness and isolation is they feel they don’t have anything to contribute, and they haven’t got the confidence to go out. So, it is just a spiral, and they end up just sitting there and doing nothing, seeing no one. Because they have nothing to talk about. So, they don’t go. And we didn’t really crack it. We did with a couple of people, but they are the people who would have engaged anyway.’

Although the recruitment strategies used within this study showed some success, it has also highlighted challenges when looking to recruit older adults within real world PA interventions. Further approaches may be needed to improve the reach of person-centred, multi-level PA interventions for older adults.

5.3.2. Daily PA

Descriptive statistics showed that *Daily PA* in the control group declined from baseline ($M = 32.4\text{mg}$, $SD = 26.5$) to mid ($M = 21.8\text{mg}$, $SD = 7.7$) then increased to post ($M = 28.4\text{mg}$, $SD = 27.7$), whereas the intervention group increased from baseline ($M = 25.8\text{mg}$, $SD = 5.2$) to mid ($M = 26.72\text{mg}$, $SD = 8.0$) and then at post ($M = 34.3\text{mg}$, $SD = 26.1$). Results indicated that there were no significant differences between groups in *Daily PA*, $F(1.5, 290.7) = .629$, $p = 0.497$. Within the qualitative data, one of the barriers to increasing steps was poor weather conditions. As the intervention was implemented from the summer/autumn months, through the winter, the weather conditions worsened. Kevin, 66 years old stated '*The weather has been particularly bad. I think that is most likely the reason for my average being down last week*'. Deborah, 73 years old, also mentioned the impact of the weather on her step counts '*On the good days I do around 6000, on the bad days I usually do around 2000. That is usually dependent on the weather.*'

In addition, without conscious effort, behaviours were often mostly sedentary (e.g., watching TV, knitting etc.). Taking part in the intervention increased participants' awareness of activity levels, which provided a source of motivation to get up and walk more, but without this increased awareness, intervention participants identified that they would have been more likely to sit down and do nothing through the winter months.

Graham, 72 years old: '*The past two weeks have gone very well. I finished the week on a 2943 average and before that I did 3035. So, they are both better than my previous two weeks. I am making an excuse to walk more, usually indoors as the weather being the way it has been.*'

5.3.3. Most active 30 mins

Descriptive statistics showed that the most active 30 mins within the control group declined from baseline ($M = 97.7\text{mg}$, $SD = 25.3$) to mid ($M = 93.3\text{mg}$, $SD = 21.0$) and continued to post ($M = 91.0\text{mg}$, $SD = 23.8$), whereas the intervention group increased from baseline ($M = 113.0\text{mg}$, $SD = 25.9$) to mid ($M = 115.3\text{mg}$, $SD = 28.4$) and then was maintained at post ($M = 115.4\text{mg}$, $SD = 29.1$). Results indicated no significant difference between the intervention and control groups across pre, mid and post measures for participants' *most active 30 mins*: $F(1.4, 144.6) = .387$, $p = 0.682$.

Within the qualitative data, the intervention group discussed how they had enhanced motivation to increase their activity by walking as a means of exercise to increase their step count. Throughout the interviews, many of the participants explained how much of their PA was

carried out during general day to day activities, such as shopping, walking for transport and so on. Abigail, 72 years old, explained:

‘Well, it encouraged me to do more if I had not done enough. If my step count was quite low by mid-afternoon, then I would go for another walk. Or get up and do something anyway. You know, try and up my count.’

Graham, 72 years old, also explained how he would be walking as a means of exercise in order to keep his steps up, *‘Yeah well, I found myself you know, doing a bit more exercise in order to keep the figure up.’*

5.3.4. Health-related quality of life

Results indicated that the intervention group scored significantly higher than the control group on several subscales of the SF-36 including physical functioning $F(1, 2938.9) = 6.8, p = .02$, role physical limitations $F(1, 4221.8) = 4.2, p = .05$, role emotional limitations $F(1, 4823.8) = 10.6, P = .005$, energy and fatigue $F(1, 1753.6) = 5.7, p = .03$, emotional well-being $F(1, 1422.2) = 5.3, p = .03$, pain $F(1, 3068.0) = 5.4, p = .03$ and general health $F(1, 3707.6) = 9.5, p = .007$. There were no significant differences between groups in social functioning $F(1, 809.0) = 2.6, p = .12$. However, there were no significant differences in subscale scores between groups over time ($p > 0.05$).

Table 4
Mean scores of the HRQOL subscales for pre, mid and post intervention

Measure	Group	Time	Mean	SD
Physical functioning	Control	Pre	64.4	29.1
		Mid	59.4	32.5
		Post	51.7	32.6
	Intervention	Pre	84.4	9.5
		Mid	86.6	9.0
		Post	81.1	6.5
Role physical limitations	Control	Pre	55.5	48.0
		Mid	52.8	42.3
		Post	44.4	44.7
	Intervention	Pre	86.1	22.0
		Mid	72.4	31.6
		Post	86.1	33.3
Role emotional limitations	Control	Pre	62.9	45.5
		Mid	74.1	32.7
		Post	55.5	47.2
	Intervention	Pre	100	0.0
		Mid	90.8	24.8
		Post	100	0.0
Energy & fatigue	Control	Pre	42.2	25.8
		Mid	79.6	22.5
		Post	43.8	27.2
	Intervention	Pre	71.7	18.2

	Intervention	Mid	86.0	9.0
		Post	67.2	16.0
Emotional well-being	Control	Pre	66.7	27.3
		Mid	55.6	23.5
		Post	66.2	22.7
	Intervention	Pre	84.9	9.8
		Mid	73.8	12.3
		Post	83.1	8.1
Social functioning	Control	Pre	76.4	32.0
		Mid	66.9	26.3
		Post	91.7	25.0
	Intervention	Pre	93.1	14.0
		Mid	86.2	10.1
		Post	95.9	8.8
Pain	Control	Pre	66.1	38.7
		Mid	60.4	31.3
		Post	55.9	37.7
	Intervention	Pre	90.6	11.8
		Mid	81.8	11.5
		Post	88.4	8.4
General health	Control	Pre	53.3	30.0
		Mid	47.7	24.3
		Post	53.9	28.3
	Intervention	Pre	87.2	10.3
		Mid	79.4	9.2
		Post	74.4	15.5

The qualitative data highlighted several key quotes relating to the subscales of HRQOL. First, in relation to increased confidence. Several participants noted increased confidence in their physical capabilities. This was evident when Alice, 80, mentioned, *‘I learnt that I was better equipped to do those things. To do the walking. And the exercise.’*

The increased confidence in their ability allowed increased exercise-based walking activity, which manifested in psychological benefits, including enjoyment and sense of achievement. Anabelle, 76 years old, displays a positive psychological experience stating, *‘On Wednesday, I decided I was going to walk down and back, up the hill, which I haven’t done in 5 years. I was amazed. It felt so good.’*

In the above quote, Anabelle highlights the positive psychological feelings she experiences and how she is attempting physical tasks that she has avoided in her later life. This reflects an improved physical function and changes in the role of physical limitations within the HRQOL subscales. Since taking part in the intervention, she reports an improved ability to carry out physical activities that she had previously avoided. She displayed a sense of confidence to set goals, feelings of a sense of achievement and positive affect. Similarly, Alice, 80 years old, spoke of how her exercise-based walking gives her a sense of achievement:

‘And the exercise. And I think it sort of lifts you a bit. If I go out for a walk now, and it is only in the garden now [due to lockdown restrictions], it lifts you. It makes you feel that little bit better for some reason, I think it is that going out a bit in the fresh air make you feel better anyway. I think the walking helps me because every time I do it, I think ‘yes I did that’. You know.’

Thus, although the quantitative data showed no significant changes in HRQOL, the qualitative data presented accounts where participants’ experiences of positive psychological affect from taking part in the intervention, which reflect emotional well-being as measured by the HRQOL subscales.

5.3.5. Loneliness

Descriptive statistics showed that the control group maintained loneliness scores from baseline ($M = 2.22, SD = 2.0$) to post ($M = 2.2, SD = 2.1$), whilst within the intervention group loneliness increased from baseline ($M = .55, SD = 0.7$) to post ($M = 1.22, SD = .97$). Results indicated these differences were non-significant $F(2, 2.0) = 3.2, p = .052$. Participants in the control group had higher levels of loneliness at all three data collection points when compared with the intervention, although these differences were non-significant ($p = .147$).

Table 5
Mean scores of loneliness for pre, mid and post intervention

Measure	Group	Time	Mean	SD
Loneliness	Control	Pre	2.2	2.0
		Mid	1.8	1.8
		Post	2.2	2.1
	Intervention	Pre	.55	.72
		Mid	1.44	1.01
		Post	1.22	.97

In contrast, within the qualitative data there were no themes that suggested an increased sense of loneliness within the intervention group. Participants did often report that they would engage in PA on their own. As the majority of their PA was accumulated through general household chores, or walking as a means of transport or exercise, participants would naturally conduct these behaviours when on their own. Alice, 80 years old, explained how she enjoyed receiving feedback from others, but when it came to engaging in PA, she would prefer to participate alone:

‘Well I quite liked the sort of formality of filling in the form and the information and doing what I was doing. And I quite liked doing it on my own. I liked the feedback from other people, but I also like the fact the [sic] I could do it on my own, I liked having the group as well, but the actual doing I felt better on my own.’

Three of the participants who took part in the intervention were members of a Pilates group within the area, where they took part once per week. Therefore, they would engage in conversations about taking part in the intervention, how to increase their step counts and overcoming barriers. Even though the intervention aimed to educate the participants about potential social physical activities, the participants would often walk alone. Out of the 3 participants within the intervention group who lived with a partner, 2 had partners who were disabled and no longer able to walk freely. Therefore, the option to walk with a partner wasn't readily available amongst the participants.

5.3.6. Self-efficacy

Descriptive statistics showed that both groups declined in their self-efficacy, with the control group initially increasing from baseline ($M = 17.0, SD = 27.6$) to mid ($M = 27.1, SD = 33.8$) and then declining to post ($M = 14.8, SD = 27.8$). In comparison, the intervention group declined from baseline ($M = 57.1, SD = 16.6$) to mid ($M = 51.7, SD = 21.6$), then increased at post ($M = 55.6, SD = 10.2$). Although, results indicated that self-efficacy for PA did not differ significantly between groups over time $F(1.5, 503.4) = 2.07, p = .156$. Means were lower at post when compared with baseline in both groups, although these differences were not significant.

Table 6

Mean scores of self-efficacy for PA, for pre, mid and post intervention

Measure	Group	Time	Mean	SD
Self-efficacy	Control	Pre	17.0	27.6
		Mid	27.1	33.8
		Post	14.8	27.8
	Intervention	Pre	57.1	16.6
		Mid	51.7	21.6
		Post	55.6	10.2

Qualitative data from the bi-weekly interviews showed some changes in individuals' self-efficacy for PA. The participants spoke of improved confidence in their ability to be physically

active. Alice, who was 80 years old, initially spoke of how she didn't feel the PA guidelines were realistic for someone of her age in the first interview of the intervention, stating '*I was shocked that we should be aiming for 8,000. I mean, I don't drive so I walk a lot, but I don't know how I could get to 8,000*'. Later in the intervention, the same participant spoke of how she was achieving in excess of these guidelines on certain days:

'This week has gone pretty good, I had some ups and downs but I passed my target both weeks. My low days were around 2500 and my highest was 9352. The biggest difference between the days is going for a dedicated walk. I make sure I got out for a walk to get my steps up, and I quite enjoy it.'

This participant showed noticeable improvements in confidence in her ability to achieve the guidelines. This improvement in confidence was also evident within other participants, such as Graham, 72 years of age, who explained '*I started the programme at 1377 and my final week I averaged at 3059. So, I have over doubled my steps for the day. I am looking forward to getting out and about with the wife when the weather is good now.*' He showed an increased confidence in his ability to accumulate PA through step counts, increasing his desire to continue these behaviours with his spouse, who had recently recovered from a stroke, and was now looking forward to setting her step count goal of her own, after seeing the results her husband was achieving. This displayed a role model effect between the husband and wife, whereby the wife wanted to replicate the behaviours being achieved by her husband. Her motivation was positively influenced by having a realistic role model with whom she can identify.

It was evident within the interviews that being able to identify progress through increasing step counts positively impacted individuals' self-efficacy for PA behaviours. Conversely, some participants showed signs of decreased confidence in their abilities. It seemed that the comparison of their own step counts to the guidelines caused some frustration with their physical capabilities. Eleanor, 67 years old explained '*I am still averaging around 2000 steps per day, but I don't know what to expect when you get older, some days I don't see how I can do anymore*'. It seemed to be that age-related expectations were a limiting factor in the self-efficacy for PA behaviours for some participants. Eleanor, 67 years old, continued '*I feel like the goal of 5000 is very high for someone of my age. I mean one day we went for a big, long walk around Newport and I achieved 4 thousand and something*'.

5.3.7. Outcome expectations

Descriptive statistics showed the control group increased their outcome expectations from baseline ($M = 34.2, SD = 6.7$) to mid ($M = 36.4, SD = 5.6$) and then declined below baseline level at post ($M = 32.0, SD = 8.6$). The intervention group increased outcome expectations from baseline ($M = 39.8, SD = 4.3$) to mid ($M = 41.6, SD = 3.7$) which were maintained at post ($M = 41.2, SD = 3.7$). Results indicated that outcome expectations of PA did not significantly differ between groups over time $F(2, 22.9) = 2.4, p = .104$. Although the patterns of change differed between groups, as noted above, these changes were not significant.

Table 7
Mean scores of outcome expectations for PA, for pre, mid and post intervention

Measure	Group	Time	Mean	SD
Outcome expectations	Control	Pre	34.2	6.7
		Mid	36.4	5.6
		Post	32.0	8.6
	Intervention	Pre	39.8	4.3
		Mid	41.6	3.7
		Post	41.2	3.7

In the qualitative interviews, participants highlighted positive physical, psychological, and social outcomes as a result of taking part in the intervention. This included both physical, psychological, and social benefits. Physically, participants were noticing they were able to do far more activity than they could prior to the intervention. Dorothy, 70 years old, explained ‘*I walked to town and back twice in one day. I have never done that before.*’ In a conversation with Alice, 80, she explained how she prioritises exercise over household chores, because of the benefits she feels exercises bring to her:

Alice, 80 years old: ‘Yes and I am still doing my exercises and Pilates and what have you. So, I haven’t got time for housework really.’

Interviewer: ‘Yeah, and what is motivating you to keep on doing that?’

Alice, 80 years old: ‘Well I sort of explained that before. I think I just feel I should. For my own benefit.’

Another participant speaks of how she is starting to exercise more from home, because she believes it is going to help her become less stiff. Dorothy, 70 years old, stated ‘*I am just doing*

more exercise now, because I can't get out so much' and 'I am getting the exercise in to get them joints going, because I have had some trouble with my shoulders.' Participants also highlighted psychological outcomes when participating in PA. Deborah, 73 years old, spoke of how she experiences enjoyment through PA:

'I enjoy it. To be perfectly honest with you. Well, I always intended to get myself fitter which I told you when you came to the house.... This is weeks ago. And I thought right, I am going to start my exercises. And that is what I did. I just did all my own aerobic exercises that I knew.'

Alice, 80 years old, spoke of the 'sense of achievement' she experiences when she goes out for walks, and how she 'feels better' for it:

'It makes you feel that little bit better for some reason, I think it is that going out a bit in the fresh air make you feel better anyway. I think the walking helps me because every time I do it, I think 'yes I did that'. You know.'

Although quantitative findings showed no changes associated with the intervention over time, it was evident within the interviews that the residents experienced positive physical and psychological outcomes, that can increase the value of, and engagement in PA.

5.3.8. Adoption

This was the first site to adopt the person-centred, multi-level PA intervention by the housing association within Newport. During the interview with the manager from the multi-level PA intervention, there were several conversations about how the intervention would be adopted within the housing association on a larger scale. Firstly, due to a lack of resources, the idea is to work with 3rd sector parties to help deliver interventions. She explained *'we work with partners to deliver these health and well-being initiatives.'* As was the case within this study, external partners can be used to help deliver the intervention. She also explained how the health and well-being team have a referral scheme, whereby residents who are at risk of poor health and well-being can be referred to the team, which could act as a funnel system to attract the target individuals of the PA intervention:

'Then we also have a different strand, which is offering well-being intervention to individuals. We receive referrals from the neighbourhood managers, for example, if someone is unable to manage their tenancy because of their mental well-being. So, we can deliver brief interventions for three sessions, and we can do a couple more if needs be and do some signposting after that.'

Residents who are referred through the neighbourhood managers are offered health and well-being support and the intervention would be offered through the referral scheme. This would also allow for the housing association to manage resources when delivering the intervention and take a person-centred approach to the intervention strategies used within the intervention. The referral scheme may also allow for the harder to reach individuals to be addressed with the intervention, as previous experiences using this approach to deliver health and well-being initiatives have shown less resistance from the residents:

‘Through our referral programme, we are seeing a lot more than we used to. And more of those really vulnerable people that wouldn’t have come out into a group. We are going into their own homes, into their safe space, and they are sharing their life. A lot of it is divorce, or if their spouse has died and they were a fulltime carer. We are going in at those really difficult moments and trying to offer them a pathway back to a decent life.’

Although the intervention implemented within this study was the first time it had been used by the housing association, the approach is open to be adopted by the health and well-being team to help encourage a more active lifestyle within the residential estate. The health and well-being team manager explained *‘we haven’t got anything on physical activity. We talk about it, but it would be really good to have a solid programme that they can follow.’*

5.3.9. Implementation

The implementation of the intervention showed several strengths and weaknesses. The cost per participant equated to £25.57. This cost was the total of the participant pack that they received (information booklet, step tracking booklet, pedometer) along with the cost of promotion banners etc. Within the interview with the manager of the health and well-being team at the housing association, it was felt that funding this intervention for those who were interested would be feasible, even though funding had been reduced in recent years. She explained:

‘I think we have around £800 per older persons scheme. That we can invest in. That can be anything. Something for them. If we identify a need, then we have got some money. There are also places where we can apply for additional funding, so as long as we can prove the need and the potential impact and outcomes, then that is an external funding bid.’

Qualitative data was also collected from the residents who took part in the intervention and were used to assess the implementation of the proposed strategies within the multi-level PA intervention. Through the interviews with the residents, several strengths and weaknesses of

the intervention components were identified. The multi-level intervention aimed to address factors at several levels of the SEM.

The information leaflets initially aimed to highlight the key benefits of PA for older adults, although this is something that may have been clearly understood by the participants, as all participants scored over 72% in the outcome expectations for exercise scale. Within the participant feedback, the main benefits reported from the intrapersonal components of the intervention were the self-monitoring and goal-setting booklet. These components allowed participants to easily monitor their PA levels. This increased participant self-awareness of their current PA levels, which could then be compared with recommendations provided within the booklets. This reportedly increased conscious effort to be more physically active. Anabelle, 76 years old, explained how she felt the intervention was *'making me more conscious that I have to move more'*. She continued *'which is a good thing because you just get up and move'*. Graham, 72 years old, also stated:

'My goal was still 2500 average per week, but last week I averaged 2702 and this week I averaged 2875. (Laughs) I tend to make excuses to get up and do a bit more. I mean, last Friday I managed to reach 3700 steps.'

Although the self-monitoring/goal-setting component of the intervention was often reported as beneficial by the participants, some participants initially found it difficult to set goals, as they didn't want to set a goal which was too difficult for them to achieve, which they would have perceived as a failure. Elizabeth, 71 years old, stated *'I don't write down any goals as I feel 'I have to do it' and if I don't do it, then I would feel guilty'*. Another participant Alice, 80 years old, also reported these objections to setting goals and putting them in writing, *'I just feel if I increase it anymore, I am not going to achieve it'*. Support during the bi-weekly check-ins allowed the participants to comfortably set achievable targets, which in turn provided the participants with increased motivation, confidence, and enjoyment.

Participants also experienced technical problems with the pedometers that were used for the self-monitoring component of the intervention. Ian, 68 years old, explained *'The programme was good, apart from the equipment that we had to use. The wrist bands weren't very accurate'*. The inaccuracies of the pedometers resulted in participants feeling like they were not getting rewarded for their efforts, which led to a decrease in motivation. Deborah, 73 years old, explained, *'The watch was inaccurate which had a negative impact on my motivation. I felt like 'why should I even bother recording if it is not accurate.'* Dorothy, 70 years old, also mentioned

that the pedometers were ‘*rubbish*’, which became ‘*frustrating*’ as it felt like she was ‘*wasting her time*’. Therefore, it was important for self-monitoring equipment to be accurate so that the participants could experience positive changes to their motivation, confidence, and enjoyment. By purchasing higher quality pedometers, the total cost of the intervention per participant may increase.

There were very few reports of social PA by the participants in the intervention. Although the intervention tried to encourage participants to combine social and physical activities, many of the participants walked alone. However, one participant would often walk with their partner. Ian, 68 years old, explained how since taking part in the intervention, he and his partner aim to go out for walks in the early morning.

‘I do appreciate the importance of doing daily walking. Especially with the lockdown, me and XXXX both go out for an early morning walk. Not a strenuous walk, but we go for some exercise by doing a walk. Yeah, so it has tuned us into that.’

Another participant reported how she found benefits in the bi-weekly phone calls throughout the intervention. These calls provided support for the participants when it was needed, including overcoming barriers, technical problems and setting goals. Elizabeth, 71 years old, was asked about what she found most beneficial in the intervention. She responded, ‘*Well your phoning was helpful and encouraging and as I said writing down, you could see how many steps you were doing, so, I found that helpful*’. Although participants wouldn’t participate in group PA, the support from the intervention leader encouraged continued efforts to increase step counts.

From an organisational standpoint, the bi-weekly phone calls that were conducted throughout the 12-week intervention were perceived to be feasible by the manager of the health and well-being team. All participants engaged in all of the phone calls with the lead researcher, and the manager of the health and well-being team explained how this would be a realistic approach to implement the intrapersonal element of the PA intervention. She explained:

‘It is a phone call. It is travel that takes up loads of time. If you see someone, it quadruples the time that you would spend on the phone with someone. Because they want your company. But as it is a phone call, that is completely doable. That would completely be doable for the well-being facilitators to do that phone call and do that check-in.’

The interviews with the participants also identified that there may be a wider reach of the intervention than those who were directly taking part. Participants reported that they valued the behaviours from the intervention so that they would encourage their friends and family to take part also. Deborah, 72 years old, spoke about how she has encouraged her friends to start monitoring their steps on their phones, she explained, *'I have got loads of people onto it now too. Some of my friends have started with their phones, they never thought to look at their steps on their phones, so I have got a few of my friends doing that now.'* Another participant, Graham, 72 years old, explained how his wife had seen him experience benefits from taking part in the intervention, so she had decided to adopt some of the goal-setting behaviours herself. He mentioned *'(his wife) as well. She can't wait now. She is setting herself goals, which helps me as well'*. Participation in the intervention thus may not only influence PA behaviour of the participants but may encourage significant others of whom they have influence over to be more active.

Occasionally, participants mentioned the use of benches when going out for walks as an area to stop and rest, indicating that frequently located benches can provide areas of rest for the participants when walking in the surrounding area. Suzie, 69 years old, explained how she needed a park bench to rest, when she had not been out walking for some time as a result of the COVID-19 lockdown, *'And I was glad to find the first bench in the park to sit down. So, I think that will be quite difficult to get back (her fitness)'*. This supported the inclusion of benches within the estate to increase the walkability of the surrounding area. Another environmental factor evident within the qualitative data was poor weather conditions. Participants often spoke of the difficulty increasing their step counts as a result of poor weather conditions, which would result in them sitting indoors or using public transport as an alternative to walking as a means of travel. Ian, 68 years old, explained:

'It has been hit and miss trying to reach my target because the weather has been so up and down. I feel like my target is set too high, because I set that when the weather is good, but I tend to take the bus around now when the weather is like this. So, I am bound to walk less.'

One of the aims of the intervention was to allow participants to fit their PA goals into their general day to day habits, which made it difficult through the winter months as many of them would accumulate higher step counts from walking outdoors. Deborah, 72 years old, explained *'If the weather is nice, I walk more. If it is bad, I go on the bus. So, it is all down to the weather'*. Poor weather conditions would result in an unsuitable walking environment for the participants

as it decreased enjoyment and increased the fear of falling, as Alice, 80 years old, explained *‘It has been tough because the weather hasn’t been good, and it makes me scared of falling’*.

Although the weather would often result in lowered step counts, the flexible design of the intervention allowed participants to calculate their weekly average step count to achieve their step goals. Thus, if poor weather conditions inhibited their ability to accumulate steps, then they could increase their average by taking advantage of days which were more walker friendly to accumulate a greater weekly average. This was evident in a conversation with Graham, 72 years old:

‘So, my goal this week was to achieve 3000 steps per day. I did this on Monday, Thursday, Friday, Saturday, and Sunday. Tuesday and Wednesday were pretty low for some reason. But I averaged out at 3059, which means I achieved my target’.

5.3.10. Maintenance

Long-term quantitative measures of effectiveness were not assessed within this study due to the limited pool of participants and the time constraints of the research project. Therefore, maintenance of any quantitative changes could not be assessed. However, interviews with the participants indicated that the residents who took part in the intervention continued to pursue PA behaviours up to 6 weeks after the intervention had come to its conclusion. Graham, 72 years old, explained how he could see the improvements he was making, which motivated him to want to continue the intervention after its conclusion:

‘Well, in the couple of weeks that we were doing it I improved myself and I felt the improvements and I just wanted to keep it up. There is no point in just doing it for a few weeks and just forgetting about it again. I wanted to keep it going. And I did keep it going for quite a while after. You know, keeping a record of it.’

Progress was a good motivator for increased efforts within the intervention. The step goals provided an instant sign of progress that may be easier to identify than the physical and psychological benefits of PA, such as improved health markers and sense of well-being. The identifiable progress also encouraged an increased sense of confidence, which was evident in the experience previously reported by Alice, 80 years old, who initially felt it was unrealistic to achieve 8000 steps per day, however, towards the end of the intervention was achieving well over what she had previously thought was unrealistic. By challenging herself through goal-setting and self-monitoring, she also reported feelings of enjoyment. The sense of achievement felt when accomplishing goals facilitated enjoyment in PA, which led her to continuing to walk

in her garden after the intervention had finished and the lockdown rules from the COVID-19 pandemic had been put in place:

'I just really enjoyed it, and the more I did it, I got really competitive with myself. I still am, because I walk, one of the walks I took is about a mile and a half away from where I live, and I am doing that walk in my garden twice per day. So, I am competing with myself really.'

The participants felt that by taking part in the intervention, their pursuit of PA behaviours continued. Several of the participants reported continued attempts to be physically active, even when confined to their own home. Deborah, 72 years old, explained, *'Well I am doing exercises every day, they are quite strenuous, they are what I was doing years ago. But my steps are not so many because I am not going out.* This was vastly different to the approach to PA of participants in the control group, who reported no attempts to be physically active, even though they knew it would have benefits for them. Margaret, 74 years old, explained, *'I can't be bothered. I should persevere really. I know that, but I can't be bothered. I'll do my knitting or watch something on TV.'*

5.3.11. Purpose

Within the interviews, purposeful activities were a common theme amongst the participants. Participants explained that they accumulated more PA through step counts when they had a purpose for the day. For example, having responsibility of a pet and general day to day tasks, such as shopping, were purposeful activities that they would participate in, resulting in increased step counts. Many of the participants spoke of how their step counts were far higher when they 'had a reason' to get up and out of the house. This included work commitments, responsibility for pets, socialising, shopping, household tasks and chores, visiting new places and looking after grandchildren. Abigail, 72 stated, *'I set myself a target of 7000 steps and I have been achieving it, especially when I go out with the dog or shopping with my daughter'*. Anabelle, 76 years old, also discussed how her more active days were when she had tasks to complete such as shopping:

'It has been getting better, I mean I did 7212 one day, because I went out shopping with my daughter'. She continued, *'When you have a little bungalow, what do you do? But when you have something to do, you're always on the go'*.

The theme of having 'something to do' seemed to be a key factor in achieving higher step counts, as it provided a reason to 'get up' and 'move around'. On days on which the participants had very little to do, they were more inclined to sit down and do very little activity. Therefore,

having a role/task for the day was a key influencer of their activity for that given day. It is also worth noting that if the participants were not walking, they would be sedentary, meaning that having ‘something to do’ not only encouraged PA, but resulted in reduced sedentary behaviour.

5.4. Discussion

The purpose of this mixed-methods study was to assess the implementation of a person-centred, multi-level PA intervention within a residential estate of older adults. The study explored device measured PA, psychosocial measures of health-related quality of life, loneliness, self-efficacy for PA and outcome expectations (quantitative outcomes). The study also used qualitative data obtained throughout, and immediately post intervention, with participants of the intervention and a member of the health and well-being team at the housing association. The qualitative data aimed to assist with the interpretation of the quantitative data and to explore participants’ personal experiences, for a more holistic assessment of the implementation strategies used with the intervention conducted within the residential estate. This chapter includes a discussion of the findings from the implementation trial, its contributions to the current literature on PA participation and implications for organisations responsible for the health and well-being of older adults. Finally, the chapter concludes with a discussion of the limitations of the study and recommendations for future research.

Organisations which work directly with large groups of older adults can be useful vehicles for the delivery of interventions (Kingstone et al., 2019). Additionally, the dual role of the researcher-implementor allowed the researcher to explore the context in which the intervention was carried out, allowing further insight into the participant experiences and the implementation of the intervention strategy. This is supported by previous research on the advantages and challenges of dual role researchers by Trondsen and Sandaunet (2008). The role of the researcher-implementor allowed for the co-construction of data through sharing the experience with the participants of the intervention and by getting ‘close’ to the data, which may produce deeper understandings of the implementation of the intervention components (Alvesson & Sköldbberg, 2000).

The RE-AIM framework was used to assess the implementation of the person-centred, multi-level PA intervention used within the residential estate of older adults. This framework has been previously used to evaluate interventions conducted within real-world settings (Glasgow & Estabrooks, 2018). Whilst, in theory, person-centred PA interventions may increase PA behaviour in older adults, as Glasgow et al. (1999) state, the knowledge generated by the RE-

AIM framework goes beyond research and supports programme adaptations to various cultures and populations within the real world.

The present analysis investigated components of the RE-AIM framework by collecting qualitative and quantitative data from intervention participants and an employer at the organisational level. Due to the modest sample size within this study ($n=18$), there was limited statistical power ($1 - \beta = 0.2$). This may have played a role in limiting the significance of some of the statistical comparisons that were carried out and means that the effectiveness of the study cannot be examined. A post hoc power analysis using G*power showed that based on the mean, between-groups comparison effect size observed in the present study ($d = .23$), an n of approximately 100 participants would be needed to obtain statistical power at the recommended .80 level (Cohen, 1988). The findings identify strengths and weaknesses of the intervention and potential areas for developing intervention strategies. Findings identify potential issues related with the use of person-centred, multi-level PA interventions within residential estates of older adults.

Results showed that the intervention offered within the residential estate had limited *reach* with the target population ($n = 18$). Within the PA intervention, 14 of the participants were female, with only 4 males being recruited. This is similar to previous research that has shown that recruitment of older adults into PA interventions presents many challenges, one of which being that older males are more resistant to engaging in PA programmes (Jancey et al., 2006). Many of the participants who took part in the intervention also reported having an interest in health and fitness at some stage in their life and wanted to make improvements to their current activity levels. The recruitment strategies used within this intervention may not have been suitable for recruiting harder to reach older adults who don't share a similar interest. A systematic review published by Franco et al. (2015) on barriers and facilitators to PA programme participation in older adults identified that some individuals believe that PA isn't necessary for people over 65 years and can even be potentially harmful. The study also identified that older adults may understand the health benefits of PA but report a range of barriers to PA engagement. The manager of the health and well-being team also highlighted the difficulties experienced when engaging older adults within the residential estate in other health and well-being programmes, stating that many of the residents show resistance to engaging in initiatives run by the organisation. However, it was reported that referral to health and well-being schemes through neighbourhood managers has resulted in less resistance from residents within the area, therefore, to improve *reach* to those more resistant older individuals, using a referral scheme

as a means of entry onto the PA programme could be considered. This is supported by previous studies that suggest that recruitment via health professional referral can enhance the recruitment of the target audience onto PA programmes (Bird et al., 2019).

Within the qualitative data conducted in the bi-weekly check-ins, participants frequently reported increased step counts, which they were monitoring via pedometers and recording within their step tracking booklet. Participants stated within the interviews that poor weather conditions inhibited their ability to accumulate steps. Therefore, PA levels would naturally decline within the winter months (Nakashima et al., 2019) and they would be more inclined to 'sit down and do nothing'. Participants from the intervention group felt that the increased awareness of their PA levels resulted in greater conscious effort to be more physically active by getting up and walking more in order to achieve the step targets that they had set that week. This showed that the self-monitoring component of the intervention was a useful strategy for increasing PA in older adults. This is supported by Compernelle et al. (2019) whose systematic review of the literature suggested that self-monitoring can be used to reduce sedentary behaviour and that developers of multi-level interventions may want to include this behaviour change strategy within their approach.

Due to time constraints, the *maintenance* of the intervention could not be quantitatively analysed. However, qualitative data showed promising signs for long-term behaviour change within the residents. Participants from the intervention group frequently reported pursuing forms of PA, such as exercise, during the COVID-19 pandemic. In contrast, the participants from the control group all understood that they should try and be more physically active but had made no effort to pursue PA behaviours. Within the intervention group, the self-awareness of their PA levels they had developed through taking part in the intervention led to increased conscious effort to be more physically active both during and after taking part in the intervention. These efforts were also maintained when faced with the barriers they faced due to the COVID-19 lockdown rules.

The quantitative data showed no significant differences over time between the control group and intervention group in the HRQOL domains. Previous research has shown increased PA levels to have an indirect influence on HRQOL through measures taken at baseline and 18-month follow-up (Phillips et al., 2013). In addition to the small sample size limiting statistical power and the ability to detect differences between groups, a limitation of the present study is the relatively short duration, which did not allow for any improvements in HRQOL to take

place. However, within the qualitative findings, the participants noted several benefits to their emotional well-being throughout the qualitative interview sessions conducted during the intervention process. The participants reported increased confidence in their abilities to participate in PA, as well as enjoyable experiences when taking part in walking-based exercise that was taken up as a result of the intervention. Bandura (1997) states that one's self-efficacy is dependent on performance accomplishments, vicarious experience, verbal persuasion, and emotional and physiological states. Participants within this study could easily identify performance accomplishments (achieving step count goals), experienced positive emotional states (enjoyment), and received verbal persuasion (through bi-weekly check-ins). These psychological responses to participating in a PA intervention have also been found in previous qualitative research. Von Berens et al. (2018) carried out focus groups with older adults who participated in a 6-month exercise-based programme and identified an overarching theme of 'feeling more self-confident, cheerful and safe'. These psychological responses have been shown to indirectly influence HRQOL through improvements in self-efficacy for exercise and self-worth (Phillips et al., 2013), and can contribute to an individual's personal belief in their capabilities to change their lifestyle and carry out behaviours they previously thought were unattainable.

Both groups in the present study showed modest declines in self-efficacy over time, although these changes were not found to be significant. Although, self-efficacy was significantly higher in the intervention than in the control group, regardless of time. This may be a result of the recruitment process, which led to three participants in the intervention group being recruited from an exercise class (Pilates). Therefore, one would expect self-efficacy to be higher as several of the group were currently take part in some form of exercise at least once per week and self-efficacy has been shown to be influential in the uptake of PA behaviours, such as exercise (McAuley & Blissmer, 2000).

Although the quantitative data did not show significant changes in self-efficacy, which could be attributable to the small sample size limiting statistical power and the ability to detect differences between groups, the qualitative data showed improvements in self-efficacy for PA behaviours in several of the participants who took part in the intervention. One participant mentioned how she felt that achieving 8,000 steps per day was unrealistic for someone of her age but ended the intervention reportedly achieving 9000+ steps on her more active days. Another participant explained after seeing the improvements he made during the intervention, that he is now excited to go out walking more in the future. Though, due to the dual role of the

researcher-implementor, it is important to consider the possibility that these responses were given to satisfy the researcher. Participants may have felt an obligation to the researcher to have their programme be successful, therefore they provided them with information that they ‘wanted’ to hear (Trondsen & Sandaunet, 2009).

Self-efficacy for PA is an individual’s beliefs regarding their capabilities to successfully carry out this health behaviour (Bandura, 1997) and can be considered as a situation-specific form of self-confidence. Several of the participants showed improvements in self-confidence in the context of PA, as they were more confident in their capabilities to be physically active after seeing that they could walk much more than they initially perceived. This was a result of the self-monitoring component of the intervention, which allowed participants to easily identify performance accomplishments and self-mastery. Identifying successes in increased step counts allowed for immediate identification of progress, which may be easier for older adults to identify when compared with other performance accomplishments that may take longer to become evident, such as weight loss or improved health markers. These achievements are important in the development of self-efficacy as they provide the individual with feelings of mastery and performance accomplishments (Bandura, 1997).

Bandura (2004) states that self-efficacy influences the activities that an individual pursues and the perseverance they display in overcoming challenges or setbacks. This was also evident within the qualitative data of the present study, whereby several of the participants from the intervention group explained how they continued to pursue PA, despite the restrictions put in place by the Welsh Government due to the COVID-19 pandemic. This pursuit of PA was not seen within the interviews with the control group. Incorporating self-regulation techniques, such as goal setting and self-monitoring, into PA interventions has been evidenced to improve older adults’ ability to successfully increase their PA levels (McAuley et al., 2011). This is supported by the present study which saw participants increase conscious effort to be more physically active when taking part in the intervention and continued the pursuit of PA behaviours once the intervention was complete and they faced further barriers as a result of the COVID-19 lockdown restrictions. Self-regulation techniques included recording steps via a pedometer, keeping a weekly log, calculating average step counts and weekly goal setting. This is contradictory to the findings from a recent systematic review by French et al. (2014), who found self-regulatory techniques such as goal-setting and self-monitoring of behaviour to be associated with lower levels of self-efficacy and PA. Zubala et al. (2017) suggest that goal-setting on its own may not be effective, although may be effective when combined with other

BCTs. Within this study, goal-setting was combined with other BCTs such as providing information of how to perform a behaviour and self-monitoring. The participants frequently mentioned the benefits of the self-monitoring component of the intervention. By being able to objectively measure their PA through step counts, conscious decisions could be made to ‘get up’ and ‘move more’. Compennolle et al. (2019) previously highlighted the importance of objectively measuring PA when aiming to reduce sedentary behaviour in older adults using self-monitoring techniques, as it is often accumulated subconsciously in older adults. This study demonstrated how by objectively measuring PA and setting daily step goals, older adults could make the conscious decision to increase their efforts towards increasing their PA behaviours.

Findings from the quantitative data did not show any significant differences in outcome expectations between control and intervention groups over time which could be explained by the small sample size limiting statistical power and the ability to detect differences between groups. However, descriptive statistics showed a modest increase in the intervention group and a decrease in the control group. The qualitative findings showed that participants experienced positive physical and social benefits from taking part in the intervention that increased their motivation to participate in PA. Outcome expectations reflect an individual’s belief that a chosen behaviour will result in a specific outcome and have been associated with increased levels of PA (King, 2001; Williams et al., 2005). This was evident in the present study, whereby, as mentioned above, participants continued to pursue PA behaviours, when confined to their own home as a result of the COVID-19 lockdown rules set by the Welsh government. Several participants continued to participate in home exercise, including walking in their garden and conducting exercises that could be remembered from previous exercise experiences. Participants understood that continuing PA when in lockdown was important as it would result in physical benefits, such as increased mobility and decreased feelings of physical pain. These benefits are incentives for taking part in PA behaviours that were valuable to the participants. Conversely, in the control group, the participants were aware that exercising from home would be beneficial to them but made no conscious effort to do so, which highlights the importance of outcome expectations in the decision-making process, as proposed in social cognitive theory (Bandura, 2004).

One explanation for no significant improvements in outcome expectations within the intervention group may be that outcome expectations for PA scores were high at all time points and in both groups. Scores ranged between 32 and 36 in the control group and the intervention

group scores ranged between 39 and 41, out of a total of 45. These predominantly high scores may suggest a ceiling effect of the 1-5 scoring, which may have made it difficult to identify any significant changes in outcome expectations for PA within the intervention group.

The intervention group felt less lonely at all three time points. This may be a result of the intervention group having a higher percentage of participants who were married/living with a partner (62.5%) than the control group (37.5%) and previous research suggests that one's perceived lack of intimate relationships can contribute significantly to feelings of loneliness in old age (Ayalon et al., 2013; de Jong-Gierveld, 1998; Dykstra et al., 2005). However, the intervention group had increased feelings of loneliness when taking part in the PA intervention. Participants often reported engaging in PA on their own, which may explain the increased feelings of loneliness within the intervention group. Pels and Kleinert (2016) state that it is the quality of relationships within a PA context that moderates the positive relationship between PA and loneliness. Therefore, although the intervention aimed to offer social support through bi-weekly check-ins and encourage the participants to combine social and physical activities, this may not have provided the quality of relationship needed to positively influence feelings of loneliness.

As mentioned previously, participants within the present study often engaged in PA on their own. This was due to PA often coming in the form of general activities which were usually carried out on their own, such as shopping or walking for transport, or a preference to conduct PA on their own, such as walking as a means of exercise. Although previous research has identified social interactions as a key motivator of PA (Guell et al., 2018), the present study suggests that this may not always be the case. Some older adults may prefer to engage in PA on their own. This was also evident in the first study within this thesis, which highlighted how group PA can result in individuals making negative comparisons with other older adults, thus acting as a reminder that they are not as capable as they once were in a PA environment. The present study aimed to allow the participants to self-monitor their own activity levels through step counts, which allowed them to dictate when, where and with whom, they engaged in PA. Even though this offered the opportunity to have autonomy over their PA behaviour, it lacked the necessary social support needed to support feelings of loneliness within the participants. Therefore, future intervention strategies may need to provide greater support for older adults to develop quality relationships within a PA environment if they are going to have a positive influence on feelings of loneliness.

The participants were provided with an information leaflet at the start of the intervention, which highlighted how to incorporate social and physical activities, but this was not enough to encourage social activities or decrease feelings of loneliness. Bowling et al. (2003) identified ‘social relationships’ and ‘social roles and activities’ as key themes that contribute to older adults’ quality of life, whilst social interactions can provide ‘meaning’ to an activity that without it may become ‘meaningless’ (Argyle, 2001). Older adults prefer meaningful activities (Read et al., 2013), therefore the intervention presented within the study may have benefitted from an increased focus on encouraging social roles within physical activities if it was going to have a positive impact on loneliness within the participants. These findings are supported by a systematic review of the literature (Pels & Kleinert, 2016), which suggests PA can contribute to decreased feelings of loneliness, although this effect is dependent on the quality of relationships shared during participation in PA. Although the weekly check-ins aimed to provide social support for the participants, this relationship was neither deep nor meaningful enough to have a positive impact on measures of loneliness within the participants.

In relation to the *adoption* of the intervention by the housing association, this intervention was the first of its kind to be implemented within the residential estate. Through the qualitative data collected with the manager of the health and well-being team at the housing association, it is believed that the intervention design that was implemented within the residential estate could be implemented by the staff within the team. The findings suggest that the intervention could be delivered by a 3rd party, as was done within this study. By working with other stakeholders of older adults’ health and well-being, such as research teams, charities and universities, housing associations may overcome barriers to delivery by collaborating with 3rd parties who can help with intervention implementation.

Findings also suggested that the *reach* of the intervention may be better improved through the addition of a referral scheme. The representative from the health and well-being team at the housing association identified that referral onto other health and well-being interventions within the residential estate have been well accepted by the residents. This is supported by a recent systematic review from Albert et al. (2020), which highlighted that PA referral schemes can be a key motivator for individuals to take part in, and adhere to, PA interventions. Within this study, it was believed that through a referral scheme, the housing association would be better positioned to manage resources and recruitment onto the intervention, and that this approach would be feasible for the implementation of the intervention in the future.

Regarding the *implementation* of the intervention within the residential estate the cost per participant of the intervention was £25.57. Within implementation research, there is a lack of reporting on costs associated with PA interventions (Abu-Omar et al., 2017), which makes it difficult to compare the cost to other interventions. However, the representative from the housing association felt that these costs were feasible, in spite of limited funding. These findings may not be generalisable, however the affordability of this intervention would be dependent on the funding available and the number of individuals which it aims to target. In relation to the deliverer's fidelity to the intervention, the intervention was delivered consistently for each participant who took part. However, it is worth noting that during data collection, the participants opted not to engage in the physical functioning test. After only 1 of the initial 6 participants took part in the test, the test was discontinued for the remainder of the intervention. This should be taken into consideration if the intervention was to be conducted on a larger scale, as assessing physical functioning may come with some resistance. Reasons for not wanting to engage in the assessment included not feeling comfortable, lack of readiness and a personal preference not to.

Some participants reported technical problems when using self-monitoring tools. Through the role of a dual researcher and implementor, the researcher was able to respond accordingly to issues faced during the implementation of specific intervention components. Thus, technical problems with self-monitoring tools could be addressed effectively and efficiently. Barrier identification and problem solving has previously been highlighted as an effective BCT for increasing PA (Zubala et al., 2017). Through frequent engagement between the researcher/implementor and participants, it allowed the researcher to develop further knowledge into the implementation strategy of the intervention components. Morrison and Liford (2001) describe this as *simultaneous improvement*. This allows for the intervention to be changed in order to deal with a problem, whilst in the process of research. By incorporating the role as a dual researcher, immediate use of the data could be made, as could adjustments to intervention strategies. Within this study, the bi-weekly check-ins provided the researcher with an opportunity to continuously assess the experiences of the participants and incorporate this information into the development of the intervention components, therefore the users of the intervention had an active involvement in the continued development of the intervention design.

The participants also identified how they found the feedback from the deliverer during the bi-weekly check-ins supported their efforts to be more physically active. This is consistent with

previous research, which identifies that support and guidance provided by intervention deliverers is perceived to be key in facilitating positive changes in participants (Matthews et al., 2014). This highlights the need for continuous support from the deliverer of the intervention to help the residents to overcome barriers, address any technical issues with the intervention and help with achievable goal setting for the participating residents.

Finally, a key finding within the qualitative data was the influence of purposeful activities on the PA of the participants. Participants often highlighted ‘having something to do’ as a key reason for being more physically active, and unless there was something purposeful to do, then it became natural to ‘sit down and do nothing’. Morgan et al. (2019) state that PA can support older adults in regaining feelings of purpose, through being needed in collective group activity and by providing structure to the day. The present study highlights that this process can be reciprocal and by ensuring older adults have a meaningful daily structure, which includes a range of purposeful tasks, can provide opportunities to carry out physically active behaviours. For example, walking to shops to collect groceries or helping family members with their DIY. Purpose in life is associated with health behaviours such as healthy eating and PA, and psychological states that support good health such as self-efficacy (Ribeiro et al., 2020). Though purpose in life is evidently influential in the health and well-being of older adults, previous research has shown decline in purpose as we transition from mid-life into older adulthood (Pinquart, 2002; Yu et al., 2015). Older adults who feel that life is meaningful will have desires and goals that are worth living for (Ryff, 1989). Therefore, one would presume that maintaining purpose in life in old age would increase motivation to pursue behaviours that facilitate good health. Future interventions may want to include strategies that can maintain a sense of purpose in life that may be lost as we transition into old age, which may encourage increased PA behaviour in older adults’ day-to-day life.

5.5. Strengths

Strengths of this mixed-methods implementation trial include the use of the RE-AIM framework, alongside both qualitative and quantitative data from a variety of sources to explore the implementation of the proposed person-centred, multi-level PA intervention within a residential estate of older adults. This study combined quantitative data with qualitative semi-structured interviews. This approach allowed for observations relating to quantitative variables (PA, HRQOL, Loneliness, Self-efficacy and Outcome expectations) to be further explained, contextualised or expanded upon within the qualitative data. This was particularly beneficial within the present study, where the quantitative data had limited power due to a small sample

size as a result of a small population group within the residential estate. The study also used objectively measured PA, which has been shown to be more accurate than self-report measures used in previous research (Prince et al., 2020). Finally, the residential estate was a suitable setting for the implementation of the intervention and could be used for future research within this area of study.

5.6. Limitations

As previously mentioned, the relatively small sample size meant that the quantitative data lacked statistical power, which meant that a significant finding may have been difficult to detect. This mixed-methods approach combined quantitative data with qualitative interview sessions from the intervention participants and a stakeholder of the intervention to provide a deeper insight into the explored variables, interventions components and contextual factors. This was particularly beneficial in this study where the quantitative data suffered from limited power due to the small sample size available. Although the intervention was implemented and addressed factors on multiple levels of the SEM, we were also unable to identify which components were perceived as most beneficial by participants. However, qualitative findings did offer insight into what intervention components the participants found more beneficial in their own experiences. Finally, as this study was designed and implemented based on a certain context, then generalisations from this study should be approached with caution. These findings are specific to the individuals present within the study and the study context.

5.7. Future research

The present study highlighted the importance of purposeful activities in the accumulation of PA in older adults. Previous research has also identified that older adults have a preference for physical activities that are more meaningful to them (Guell et al., 2018). Future research may want to explore the inclusion of concepts such as meaning and purpose in life, into person-centred PA interventions for older adults. By maintaining feelings of meaning and purpose in life, older adults may increase levels of PA as a by-product of other activities that they choose to engage in, such as social and intellectual activities.

5.8. Conclusion

The present study offers a promising strategy for encouraging PA behaviour in older adults living within a residential estate. The mixed-methods synthesis of quantitative and qualitative findings suggests that the person-centred multi-level PA intervention presented within this study supported more conscious effort towards being physically active. The overall

effectiveness of the intervention could not be assessed, due to the lack of statistical power. However, participants reported several key physical and psychological benefits from taking part in the intervention, within the qualitative data. The intrapersonal components of goal setting and self-monitoring were regarded as key features of the intervention strategy, which provided easily identifiable progress and an increased awareness of their current PA levels and how these compared to the PA guidelines set by the WHO. Participants indicated that the intervention helped increase motivation to walk more and confidence in their ability to be more physically active through increased step counts. The intervention was perceived to be feasible for implementation by the housing association and areas for future implementation strategies, such as a referral scheme, were also identified within the interviews with the health and well-being officer.

The study also highlighted the importance of purposeful activities as a key source of PA for older adults, with PA being the by-product of, rather than the driving factor behind, the activity itself. This suggests that maintaining purposeful activities in old age may be an important factor in the maintenance of PA.

5.9. Chapter summary

This chapter assessed the implementation of the person-centred, multi-level intervention that was designed using the findings from Study 1. The chapter discussed the strengths and weaknesses of the intervention, how this research adds to the current body of literature on PA interventions for older adults and provided recommendations for future multi-level PA interventions. Finally, the chapter highlighted the strengths and limitations of the study, and the final conclusions. The concept of purpose was highlighted as a key factor for engaging in PA within the intervention, therefore the following study will aim to explore purpose, and related concepts such as meaning and identity, in later life and how this may influence PA behaviour in older adults.

6. Purpose, meaning, identity, and physical activity in later life: A composite vignette of older adults' transitions into old age and how they influence physical activity behaviour

This study was informed by the findings from the previous 2 studies, which highlighted the importance of purpose, meaning and identity in the PA behaviour of the residents living within the residential estate. This study will look use creative non-fiction to develop our understanding of the relationship between these 3 concepts, and their influence on PA behaviour in older adults, which will be presented in a composite vignette.

6.1. Introduction

An older adult is often defined by being aged 65 years and older. However, becoming 'old' is not a single occurrence that is determined by the age of an individual. Schumacher et al. (1999) states that becoming an older adult is a process that happens over time, with several gains and losses. Older adults experience many transitions that are characteristically linked to their physical health, sense of purpose, identity, beliefs about the world around them, and their capabilities in carrying out daily tasks (Pettit et al., 2015). Transitions into later life are major events and include retirement (Barnett et al., 2012; McDonald et al., 2015), bereavement, relocation (Bidonde et al., 2009) and a decline in physical health (Dumas & Laberge, 2005), all of which can increase an individual's awareness that they are becoming old. This awareness of the ageing body is often associated with a decreased sense of purpose and identity (Morgan et al., 2019). The outcome of a transition will be dependent its context, and how the individual experiences the transition (i.e., positive, or negative transition). For example, retirement is a transition that is often associated with older age, but the changes in life that occur from retirement are likely to be different from the changes related to bereavement, another transition which is likely to be experienced in older adulthood. As individuals age, circumstances change as we gradually lose things that previously occupied our time and gave purpose to our lives.

6.1.1. Purpose and meaning in life

Purpose in life has emerged as an important concept in psychology and is considered to be imperative to an individual's well-being. Although definitions of purpose in life can vary, they all share three common components: commitment, goal directedness and personal meaningfulness (Bronk, 2014). Kashdan and McKnight (2009) define purpose as 'a central, self-organising life aim that organises and stimulates goals, manages behaviours and provides a sense of meaning' (p. 242). Meaning is another concept related to purpose in life. A sense of

meaning in life can give zest and vigour to one's life (Frankl, 2006) and is positively associated with increased subjective vitality and self-rated health in older adults (Mcmahan & Renken, 2011). Having meaning in life "strengthens us, not by numbing our pain or distracting us from our problems, or even by comforting us. It heals us by reminding us of our integrity, who we are, and what we stand for" (Remen, 2001, p. 5). Purpose can provide a sense of meaning to an individual and encourage behaviours directed towards achieving personal aims and objectives, which also offer insight into how and why individuals remain healthy over time (Irving et al., 2017). Purpose in life is a key feature of well-being, and individuals who lack purpose may experience total meaninglessness within their life (Frankel, 1958). Frankel (1984) further suggests that the pursuit of a meaningful purpose in life is essential for human motivation and that purposelessness can result in ill health, boredom, hopelessness, depression, and the loss of a will to live. Low sense of purpose in older adults has been attributed to decreased opportunities for purposeful engagement in activities and a loss of roles within society (Hedberg et al., 2010). Bronk (2014) states that individuals find a strong sense of purpose during their adulthood through roles as a parent, carer and by involvement in work or voluntary occupation. A loss of purpose as we age can be influenced by a series of transitions that are commonly associated with later life (Kaplan & Berkman, 2019). As we transition into older adulthood through lived experiences of bereavement, retirement, decline in physical health and relocation, maintaining levels of purpose may become more difficult due to the losses associated with these transitions.

Current literature suggests that purpose in life is associated with several physical and psychological outcomes. Physical factors include a stronger immune system (Bower et al., 2003), lower levels of inflammatory markers associated with age-related disorders (Friedman, 2007), lower blood pressure (Mezick et al., 2010) and has also been correlated with increased levels of high-density lipoprotein cholesterol (HDL; Ryff et al., 2004). Psychological factors positively associated with purpose include better cognitive reserve (Boyle et al., 2012), better stress management (Fogelman & Canli, 2015), increased optimism and positive affect (Kim et al., 2013), proactive coping (Prairie et al., 2011), life satisfaction (Sougleris & Ranzijn, 2011) and higher levels of subjective well-being (Ardelt, 2003). People can develop purpose from relationships, roles in society (e.g., family, occupation, societal), personal goals, maintaining independence, community engagement and/or participating in activities that hold meaning (Irving et al., 2017). Older adults may find difficulty in maintaining high levels of purpose in life may become more difficult, due to increasing losses (e.g., bereavement, retirement).

Transitions into old age can be extremely challenging, therefore maintaining purpose in life may be crucial during these transitions as it can promote resilience against life challenges and obstacles, resulting in more positive and healthy transitions into older adulthood (Kashdan & McKnight, 2009).

Morgan et al. (2019) state that PA can help regain feelings of purpose in older adults by providing habitual routine, structure to a day and responsibility to others, which may have been lost through the transitions into older adulthood. Recent qualitative findings identify how older adults favour meaningful activities to accumulate PA in later life. For example, walking to socialise with friends or taking the dog for a walk (Guell et al., 2018). However, as purpose in life has been shown to decline as we age, particularly for those who have experienced greater losses through the transitions into older adulthood (Pinquart, 2002), this can leave some older adults with fewer purposeful activities to keep them physically active in later life. This highlights the importance of maintaining a sense of purpose in older adults, if they are going to frequently engage in a PA.

6.1.2. Identity

Identity provides meanings associated with a role (Burke & Stets, 2009). When people subscribe to an identity, these meanings provide them with personal goals which they aim to achieve through participating in corresponding behaviours (Burke & Stets, 2009). Identity is another concept that is vulnerable when an individual passes through transitions into older age. An individual may hold multiple identities such as a farmer (occupation), father (family member), or friend (social relationship). Older adults may suffer from a loss of identity through the changes experienced in identities/roles, going through retirement, dealing with the death of a spouse or when the role of a caregiver comes to an end (Morgan et al., 2019). Morgan et al. (2019) state that these transitions can affect the identity of an older adult, which could potentially explain the lack of PA in the older adult population, through a loss of ‘social labels’ and a decreased sense of self-worth. Warmoth et al. (2016) state that identity is created in response to life experiences and changes in personal circumstances, thus transitions construct identity. For example, if an individual experiences the death of a spouse, their identity will shift in response to the change in circumstances and their identity may become that of a widow. An individual’s identity will dictate their motivation to pursue behaviours associated with that identity (Oyserman, 2007). Therefore, we can see the importance of these transitions in the future behaviours of older adults.

The Identity-based Motivation model (IBM; Oyserman, 2007) states that our identities are formed in context. Individuals live through experiences and process the challenges of these experiences in ways that are congruent with their current identity, preferring identity-congruent to identity-incongruent behaviours. For example, an individual who identifies as 'fit' or 'healthy' will pursue behaviours such as exercise and healthy eating, as they are congruent with their active identity. Oyserman (2007) states that conscious health behaviours are identity based, which means that individuals will choose to behave in a way that may even negatively impact their health and well-being if this behaviour is more congruent with their active identity. Behaviours that are congruent with our identity will be perceived as valuable and important, whereas behaviours that are incongruent with our identity will be meaningless. Previous research states that transitions experienced in older adulthood, such as physical deterioration, can trigger people to identify as 'old' (Fillit & Butler, 2009). Warmoth et al. (2016) also identified that older adults who self-identify as 'frail' demonstrated behavioural confirmation of this identity, by losing interest in participating in social and physical activities. Therefore, the impact of these transitions on an older adult's identity is important as it may influence the value of, and participation in, health behaviours such as PA in later life.

Identity provides us with meaningful personal goals that are achieved through behaviours that are congruent with our chosen identity (Burke & Stets, 2009). For example, individuals who identify as 'old' may have internal expectations that they will pursue behaviours such as attending older adults' social events or participating in bingo. These expectations may also discourage them from behaviours such as sport and exercise, as they feel they are not congruent with their new identity. Previous research has shown the influence that identity can have on PA engagement, with an exercise identity having a positive relationship with self-efficacy for exercise, exercise bout frequency and the likelihood of carrying out exercise intentions (Strachan & Whaley, 2013). This positive relationship has been shown to be consistent in older adults (Strachan et al., 2010) and those who have recently transitioned through retirement (Perras et al., 2015). However, little is known about how we can promote a more physically active identity in older adults. Perras et al. (2015) conducted a possible-selves intervention which aimed to increase PA behaviour and PA identity in a group of newly-retired older adults. Although there were no significant differences between control and intervention groups, marginal improvements in both PA behaviour and identity were observed over time. Therefore, interventions aiming to increase PA identity and behaviour still warrant further investigation.

6.1.3. Interactions between purpose, meaning, and identity

Although purpose, meaning and identity are separate constructs, they are constructs that largely overlap. Identity relates to the development of one's sense of self, whereas purpose relates to the development of what one hopes to accomplish in life (Bronk, 2011). According to Kashdan and McKnight's (2009) definition, purpose is a central, self-organising life aim, which is a predominant theme of an individual's identity. By describing purpose as self-organising, it means purpose provides a framework for systematic behaviour patterns in everyday life. For example, a new mother may dedicate her time and energy into actions that fit in with her new life aim of being a good carer for her child. Current literature highlights the interactions between identity and purpose in life. It is suggested that having a motivating purpose in life is an important component of healthy identity development. Thoits (2012) highlights the way in which these two constructs interact, suggesting that processes of identity formation and purpose development reinforce one another. For example, purpose in life supports the development of identity, whilst the development of identity reinforces purposeful commitment to behaviours (Bronk, 2011), such as an aspiring academic exploring further education provides him with purpose, whilst developing his identity as an academic. Furthermore, this development of an academic identity strengthens his commitment to his studies, as this behaviour is congruent with his active identity.

6.1.4. Transitions into older adulthood

As mentioned previously, becoming old is a process whereby an individual typically passes through several transitions. This includes retirement, bereavement, relocation and decline in physical health.

6.1.4.1. *Retirement*

Retirement can be described as a psychosocial process of identity transition, whereby an individual may be required to search for a new meaning (Wang et al., 2014). Retirement is a process that is driven by life experiences, individual attributes, environmental factors and internal qualities that may be subject to change throughout the process itself (Szinovacz et al., 2003; van Solinge & Henkens, 2008). Miller (1965) considers retirement as an identity crisis, as people's occupations are a key factor in the development of their identity. Miller also highlights the negative impact retirement can have on well-being, due to the degrading effects it may have by implying that one can no longer satisfy an occupational position.

Research has shown both positive and negative transitions through the retirement process. Some individuals find a new sense of purpose as a result of their retirement, whilst others experience a loss of meaningful, productive activities that filled a large proportion of their life (Shim et al., 2013). An individual can develop a new identity through the retirement process. Atchley (1971) explains how individuals can make adjustments that result in identity continuity through the retirement process, by adopting social roles, family roles or leisure roles. For example, a retired lawyer may decide to spend more time with his family as a result of reduced work commitments. Due to being heavily involved in work for many years, he never really considered himself as a 'family man'. Throughout this transition, the individual experiences enjoyable moments with his family, which assist in the development of a new identity as a 'father figure'. This new identity will then reinforce the purposeful commitment to the behaviours congruent with his new active identity. Hall (2002) adds that the process of these new behaviours (spending more time with family) and outcomes (enjoyable experiences) can encourage an individual to be more involved with these new behaviours. The new skills (caring for spouse and children) acquired within this new identity can increase confidence and encourage the individual to explore other opportunities whereby they can exhibit a similar role (carer, teacher etc.). This would be an example of a positive transition through retirement, whereby the individual has shaped a new identity in retirement, through their commitment to purposeful activities.

Read et al. (2013) examined a sample of 123 retirees to assess the role of meaningful leisure activity in quality of life. They suggest that retirees seek out leisure activities that are meaningful rather than leisure activities that are pleasant. The retirees sought leisure activities that could be experienced with others, which would then contribute to feelings of 'collective purpose'. These activities may enable retirees to develop a sense of purpose that may have been lost within the retirement transition, rather than experiencing retirement as a pathway to the inevitable end. Osbourne (2012) also claims that meaningful activities and human relationships are important in adjusting to retirement. This highlights the importance of meaningful activities in the well-being of older adults, but if identity is lost through retirement, then meaningful activities may no longer be present.

6.1.4.2. Relocation

As age increases, older adults may experience a decline in their physical capabilities through deterioration and ill health, increasing the likelihood of physical limitations which result in the need to relocate (Oswald & Rowles, 2006). Although older adults would usually prefer to stay

in their own home, if their physical capabilities become insufficient, the decision needs to be made whether to adapt their current home to their needs or move to a new location with the appropriate facilities, support and/or care (Roy et al., 2018). Factors within a society or culture can influence one's perception of the self, such as a person's social environment or their economic condition. This perception of one's self can be referred to as their identity, as it is who one perceives themselves to be, and how they portray themselves to the outer world. Our identity is both externally imposed and internally constructed, meaning that our external surroundings influence the way we develop our identity, such as joining an exercise group can encourage a physically active identity in an individual through external influencers (Terry & Hogg, 1996). Research by Ponzetti (2003) states that older adults refer to their environment as a 'secure source of identity', supporting the claim of the importance of the surrounding environment in identity formation.

As one reaches old age, we may often have greater dependence on the home environment due to changes in social, economic and health status (Rubenstein & de Medeiros, 2005; Miller, 1965). An individual's home can be the projection of one's identity through identity defining objects. Older adults may consciously display specific objects within the home that represent aspects of someone's identity (Brown & Perkins, 1992). For example, a former athlete may display sports memorabilia around their home to portray the athletic component of their identity or an individual may have several photos of family members to exhibit their role as a grandmother/grandfather.

The transition of relocation can be a challenging experience for older adults. Through relocation older adults can lose social networks and meaningful daily routines and activities that help form our identity and give purpose, which supports good well-being (Bridges, 2007). Relocation to a new home may be required to deal with the physical challenges of ageing. For example, downsizing to a smaller house or having a home with handrails placed accordingly for support (Rubenstein & de Medeiros, 2005). This new smaller home and a change of surrounding objects help to form the daily habits of an older adult, thus having a role in their identity formation. Recent research on the impact of relocation on the identity of older adults suggests that residents can become disconnected from symbols of their identity, which can limit an individual's ability to adapt to the new environment and exacerbate an ageing identity (Paddock et al., 2019). This ageing identity can also be a result of limited social networks (e.g., loss of meaningful relationships), restrictions of independence and autonomy (e.g., moving into assisted living; Paddock et al., 2019). Cultural norms have come to expect that older people

will relocate in later life. Therefore, understanding the relocation transition for an older adult and how support can be offered for the maintenance, or formation of new, positive identities, is important for future health and well-being.

6.1.4.3. Bereavement

Bereavement is a common transition during later life, which involves the loss of a relative, spouse or friend. Bereavement is a risk factor for poor mental and physical health (Jones et al., 2010), and is associated with suffering (Holmes & Rahe, 1967), disability (Lee & Carr, 2007) and increased risk of mortality (van den Berg et al., 2011). This transition can be even more concerning for older adults who have experienced losses through several other transitions, including retirement, relocation, and a decline in physical health, which are also associated with the ageing process. Previous research has shown bereavement to have an impact on health behaviours, including PA, which can have long-term consequences for the surviving individual.

The loss of a spouse can have a significant impact on the health behaviours of a surviving older adult (Umberson, 1992), such as increased smoking, drinking and risk taking behaviour (Osterweis et al., 1984) and decreased PA (Stahl & Schulz, 2014), and research suggests that these changes in health behaviours may be a result of bereavement-related health problems (Chen et al., 2005). Reczek and Umberson (2012) identified that a spouse can encourage positive health behaviours in their partner, meaning that if the spouse is absent then the behaviour of the individual may be subject to change. Developing an understanding of how this transition during old age can impact behaviour is key in designing effective interventions to encourage health behaviours for older adults.

Previous longitudinal research has shown bereavement and PA to have an inconsistent relationship. Some studies have shown bereavement to increase levels of PA through exercise participation. Wilcox et al. (2003) found that PA decreased after the initial bereavement process when compared with married couples, but long-term widows increased their PA, through increased walking and exercise. Lee et al. (2005) support these findings and found a non-significant increase in PA in widowed older adults. Conversely, other previous longitudinal studies have shown a decline in leisure and PA when transitioning through the bereavement process. Janke et al. (2008) reported a decrease in the number of leisure activities and frequency of leisure activity participation in widowers. This is supported by evidence from Eng et al. (2005) who found a decrease in both leisure time and PA in widowed males. The variations

between the findings may be attributed to the definition of PA, or the methods used within the studies. These studies also included younger adults who had experienced bereavement, as well as older adults. Research on older adults following bereavement is more consistent and shows a decrease in sport/exercise as time progresses following the passing of a spouse. Although, this may be a result of the ageing process itself, rather than the direct effect of the bereavement transition. Regardless of these discrepancies, bereavement can have a varied impact on PA levels in older adults, depending on the nature of the transition, and how it is experienced by the individual.

Meaninglessness defines an individual who has no recognisable purpose or function. An individual who feels meaningless will have no intentions, general life pattern, decision making systems and life direction (Carlsen 1988). A systematic review of both qualitative and quantitative studies by Holm and Severinsson (2012) found a key theme throughout the literature being 'A struggle to perceive meaning in the meaningless'. The review examined the emotional state and self-management of widows and found that elderly widows felt 'sad' and found difficulty maintaining 'close relationships' and meaningful activities. This is supported by Koren and Lowenstein (2008) who identified that later-life widowhood can result in a loss of the sense of meaning in life, with a significant difference in meaning in life between married and widowed older adults. Older widows can be left with a sense of meaninglessness, due to part of their identity being stripped from them throughout the bereavement transition. As Read et al. (2013) explained, older adults' favour meaningful activities as they contribute to a purpose beyond themselves (e.g., DIY or shopping) and can provide structure and meaning to daily living. This demonstrates how bereavement may have a major impact on the purpose and identity of older adults and the activities that they participate in. For those older adults who accumulate PA through indirect means by engaging in other meaningful activities, such as the role as a caregiver for a spouse. Bereavement can reduce meaningful activities available to them, thus reducing PA behaviour.

6.1.4.4. Decline in physical health

Poor physical health is recognised as one of the most common barriers to PA in both older males and females. The significance of poor physical health as a barrier to PA increases as we age (Moschny et al., 2011). Qualitative studies have previously shown several health conditions that act as barriers to PA in older adults, including heart conditions, musculoskeletal problems (e.g., knee and back issues) and physical function limitations (e.g., arthritis; Mathews et al., 2010). 85% of older adults also report having one or more chronic diseases (Bauman et al.,

2002) such as cardiovascular disease, osteoporosis, and dementia (Jaul & Barron, 2017) and those older adults with poorer health conditions are more likely to be physically inactive (Bauman et al., 2002). Previous research has shown that low self-rated health and poorly perceived physical abilities in older adults are strongly associated with lower PA levels (Rhodes et al., 1999; van Stralen et al., 2009). The decline in physical health and potential increase in chronic disease may impact an older adult's self-identity, which can discourage them from PA and encourage a more inactive lifestyle.

Bullington (2006) states that we experience the realities of growing older through social and physical changes, for instance the onset of health conditions such as arthritis and osteoporosis. However, the ageing process is not made up of purely physiological change, and psychological and cultural phenomena all contribute towards personal experiences through the transition into old age (Williams & Bendelow, 1998). For example, negative perceptions about physical health and an ability to control the ageing body can contribute to the loss of function in later life. Previous research has identified that older adults eventually came to the realisation that the older body is no longer what it was and that this was a reminder that they were no longer young (Bullington, 2006). Younger age identities are associated with a stronger ability to cope with age related medical conditions (Boehmer, 2007) and previous research has identified that health status is a key predictor of identity as we age (Barrett, 2003; Johnson, 2007), meaning that seeing a decline in physical health encourages an older identity and a realisation that one is no longer 'young'. This realisation can become frustrating as the older body is not capable of things that it once was, creating a change in identity of the ageing individual.

As previously mentioned, the likelihood of chronic disease increases as we age, with 85% of older adults reporting one or more chronic diseases (Bauman et al., 2002). Although many individuals adapt to age related declines in physical health and chronic disease, some individuals will experience considerable difficulty, which can negatively affect their physical health and psychological well-being (Morea et al., 2008). Leventhal et al. (1999) state that individuals faced with a chronic disease must understand what this means to their identity and how they are going to integrate the chronic disease into their identity, as the physical changes that occur as a result of the decline in physical health can interfere with identity roles. Changes in physical health due to chronic disease also inhibit an individual's ability to participate in meaningful activities (McQuoid, 2017), which may have a direct impact on their purpose in life. Therefore, it may be necessary for older adults to adapt to the changes they experience

through the transition into old age in order to maintain identity, purpose in life and engage in PA in old age.

Interventions that aim to increase PA in older adults have shown some success, although changes are often small and short-lived (Chase, 2013). Although we generally define ‘older adults’ as 65+ years old (WHO, 2010), one could argue that becoming an older adult is a process that happens over time, that is likely to feature several gains and losses (Schumacher, 1999). This process often features transitions such as retirement, bereavement, relocation, and a decline in physical health (Barnett et al., 2012; McDonald et al., 2015; Bidonde et al., 2009; Dumas & Laberge, 2005). Previous research has identified that these transitions can influence meaning, purpose and identity in old age. This qualitative study aims to explore these lived transition experiences in an attempt to better understand PA behaviour in older adults and the challenges that we face when trying to encourage an active later life.

6.2. Methods

6.2.1. Study setting and population

The study was approved by the Swansea University College of Engineering Research Ethics Committee on April 7th, 2020. All participants had to provide written informed consent before taking part in the study. Prior to providing consent, participants were provided with details about the study, what would be expected from them when taking part and how the data was going to be used. Additionally, participants were informed that any personal information they provided would be kept strictly confidential and that any reported data would be identified with a pseudonym, to ensure anonymity. Initially, five participants were recruited who had experienced one more of the identified transitions into older adulthood. One participant withdrew before the first data collection point, so the final number of participants was four.

6.2.2. Recruitment

Participants were recruited from a residential estate provided by Pobl, with prior permission to contact residents being granted. Participants were contacted via telephone in order to abide by the social distancing rules implemented by the Welsh Government at the time of testing due to the COVID-19 pandemic. Participants were expected to fit the eligibility criteria of the study, which required them to be 65+ years of age, with experience of one or more of the transitions into older adulthood and willing to share these experiences with the researcher over several interview sessions. Therefore, it was also required that participants had the capacity to communicate effectively through the English language. Participants were excluded from the

study if they had not experienced any transitions into old age, suffered any psychological conditions that would put them at risk when taking part in the study, or did not feel comfortable sharing information on the experiences of the transitions into old age. Purposive sampling was used to target participants that would provide the researcher with an information rich data set, in an attempt to gain as much knowledge about the phenomenon being researched (Sparkes & Smith, 2014). Small, purposively selected samples are typical in qualitative research (Smith et al., 2009). The lead researcher predetermined criteria for the recruitment process to ensure the participants within the study had all experienced specific transitions, an approach referred to as criterion-based sampling (Patton, 1990). The lead researcher had shared several conversations with the participants throughout the previous two years spending time within the residential estate, which allowed for participants to open up about sensitive topics (e.g., bereavement) which is important when collecting information rich data. The age range of the four participants was 66-84 years (M= 78.3 years).

6.2.3. Data collection

This study used repeat semi-structured interviews to collect personal experiences of the participants. The number of interviews per participant was dependant on how many of the transitions they had experienced. Interviews ranged from 2-4 sessions per participant and lasted 40-60 minutes each. The researcher used a relatively un-structured approach to the interviews and asked predominantly open-ended questions, allowing for the participant to lead the interview sessions. For example, “can you tell me about your experience of bereavement?” (see Appendix 9.3). Although certain experiences and general ideas were listed beforehand, for the researcher to explore relevant topics, questions were not pre-set before the preliminary interviews. Once the preliminary interviews had taken place, the researcher listened to the interview and made notes for following interviews with the participant. Read (2018) highlights several benefits of serial interviews (repeat interviews) which were relevant to the present study. These include the study of complex issues, when participants may be reluctant to share sensitive information, building rapport with participants and for verifying and cross-checking information. Generic probes were prepared, such as *Change in daily activities? Perceptions of the self?* etc., which were infrequently used as participants would often address such issues within the interviews without necessary probing.

Interviews were conducted by the researcher over the telephone. This was to abide by the social distancing rules put in place by the Welsh Government as part of the COVID-19 pandemic. The researcher was very familiar with the participants within the residential estate, having

previously conducted several research projects in the area. The researcher reported weekly to a second researcher, to discuss the interviews and support an informal preliminary analysis. Interviews were recorded via a Dictaphone and transcribed verbatim.

6.2.4. Data analysis

The data analysis used a narrative thematic approach, which followed the 6 steps highlighted by Smith et al. (2009) and Smith (2011). The first stage was the search for themes within the first case. As this study used repeat interviews, there was frequent relistening and transcribing of participants' interviews, allowing the researcher to fully immerse themselves within the data set. Descriptive comments were recorded to develop an early impression of what was interesting about the data. The second stage led the researcher to return to the text and transform comments into concise phrases (themes) that represent what was found within the data. Once the themes were identified, the third stage required the researcher to connect themes into clusters that shared commonalities. Smith (1996) encourages this cyclical process whereby themes are compared across cases and merged when justified. This allows for commonalities and discrepancies across participants to be highlighted (Smith, 2004). The fourth stage involved creating a table and organising the data into themes, subordinate themes, and their corresponding quotations. It was during this stage that quotations that did not fit in with the emerging ideas, or did not provide rich evidence of these ideas, were discarded. The 5th stage involved the researcher continuing this analysis process with the remaining interviews with each participant, using the themes derived from subsequent interviews to strengthen the understanding of the theme, or develop new themes which were not evident within the prior interviews. In the 6th and final stage, the researcher translated the themes identified from the interviews into a coherent composite vignette, whereby the themes are explained in rich detail. The objective within this stage was to provide a conceptual commentary placing the participants' 'descriptions' into a wider social context (Larkin et al., 2006).

6.2.5. Philosophical assumptions

In line with the philosophical assumptions of the present thesis, this study is underpinned by philosophical assumptions of ontological relativism and epistemological interpretivism, suggesting that knowledge is subjective and shaped by the lived experiences of an individual (Cavallerio et al., 2016). Thus, composite vignettes were used to present qualitative interviews of the lived experiences of older adults through the transitions associated with later life, and how these may influence PA behaviour in old age. As a researcher philosophically aligned with the constructivist paradigm, the objective was to develop knowledge and understanding

specific to a phenomenon (Sparkes & Smith, 2014). Therefore, it is important to acknowledge that the findings presented within this study are interpretations of the older adults' experiences. Although there is no correct interpretation of reality (Slevitch, 2011), due to the prolonged engagement I had with the individuals within the residential estate, I was poised to be in a strong position to construct this knowledge and understanding of transitions into older adulthood and PA behaviour.

6.2.6. Creative non-fiction

Creative non-fiction is a type of creative analytic practice that aims to show, rather than tell, theory, in and through stories in order to resonate more deeply with readers and move them towards new understandings (Smith, 2013; Smith et al., 2016). Cheney (2001) describes creative non-fiction as 'a story using facts but uses many of the techniques of fiction for its compelling qualities and emotional vibrancy' (p. 1). Creative non-fiction writing aims to convey data that moves the reader to a deeper understanding of a topic. Sport and exercise psychologists can utilise creative non-fiction writing to share lived experiences in a more holistic manner and to provoke understanding in ways that realist tales may not be able to achieve (Krane et al., 2014; Smith, 2013; Smith et al., 2016; Schinke et al., 2016; Ekengren et al., 2020). Realist tales are often closely edited data, such as interview quotes, with a tight theoretical account of the data being presented (Sparkes & Smith, 2014). Whereas creative nonfiction is a representation of ethnographic data, whereby each the story is fictional in form, but factual in content (Smith et al., 2015). More traditionally, qualitative research reports interview quotations with a specific focus on rigor, completeness and accuracy. Whilst creative non-fiction carries a similar focus, the fundamental component is to build scenes. These scenes allow the reader to create sensual images in their mind and sense action that is unfolding in front of them (Caulley, 2008). This brings quotations of the past, to the present (Cheney, 2001). Creative non-fiction writers not only understand and report data, but also display that data in a meaningful, interesting and informative way to the reader. The objective of this study was to use creative non-fiction as a method to represent the data and facilitate a deeper understanding of the transition into older adulthood and how this may influence PA behaviour in later life.

6.2.7. Composite vignettes

Composite vignettes merge stories from several individuals and different experiences to form a single story that encompasses the experiences from all individuals (Spalding & Phillips, 2007). Rather than reporting individuals' stories and highlighting key themes from within them, a composite approach allowed the authors to pull together different components of the 5

participants' experiences of the transitions into old age and display them in a compelling shared account. Therefore, the vignette should be read as a singular account from an older adult and their experiences transitioning into old age. Recent research in sport and exercise science has used composite vignettes to display their findings (Schinke et al., 2016; Ekengren et al., 2020). Schinke et al. (2016) used composite vignettes to describe acculturation experiences of 24 elite athletes who had immigrated to Canada as teenagers. Ekengren et al. (2020) conducted career interviews with nine male and nine female athletes to create two composite vignettes using the athletes' own words to describe the gender specific features of male and female players' career paths. To create the composite vignette used within the present study, inductive thematic analysis was used to first identify the key themes from within the participants' interviews. Key quotations that best represented each theme were selected and merged through careful reorganising of quotations and linking themes and subthemes to create a compelling storyline (Smith et al., 2016). Although quotations were reorganised, direct quotations were maintained from the raw data to ensure authenticity of the participants' experiences.

6.3. Results

Three key themes emerged from the interview data. Within the composite vignette the themes and subthemes have been organised to present a narrative that represents the participants' transition into old age and how this may influence changes in purpose, identity and PA behaviours. The 3 themes were: *Purpose provides a reason to be healthy*; *Lost meaning* and, *An inevitable decline*. The transitions being discussed within the interviews are previous experiences from 5 older adults (see Table 8), being retold as a singular composite vignette. Therefore, the story being told is how their life has developed through the transition into old age and what this experience means to the participant at present. As Frank (1995) explains, as life moves forward, this movement causes change within stories, therefore the experience itself changes. Direct quotations from the transcripts were merged to create the composite vignette, therefore it is important for the reader to consider the content as a singular account from one composite character.

Table 8*Participant profiles of those who took part in the interviews.*

Name	Age range	Ethnic background	Experienced transitions	Additional information
Kevin Taylor	70-75	White, British	Bereavement, decline in physical health, retirement, relocation	Acts as a carer. Born outside of Wales but has since relocated to the residential estate.
Betty Burtis	80-85	White British	Bereavement, decline in physical health, retirement, relocation	Lives alone and has always been a resident of Newport. Reports significant changes in physical health in recent years.
Peter Parkin	65-70	White, British	Decline in physical health, retirement, relocation	Has suffered severe health complication in recent years.
Gladys Seery	80-85	White, British	Bereavement, decline in physical health, retirement, relocation	Lived alone for 20+ years. No close relatives live nearby. Suffers from challenging health complications.
Geraldine Simmons	70-75	White, British	Bereavement, retirement, relocation	Lives alone. Relocated to Newport in recent years to live within the residential estate.

Note. Pseudonyms have been given and specific information has been limited to protect the anonymity of the participants.

6.3.1. Purpose provides a reason to be healthy

6.3.1.1. *I value my health because I value my independence*

I value the connection that I have with the people around me. My family, my children and my grandchildren are the most important things in my life. That's why it was most worrying when I got diagnosed with diabetes. The first thing that pops into your head is, 'how long have I got'. I value the people around me, I have things in my life that I want to do, I want to sell my home and move to Spain. So, I value my health. I value my health because I value my independence, and without good health I can't have these things in my life. Supporting my family and friends, my ability to maintain my independence, being able to move to Spain. These things can't happen if I do not have my health.

6.3.1.2. *'If I do the right things to remain healthy, then I can live a normal life. And that is what I have tried to do'*

When I first got diagnosed with diabetes I was about 2 and a half stone overweight. So that was the first thing I did was lose that. I started exercising every day. Either swimming or going to the gym. And I did that for a couple of years after I retired. It took up quite a bit of my life for a few years. The big thing with diabetes is weight of course. I always tried to stay relatively

fit. Even more so when I got diagnosed with diabetes. That was probably another milestone which made me feel old, was when I sat down in front of the doc and he says, 'you got diabetes'. But after, being told that if I do the right things and remain healthy, that I can live a full and normal life. And that is what I have tried to do.

I tried very hard not to let things get in the way and stop me from exercising, although I had to exercise differently. When I was younger, I used to go to what they used to call keep fit classes. In those you sort of throw yourself around. But as I get older, I had to go over to the yoga and Pilates type of thing. And walking. I do enjoy walking. The pleasure I get out of walking is quite, I love finding little places, exploring different sort of avenues and finding different places. So, I do enjoy the walking. My health doesn't affect the distance I walk, but it does affect the time it takes me. I sort of stroll now.

6.3.1.3. 'We found something new to do, it has got me being busy again'

When you get older, you can find yourself with very little to do. We have a lot more time on our hands. What helps is the connection you have with other people around you. Family and friends. That in itself keeps you occupied and busy. When we moved here with all the new residents, we introduced ourselves and made it clear that we wanted to start a club. It has got me busy again. Arranging trips away, printing things out, delivering leaflets and all that you know. I had a phone call just an hour ago. One of the ladies here wanted some stuff done on my computer, so I said 'yeah, no problem at all'. It gives me something to do and I feel good for being able to help. It does make you feel good.

Looking after my partner was a big part of my life. It gave me the 'I got to be strong anyway, because I am all they have got'. Before they fell ill, we used to walk all the time together. When they came out of hospital, the main thing I was concerned about was to get them walking again. We focussed on it daily, we would try and go walking down the sea front. We would walk to the first bench, then onto the next one, then you're up to two benches and so on. Eventually we were walking around the town down there you know. Once we had both retired, we also took up family history. We always said that we would love to explore it, so we started doing that. We went to all these various places and all these little villages. And it filled up our time if you like. It was something that we did together. It was all consuming, because the more you found, the more you wanted to know. We had found something new to do.

6.3.2. Lost meaning

6.3.2.1. *'My roles and responsibilities are vastly different from what they used to be'*

I really loved my last job. I always liked what I did, but I... You don't appreciate it till you get older. You usually think 'oh god, I don't want to do this for the rest of my life' but then when time goes on, I really loved my job. And I was so glad that I had the discipline of something in my life. Something to get me up in the morning. Once that had gone, I started to feel a bit useless. Although I chose to retire, I still felt abandoned. It is a bit strange. You have no structure to your life. You have to sort of move on from it. When you become older, you lose people around you, then you don't have your job. That's what you're all about really. You do become a bit lost. You lose the daily structure. You wake up and you don't have to get up for work. You're not tied to the routine of work and that in itself is difficult to deal with, just that change alone. It can be a novelty at first, but it can get very boring. You don't only get away from the job. It is the people who work there. You know when you move on in your life, your gap closes with those people, I mean they have always kept in touch. But it is not the same as being friendly and included. I lost that day to day contact with so many people.

My roles and responsibilities are vastly different from what they used to be. It started quite young. Because when your children leave home, that's when you got to remind yourself when you go shopping. You haven't got to buy that great big bag of potatoes and you don't buy that stuff. You know, you lose that. It was the same when my partner died. They never bought any clothes. They wouldn't buy a shirt or even a pair of underpants even. That was my job, I bought everything. I would see there is a sale on and you sort of, you got to pull yourself up and adjust your mind to it. As you don't have those responsibilities anymore.

6.3.2.2. *'I had become a widow as well as an orphan'*

You lose the people around you as you become older too. First my mother passed away, but that was expected as she was 105 (years old). That left a hole. It was such a big blow. It was like an abandonment you know. I used to visit her several times a week, so once she passed it was like something was missing. Whilst she was well and lived independently, I would visit her 2-3 times per week. Then once she went into a home, I would visit her around every other day. I felt I had a responsibility as her child, because you see, she didn't have many others around her. So, I used to go to keep her company and make sure she was ok. But it was a challenging time seeing her struggle with her health and everything. The passing of my partner was more challenging. That was a result of cancer, where they got diagnosed 2 months after my mother died and then passed away the following January. That was very challenging

because I had become a widow as well as an orphan. We used to do everything together. It was the first time I have lived on my own ever, because I had moved out of my family home, to live together and I lived with them ever since. We used to do everything together. We used to go on lots of holidays, and we would do something every day, even if it were just to go for a coffee. We would always do something. They would go to bowls, sometimes I would join them. But I wouldn't go anymore now. It was a lovely hobby for the two of us to do. It wouldn't be the same anymore.

It took a long time to get over bereavement. I'd say you never fully get over it, but I think about 2-3 years before I felt myself again. Before my partner passed away I used to have my kids to look after, but they have moved far away now. Then my partner passed. I got no grandchildren. My sons don't live locally, one is in New Zealand, so I don't get to see him very often. And the other is in London. I am very much on my own. I spend a lot more time in the house than I used to. When J***e moved on, that was my eldest, I locked myself in the bathroom and cried my eyes out. You know, it was devastating. I had lost half of my family in a way. I only had the 2 children.

6.3.2.3. 'I don't do the things that I loved doing'

I always had plenty of hobbies. The last place we lived in, I built a workshop there. I mean I could go in there at 8 o'clock in the morning and still be in there 8 o'clock at night. Without having to sit down even. I would just carry on until I would finish what I was doing. I'll be honest with you, I would love to do that again, but I haven't got the opportunity since having to downsize. Since relocating, we are a bit restricted to be honest with you. I don't drive. So, living in a hilly place, I can't get out much. I manage to get up the shop on the scooter. But that is as far as I can go on it really. Back then I could walk along the sea front, I could go on for miles. I miss not having a garden as well. I have the patio there, but it is not the same. I miss my little workshop, it was ideal for me. It became my main hobby I suppose.

Since relocation, my life has changed greatly. I used to go out in the morning and have a walk down the town or go on the scooter. I went out every day. Just around the town or around the shops, but I don't do that here. I can't do that here. I really miss that. I never realised the hills were so steep around here. I walked down to the Tesco one day, and I was walking back up and I had to stop, I was leaning on the bridge pretending I was looking out at the scenery, when in actual fact, I was trying to catch my breath. I have COPD, so that limits what I can do a lot. A few years ago it was diagnosed, I mean, I smoked for 50 years, so that is probably the reason.

You know, I can't go for walks, I can't do much physically. I get very tired and out of breath. So, it does limit me, although I got inhalers, it does limit me a lot what I can do. I don't do the things that I loved doing. I used to do the gardens, but I can't do that now. It is very limiting, very limiting. I did enjoy doing the planting and doing the flowers, but I can't do it now.

6.3.2.4. 'They start helping you across roads, whether you want the help or not'

People treat you differently when they think you're old. One person in the hospital ward when I was there before, she was playing up a bit. And I had asked her to do something. And one of the nurses said 'Oh that's what we need, a little old person in every corner of every ward'. Oh my god. I thought who was she talking about! I don't see myself as old. Until I look in the mirror. I feel like I look like my parents. It is only looking in the mirror that you feel old. You don't feel it so much inside you. People always remind you. Even back when I was in my 50s and 60s. People would call you the old one. It is other people who do that, not you. They start helping you across roads, whether you want the help or not. Or telling you to be careful. That sort of thing. And you think, oh shut up.

6.3.2.5. 'Who am I now? What is the reason for me?'

You spend the last few years of your working life leading up to retirement, so it doesn't come unexpectedly, it doesn't come as a surprise. But, it still is a surprise when you wake up one morning, the morning after retirement and your life has changed completely. You find you're sitting at home watching TV far more than what is good for you, you know. It is a feeling of worth. There is no feeling of worth, when you feel all that you have done is sit down and watch TV. You don't feel like you have achieved anything, you don't feel like you have added value to anybody's life. All you have done is watch TV.

I don't really have anything that I would like to achieve anymore. Nothing I can think of. I have got no ambition or anything like that. Not really. In the future I will only need more care probably. Going somewhere where I will have care, rather than living alone. I am just a waste of space now. That's how I feel. I got no grandchildren. My sons don't live locally, I am very much on my own. So, yes. I have got no reason for being actually. Well, I mean there is nothing left to really live for, to be honest. As much as nobody wants to die too soon. There is not a lot to live for, if you know what I mean. You sort of, you, I know people say this a lot, but you disappear. If I went and robbed a bank now, nobody would be able to describe me you know. I am just an old person. You know, sometimes I do sit back and think, what is the reason for me. I used to have kids to look after, but they have moved far away now. Then when my partner

passed, that was another one. What is the reason for me now? I mean, maybe being a friend to other people, but apart from that I don't think I have a reason anymore. You become a sort of, my identity has gone. You're like a bit of a nobody really. Perhaps that is a bit harsh but that's how I feel. I don't do this and I don't do that.

6.3.3. An inevitable decline

6.3.3.1. *'You're only going to get worse, and that is what it is I am afraid'*

I retired because of relocation. Because of the job I had to work until around 10 o'clock in the evening, which is quite late to be out walking in certain areas. And I moved further away. Because I was only around the corner from my job before. And although I didn't move very far away, it was too far to be walking late at night. And the truth of the matter is, you got a lot of problems when you are working in an off licence and the family put a bit of pressure on me to get out of there. But I was 70 then. Although I was definitely not happy to retire, you come to a time when you know you have to do certain things. Even when you don't want to do them.

After my partner had the stroke and I was a bit restricted then. I came back to Newport because we were being pestered by our children. They said we were living too far away, and if anything happened. So that was the reason. I miss living by the sea. You know, even with the lockdown I could have just walked out the door there and walked along the sea front no problem. Not bumping into anyone or anything. You can't do it here. I have started walking much less here. Back then we had a lot more housework to do too, as it was a big house with a rather large garden. I don't do the things that I loved doing. I used to do the gardens, but I can't do that now. It is very limiting, very limiting. My partner was feeling like he couldn't cope with all the garden and the repairs, so we decided to downsize.

As you become older, you start to lose your physical capabilities too. It didn't change the way I do things, but it did change the way that I think about things. You forget your memory and you forget the names of things. It is so annoying. There is nothing you can do about it. I remember things from long ago. Ask me what I had for lunch yesterday and it is difficult every now and again. It makes you feel older. As if 'oh well, this is the end'. You're not going to get better from it, you're only going to get worse. And that is what is happening I am afraid. It is so annoying. There is nothing you can do about it. I remember things from long ago, but nothing. Ask me what I had for lunch yesterday and it is difficult every now and again. In the future I will only need more care probably. Going somewhere where I will have care, rather

than living alone. It doesn't feel very nice. I mean, I think if I were to start to exercise, that I wouldn't really improve at my age.

6.3.3.2. *'It weakens you, it makes you feel older'*

As I got older, you probably hear this a lot, you still think like an 18 or 20-year-old. You go through life thinking like you were when you were young you know. But when something like that happens it really does make you think about, well it makes you realise that you are getting old. You never really think about what is to come. But when you confront, having the stroke really confronted me with my own mortality. And it made me think about things. It made me realise that I am no longer a 21-year old. It does tend to change your outlook and the way that you see things. Everything that happens to you physically, it weakens you. Makes you feel older.

It is all the normal old age things that start to creep in. I look in the mirror and I see the wrinkles; I think to myself Christ. Look at my stomach sticking out like my father's did. Because I never had a pot belly before. When I wake up in the morning and have a wash, my hair is wet and I brush it back and think, jeez, I am looking like my parents. It is difficult to know when things start. Because they happen so gradually some of the changes. But you go a long time without doing one particular thing, then you go to do it because you know you can do it, then you find you can't. Like moving things around, you know. When you're young you throw your furniture around and clean behind it and all the rest of it. Then one day you go to do it and sort of 'Oh, this is hard work'. It happens so subtly and so gradually.

When you are walking about late and there is a streetlight on, then it goes dark, then there is a street light. The changes throw you if your sight is bad. My worst thing is steps. Pavements, getting up and down pavements. I always have to pause. And crossing roads of course. I was out for a walk and I asked somebody for directions. About 20 minutes later, the police turned up. Somebody phoned the police to say that I was wondering. That made me feel really old. I didn't want to go out, I didn't want to go for a walk after that. I wanted to hit them. I felt really, really upset that they had done that. What people don't realise is, if they see someone struggling, you can say do you want any help or are you ok? And if they want help they will probably say yes. And you also get the people, you're waiting to cross the road and they will put their arm into yours and drag you across the road. And that is not helpful because it throws you all off balance. There is a happy medium, you always need to ask if someone needs help. It is surprising how many people will force their help on you, especially when you are older.

The only difficulty I find is, I walk, I can walk for probably 4-5 miles, but if I go up hill. I can walk up hill, I can walk up quite steep hills sometimes. But it is very hard. I have to stop. But of course, the ageing process and the COPD are two separate things aren't they. Although they're both together in me. But the ageing process does that to you as well. It stops me being able to walk or do the things that I enjoy doing. I mean, I can't even walk to the bus stop without having my stroller with me. Very limiting, very limiting. I suppose I can't expect anything else at this age.

It definitely makes you think, 'oh well, this is the end'. And that is what is happening I am afraid. Just a month ago, the youngest, she was on Holiday in Wales actually, she had a heart attack and died. That was it. I was only talking to her the week before. My mother and father both died in their 70s, all my siblings are gone. I suppose I am the lucky one. I thought 'Oh well, I haven't got much time left now'. So, I need to do something. I used to have 6 siblings, now I am the only one left. That was the main thing that changed for me was, you start to think about the end. When I never did before, especially when my last sister died. You start to think about the chest pain and think, jeez, is this it? When I never used to think like that. Whether that starts to happen naturally at my age, I don't know.

6.4. Discussion

A composite vignette was used to portray older adults shared accounts of their transition into older adulthood, to provide a person-centred interpretation of these experiences and how they may influence PA in later life. This study adds to the existing knowledge of PA behaviour in older adults by offering insight into the personal experiences of the transitions into older adulthood and how these transitions may influence PA behaviour in later life through concepts such as meaning, purpose and identity. The figure below demonstrates how these concepts may change through these key transitions and how this can influence PA behaviour in older adults. Given the nature of this study, specific guidelines will not be suggested on how to increase PA, rather how the findings can inform decisions when looking to encourage PA behaviour in older adults.

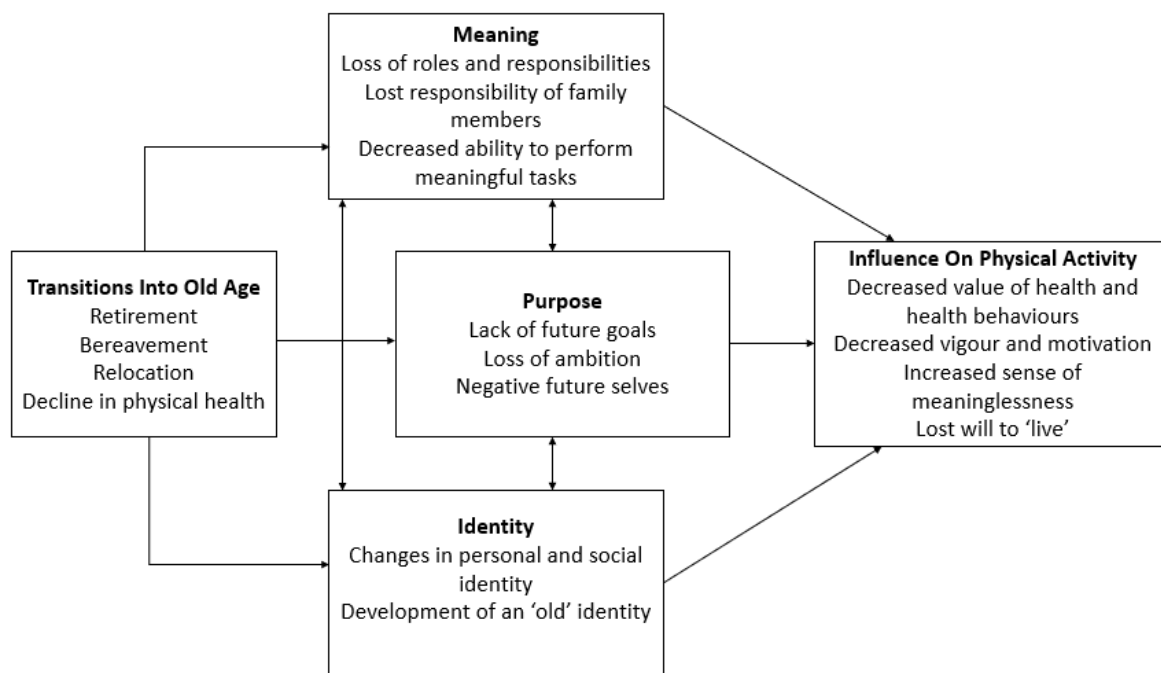


Figure 8. The influence of the transitions into old age on PA behaviour in older adults, through changes in meaning, purpose and identity.

The first theme within the composite vignette identifies the importance of purpose and meaning in the motivation of older adults to be physically active in later life. Having ‘people around you’ was important for providing ‘meaning’ to the life of the older adult within the composite vignette. Relationships with others result in our own thoughts, emotions and actions having an impact on others around us, which provides a significance to our lives (Steptoe & Fancourt, 2019). Previous research has identified that PA has been positively related to the belief that one’s life is meaningful, and goal directed (Brassai et al., 2015; Hooker & Masters, 2016). These relationships also provided a sense of purpose to the older adult through providing a goal directed life. A sense of purpose is generally gained through long-term life goals, which can relate to any part of life that is important to the individual, such as supporting a family, learning new skills or helping people in a way that uses their unique skills. The older adults within this study spoke of how having meaningful and purposeful facets of their lives increased the value of maintaining good health. For example, supporting their family members and maintaining independence could only be achieved if they were able to maintain good health. Therefore, pursuing health behaviours, such as PA, was seen as valuable as it supported parts of their life that were important to them. Previous longitudinal research also suggests that a strong sense of

purpose and meaning in life may protect against a decline in health through delaying the onset of age-related disabilities, decreasing incidence of cardiovascular disease, whilst encouraging healthier lifestyles and health promoting behaviours (Kim et al., 2013; Boyle et al., 2010; Cohen et al., 2016).

The pursuit of PA in the older adult may be explained by central constructs of the social cognitive theory (Bandura, 1977; Bandura, 1986). Self-efficacy is the confidence one has in their ability to perform a given behaviour, when faced with challenges or obstacles (Bandura, 1977; Bandura, 1986). Outcome expectations are the anticipated outcomes of a given behaviour, that influence behaviour by acting as incentives or disincentives (Bandura, 1977; Bandura, 1986). Both self-efficacy (Keller et al., 1999; McAuley & Blissmer, 2000; Rhodes et al., 1999; Ashford et al., 2010) and outcome expectations are important psychosocial determinants of PA behaviour. The older adults within this study displayed high levels of confidence in their pursuit of exercise, a form of structured PA, when faced with physical barriers associated with old age. They discussed pursuing forms of exercise that were more suitable to their current physical functioning. The older adults' PA behaviour was also incentivised by its perceived impact on health, which was tied to the meaningful and purposeful facets of their life. By pursuing PA behaviours, the older adults felt that they would be able to maintain the meaningful and purposeful components of their life, such as their independence and supporting their family.

Deep and important relationships were key sources of meaning and purpose in the life of the older adults within the composite vignette. Both family members and friends added life meaning as these relationships provide a significance to our lives through the impact we have on others. This is supported by Steptoe and Fancourt (2019), who state that a greater meaning in life is associated with stronger personal relationships, such as having a partner, and staying in contact with family and friends. Within this study, these meaningful relationships also provided purpose, through the achievement of goals associated with them. For instance, the older adults mentions using their unique skills to help friends with daily tasks, and supporting their partner to the best of their ability, which provided a reason to be 'strong'. Deep and meaningful relationships were also important for PA participation, as it was something to do with their partner. Reports of walking for exercise, visiting new places or playing sport together were valued activities that were not as meaningful without the company of a partner. This is supported by Guell et al. (2018) who state that some older adults accumulate PA through participation in social activities, therefore loss of meaningful relationships through transitions

into old age can in turn impact PA levels. Meaningful relationships are also a key source of social support for older adults and social support has been shown to be positively associated with PA levels (Karavidas et al., 2005; Ford et al., 2000). Transitions into old age, such as retirement and bereavement, are likely to have an impact on these key sources of social support, thus potentially influencing PA behaviour in later life.

The second theme highlighted the loss of meaning that can occur as an individual transitions into old age. For example, the death of a spouse resulted in a loss of meaning, as their emotions and actions no longer had an impact on people around them, thus losing significance. Retirement may also result in a lack of purpose, as work-related goals were no longer part of their life. Previous research has also shown that transitions into old age can result in breaks in significant social and psychological involvement, which can deprive an individual of important sources of purpose in life (Baumeister, 1991; Nies & Munnichs, 1987). The transition experiences highlighted within the older adults' composite vignette show how loss of purpose can occur through diminishing meaningful activities, relationships, and daily structure. McGowan et al. (2017) state that PA is often a by-product of more purposeful activities for older adults. For the 'out-and-about-er' identified by Guell et al. (2018), who accumulates PA through participation in social and intellectual activities, one would presume that PA would likely decrease with the loss of meaningful activities, deep relationships and daily structure that can occur as they transition into old age. This is supported by previous research, that has identified PA to be positively related to the belief that one's life is meaningful, and goal directed (Brassai et al., 2015; Hooker & Masters, 2016).

The older adults within the composite vignette highlighted several ways in which they had lost meaning and purpose as they entered old age. This included the lost responsibility of raising children, lost opportunities for valuable contribution, achievement of life goals with little to focus on next, and, disease and disability. The losses that had been experienced had resulted in a lack of meaning and purpose in their life, leading to questioning '*what is the reason for me?*'. Frankl (2006) states that losing meaning in life can increase feelings of depression and extreme meaninglessness, resulting in a loss of will to live. Previous research has also identified how age-related losses can create feelings that life is no longer worth living (Crocker et al., 2006; Harwood et al., 2006; Kjolseth et al., 2010; Rurup et al., 2011). Therefore, if the motivation to maintain good health was to continue a meaningful and purposeful life, then what indeed would motivate older adults who have lost such life values. This is supported by Freeman (2000), who defines this life experience as "Narrative foreclosure". Even though an individual's life

continues, the story of life in their own mind has ended. Although life is not over, it is considered so by the individual. Why pursue good health if life has become meaningless and scarce of all pleasant future expectations (Freeman, 2000)? The older adults within the composite vignette had lost meaning and purpose in life, and had come to realise the inevitable end that stood before them, therefore the benefits of good health, along with PA, had become largely irrelevant. This study gives us an insight into the difficulties that we face when aiming to increase PA in older adults who have experienced significant meaningful losses and that promoting the health benefits of PA to these individuals may fall on deaf ears.

Changes in identity were also evident within the older adult's composite vignette. Burke and Stets (2009) state that an identity can provide an individual with personal goals, which in turn encourage engagement in corresponding behaviours. Through the transitions explored within this study it became evident that the associated losses can result in a loss of identity in later life. Since losing the identity of a 'parent' and a 'worker' there was a feeling of a 'waste of space' and having 'nothing left to really live for'. These forms of identity can give daily pursuits that provide a source of PA for older adults, such as walking whilst shopping for family members. Morgan et al. (2019) suggest that by getting "out and about" and "staying busy" older adults can boost self-esteem and avoid feelings of helplessness. The identity of the older adults within this study was not only influenced by the losses occurred through the transitions, but by how they were treated by others around them. The IBM (Oyserman, 2007) states that our identities are formed in context and that individuals will prefer behaviours congruent with this identity. The present study highlighted that by being referred to as 'old' by others, and being treated differently because of their age, reinforced an older identity in later life. Older identities can discourage older adults from engaging in PA (Warmoth et al., 2016), as it is not congruent with their new identity. Finally, the present study identified how a loss of social identity may also influence an individual's engagement in PA. Long lasting relationships can form a social identity, whereby an individual may identify as a group, such as 'we' or 'us' rather than an individual, such as 'I' or 'me' (Turner, 1982). The findings of this study showed how the loss of meaningful relationships through transitions, such as bereavement and retirement, can cause a loss of social identity. Thus, a loss of interest in PA that were associated with the lost relationships, such as playing bowls with a spouse. The loss of a spouse meant that the PA was no longer congruent with their new identity. These findings support previous research from Perras et al. (2016), suggesting that PA interventions may benefit from targeting PA identity to encourage behaviour change in older adults.

This study highlighted the importance of the transitions into old age and their potential influence on meaning, purpose, identity and thus PA behaviour in later life. Transitions into old age can result in breaks in significant social and psychological involvement, which can deprive an individual of important sources of purpose in life (Baumeister, 1991; Nies & Munnichs, 1987). Morgan et al. (2019) state that PA can help regain feelings of purpose which may have been lost through transitions into old age, by providing structure, habitual routine and the feeling of being needed in group activity. Previous research has also identified that PA has been positively related to the belief that one's life is meaningful and goal directed (Brassai et al., 2015; Hooker & Masters, 2016). Although PA can be used to help reclaim purpose in life, the present study suggests that PA behaviours may decrease as a result of losing meaning, purpose, and experiencing changes in identity through the transitions into old age. Qualitative findings by Guell et al. (2018) suggest many older adults remain active through indirect means, such as socialising, gardening, housework and looking after grandchildren. These avenues are related to the important life meanings evident within the first theme of the composite vignette, such as meaningful relationships, occupations and maintaining independence. These activities may be lost through the transitions into old age, due to the losses associated with each transition. Examples from the present study include the loss of social activities through bereavement, loss of the ability to do garden work through a decline in physical health and the loss of a caring role through children moving far away from home. Therefore, although PA may provide an opportunity for older adults to reclaim purpose, for those older adults who accumulate physical activities through indirect means, the focus may be better targeted on encouraging purpose in life, to facilitate PA behaviours.

With the loss of meaning and purpose, older adults may be more predisposed to sedentary, meaningless activity. This is supported by McGowan et al. (2017) who discovered that PA was often viewed as a by-product of more purposeful activities by older adults. Therefore, maintaining a purpose may encourage more PA behaviour as we transition into later life. This suggestion is reinforced in a systematic review of reviews by Zubala et al. (2017) who suggest that PA promotion for older adults should focus on motivators more meaningful to them, specifically social and environmental support, and enjoyment achieved through PA. Participants within this study explained how they formed new relationships with other older adults since relocating to their new residential estate, which had 'got them busy again'. The new relationships provided meaningful roles and activities, such as organising day trips to visit new areas and forming social committees. Future research may want to explore how

interventions can provide older adults with meaningful and purposeful PA to encourage the uptake and long-term engagement in PA behaviours. Additionally, by encouraging greater feelings of meaning and purpose we can increase the importance of good health, thus the value of healthy behaviours, such as PA.

6.5. Limitations

Despite the theoretical and practical contributions of the creative non-fiction methodology, there are some limitations with this approach. First, using semi-structured interviews to collect data from the participants may potentially encourage the production of vignettes on a predetermined research agenda (Smith & Sparkes, 2016). However, the lead researcher had built extensive rapport with the participants through prolonged engagement, and the accounts provided were checked for understanding through repeat interviews. Second, there is a risk that creative non-fiction writing results in data representation that becomes overly suggestive. Therefore, the vignettes were revised several times to ensure they were inclusive of all participants experiences, supporting the transferability of the findings (Smith, 2018). Finally, it is worth noting that the practical worth of a composite vignette is not to provide truth, but to serve as a representation that can stimulate reflection and improve action (Spalding & Phillips, 2007). For example, the present study explored older adults who have experienced several transitions associated with later life, rather than individuals who were 65+ years old as is common practice in older adult research. This approach highlights important time points in the life of an older adult, which may greatly influence PA behaviour in later life.

6.6. Conclusion

This study aimed to use creative analytic practice to highlight the importance of the transitions into old age in relation to PA behaviour of older adults, through personal experiences of the transitions into old age and how they can impact meaning, purpose and identity, which in turn, influence PA behaviour in later life. The losses associated with these transitions not only have a direct influence on PA through reduced roles and responsibilities and social activities. They also decrease meaning and purpose in life through lost meaningful relationships and a lack of future pleasant goals and aspirations. Although transitions may have common features, the outcome of transitions between individuals is unpredictable (Dunne, 2004). As we become older and experience several transitions into old age, we may find it increasingly challenging to sustain a physically active lifestyle and a strong purpose in life due to the accumulated losses and reduced opportunity to participate in meaningful activities and preserve meaningful relationships. Therefore, in order to encourage PA in older adults, it may be necessary to ensure

that meaning and purpose in old age is maintained through the continuation of valued roles and responsibilities, deep and meaningful relationships, and supporting future goal and aspirations. Increased feelings of meaning and a sense of purpose may not only encourage PA itself, but also increase the value of good health and the behaviours associated with it.

Finally, it is important to note that the interpretations expressed within this study reflect a socially constructed reality, dependent on the specific context. The findings are not final and future researchers may need to interpret these findings for their own context and utilise their own qualitative methods to enhance their understanding of these key transitions in the life of older adults and how they relate to PA.

6.7. Chapter summary

This study was designed based on the findings from the previous 2 studies that were conducted within the residential estate of older adults. This final study provided a qualitative exploration of the transitions associated with later life and give insight into how these transitions can result in changes in purpose, meaning and identify, which then influence PA activity behaviour in later life. Strengths and limitations of the study are acknowledged, as well as the key findings and recommendations are given for future person-centred PA interventions.

7. Overall conclusions

The purpose of this chapter is to re-visit the aims and objectives of the thesis, to discuss the key findings from the three studies conducted and outline how they advance the understanding of the literature on the topic of PA behaviour in older adults. Finally, the chapter will present a critical appraisal of the thesis, along with proposed practical, theoretical and research implications of the findings.

7.1. Aims and objectives

The aim of this thesis was to fill gaps in the research concerning PA interventions to support the health and well-being of older adults living within a residential community. To achieve this, the first objective was to develop and implement a person-centred, multi-level PA intervention for older adults within a residential community. This was achieved within the first two studies. The first study aimed to (i) gain an understanding of the barriers to, and facilitators of, PA in older adults living within a residential estate, (ii) map these findings onto the SEM (Sallis & Owen, 2015) and (iii) provide recommendations for a multi-level PA intervention to be implemented within the residential estate. The findings from study 1 were used to design an intervention aimed at increasing PA, which was implemented within study 2. Study 2 employed a mixed-methods approach to (i) conduct an implementation trial using an intervention strategy designed using the findings of study 1, and (ii) use qualitative and quantitative data to assess the implementation of the intervention using the RE-AIM framework. Study 2 highlighted the need for meaningful PA and how PA was often accumulated through activities associated with a daily purpose. The second objective of the thesis was to explore PA behaviours of older adults in the context of dynamic changes in purpose, meaning and identity throughout life transitions. Therefore, the third study explored changes in purpose, meaning and identity through lived transition experiences in an attempt to better understand PA behaviour in older adults and the challenges that stakeholders face when trying to encourage an active later life.

7.2. Key findings

This thesis provides a suitable strategy to develop and implement a person-centred approach to a multi-level PA intervention for older adults living within a residential estate. Findings from study 1 highlighted influencers of PA that relate to the intrapersonal, interpersonal, environmental, and organisational levels of the SEM. Bethancourt et al. (2014) had previously identified barriers of, and facilitators to, PA programmes in older adults on different levels of the SEM, and many of the barriers and facilitators identified were common across diverse

populations of older adults. However, findings may not be generalisable to older adults within different contexts, thus using these findings to design intervention strategies for older adults within other contexts should be approached with caution. Therefore, the present study aimed to identify the influencers of PA within the specific context of interest, to enable intervention strategies to be individualised to meet the specific needs of individuals within this context. By engaging with the targeted individuals and exploring the barriers to, and facilitators of, PA within the specific context through qualitative methods, intervention strategies could be tailored to address factors on intrapersonal, interpersonal, environmental and organisational levels of the SEM.

Zubala et al. (2017) highlighted the need for a person-centred approach to PA interventions, to enable strategies to be designed to address the subjective needs and preferences of the targeted individuals. The present thesis allowed for barriers to, and facilitators of, PA to be identified within the targeted individuals and used this information to develop intervention strategies specifically to meet their personal needs. In doing so, the study makes a novel contribution to the body of research on PA interventions in older adults, enhancing understanding of how to design and implement person-centred, multi-level PA interventions within a group of older adults that are part of a residential community within an urban UK context. Recommendations for intervention design within this context included improving knowledge and understanding (intrapersonal), encouraging social PA (interpersonal), adapting the physical environment to suit the needs and wants of individuals (environmental) and providing affordable and adaptable PA options (organisational). These factors could then be addressed by specific intervention components, and BCTs. These findings led to the design of the person-centred, multi-level PA intervention within study 2.

The findings from study 2 suggest that the proposed person-centred, multi-level PA intervention could be implemented within the residential estate of older adults, potentially over the longer-term. Although the study did not explore long-term implementation directly, the follow-up interview with the senior health and well-being team member from the housing association suggested that the mode of delivery and content of the developed intervention could be implemented longer-term. However, study recruitment indicated that it is also clear that reaching older adults who lack interest in PA or improving their personal health and well-being may be difficult. Effectiveness of the intervention on the older adults' objectively measured PA, HRQOL, self-efficacy for PA and outcome expectations is uncertain, as the data set was not sufficient in size to establish statistical power at the recommended level of 0.80 (Cohen,

1988). However, initial trends showed a decline in objectively measured PA within the control group and an increase within the intervention group (in both Daily PA and Most active 30 minutes), with qualitative data showing increased conscious effort to being more physically active, even when faced with increased barriers as a result of the COVID-19 pandemic. Due to the modest sample size within this thesis, future research may want to try and implement the intervention strategy used with a larger sample size to assess its effectiveness. A post-hoc power analysis using the G*power programme suggested that a sample size of around 100 participants would be required to obtain sufficient statistical power and evaluate the effectiveness of the intervention. The qualitative findings also suggest that the intervention was generally well accepted by the participants, and they felt that as they have lost roles and responsibilities in later life, it became natural to ‘sit down’ and ‘do nothing’, but the self-monitoring and goal setting components of the intervention resulted in an increased conscious effort to ‘get up’ and ‘move more’. This supported previous claims by Compennolle et al. (2019) suggesting that self-monitoring can be used to reduce sedentary behaviour in older adults. The findings from the present thesis suggest that developers of multi-level interventions may want to include this behaviour change strategy within their approach, as it may support PA levels in older adults, through increasing self-awareness and encouraging conscious effort to get up and move more. Furthermore, a recent systematic review by Stockwell et al. (2021) suggest that PA interventions may be necessary to maintain levels of PA, should more lockdowns occur as a result of the COVID-19 pandemic. The qualitative findings from this thesis suggest that the implemented intervention strategy may encourage more conscious effort towards maintaining PA behaviour whilst abiding by lockdown rules in older adults. Although not originally intended, this is a novel contribution of this thesis as data collection occurred during the first lockdown, providing an unplanned opportunity to explore how these older adults responded and if the experienced intervention was influential in their responses. Therefore, it is one of the first studies to offer insight into older adults’ PA behaviour during the COVID-19 pandemic and how the strategies used offered support for their PA engagement, increasing efforts to be more physically active when faced with the restrictions of the lockdown. Given the small scale and retrospective nature of the data collected here, although promising, these findings must of course be cautiously applied and interpreted but also followed-up with further research.

Within the descriptive data, study 2 also found a trend of increased loneliness scores within the intervention group when taking part in the ‘Get-moving’ programme. Participants often

reported engaging in PA on their own, due to engaging in day-to-day activities whereby participating alone was expected, or because of a personal preference to be active alone. This may explain the increased feelings of loneliness within the intervention group. Although the intervention aimed to offer social support through bi-weekly check-ins, and encourage the participants to combine social and physical activities, it did not provide the quality of relationship needed to positively influence feelings of loneliness. This finding contributes to the current research on PA and loneliness, suggesting that PA on its own may not be enough to reduce, and may in fact increase, feelings of loneliness through conscious engagement in activities whereby meaningful relationships are absent. This is supported by a systematic review by Pels and Kleinert (2016), who state that PA can contribute to a decrease in loneliness, however, this effect is likely dependent on the quality of relationships present during PA. Therefore, future intervention strategies may need to provide greater support for older adults to develop quality relationships within a PA environment if they are going to have a positive influence on feelings of loneliness.

Finally, the second study highlighted the preference for purposeful PA within the residents. Having ‘something to do’ was a key reason for being more physically active and unless there was a purpose to the day or a meaningful activity to do, then it became natural to ‘sit down and do nothing’. This is related to the decreased PA seen in older adults during winter months (Kimura et al., 2015), as poor weather conditions can decrease opportunities to engage in meaningful activities, such as shopping and gardening. In the present study, poor weather conditions resulted in fewer opportunities for walking outside, gardening, outdoor social activities, and reduced enjoyment in exercise-based walking. This should be considered when designing interventions that allow PA to be accumulated through general day-to-day activities, which has previously been identified as a key source of PA for older adults (Morgan et al., 2019). Additionally, the qualitative data identified that the participants were more active when they had tasks or roles for the day, such as to go shopping or to meet up with friends. However, as we become older, we often experience transitions such as retirement, bereavement, relocation, and a decline in physical health (Barnett et al., 2012; McDonald et al., 2015; Bidonde et al., 2009; Dumas & Laberge, 2005), whereby roles, responsibilities and social relationships are subject to change, likely influencing changes in PA behaviour. Therefore, the final study aimed to explore these transitions into later life and how they may influence PA in older adults through changes in purpose, meaning, and identity.

The final study offered an in-depth insight into how the transitions into older adulthood may influence PA behaviour in later life presenting a novel contribution to understanding older adults' PA. To the researcher's knowledge, this is the first study to qualitatively explore the transitions into older adulthood and how they may influence PA behaviour in old age, through changes in meaning, purpose, and identity. A key finding from this study highlights the importance of purpose in life for older individuals when adopting health behaviours. Maintaining good health may be more important for those individuals who have a strong sense of purpose in life, than those who do not. In later life, we may want to maintain good health to allow us to spend time with our family, be able to live independently, or to enable us to be able to take part in social activities. Therefore, we value health behaviours, such as PA. Older adults who lack purpose in life may find it difficult to identify with the health benefits of PA, as without a purpose for living there seems little reason to maintain good health. By supporting older adults through transitions, such as retirement and bereavement, where purpose in life can be suddenly changed or removed, and ensuring that feelings of purpose in life are maintained, might provide older adults with a 'reason' to be healthy, thus increasing their motivation to engage in PA.

Previous research has highlighted the need for person-centredness within intervention design, which can be tailored to address the individual, social and environmental needs of older adults (Zubala et al., 2017). By taking a more person-centred approach, we can select BCTs most suitable to the targeted older adults. Person-centredness is a concept that involves meeting the multidimensional needs and preferences of older adults, taking into account each individual's needs, goals, and abilities (Kogan et al., 2016). This thesis first highlights the importance of purpose within a person-centred approach to PA intervention design, offering a novel position on developing PA interventions for older adults. Definitions of purpose in life vary, but they all tend to share three common components, being commitment, goal-directedness, and personal meaningfulness (Bronk, 2014). For an individual to have meaningful goals, they must have a purpose in life as this is what drives goal-directedness. By taking a person-centred approach, where we communicate with the individual, develop an understanding of the whole person and their sources of purpose in life, we may be able to better understand their PA behaviour and how best to tailor intervention strategies to suit their needs, goals, and abilities. This thesis highlights the importance of the transitions associated with later life and their influence on purpose, meaning and identity in older adults, again, offering a novel perspective on understanding PA behaviour in older adults. By taking a person-centred approach to

intervention design and understanding previous and current sources of purpose in life, we may be able to better prescribe PA interventions that either help increase a sense of purpose within the individual or identify how they can accumulate PA incidentally through activities that hold meaning to them, such as social or intellectual pursuits (Guell et al., 2018).

This thesis also extends the body of literature that highlights the relevance of purpose in life and PA engagement in older adults. Morgan et al. (2019) highlighted the role of PA in older adults' sense of purpose, stating that PA can boost self-esteem and support self-identity through adding new roles and daily routines, and structure to daily life. PA also fulfils an individual's need to 'keep busy', which was also evident within the findings of this thesis. Older adults can use regular PA, such as exercise classes, to provide them with a task, and add meaning to their day. The findings within this thesis observe this relationship from an alternate angle, indicating that by maintaining purpose in life as we become older, individuals may have more meaningful activities available to them, such as socialising with friends and family or taking up a voluntary role, whereby they can accumulate PA. Therefore, not only can PA provide older adults with a sense of purpose, as highlighted by Morgan et al. (2019), but by maintaining purpose in life, older adults have meaningful daily tasks to keep them busy and indirectly engage them in PA behaviours.

Within the current literature on interventions designed to promote engagement in PA, results tend to produce small or short-lived changes in PA behaviour (Chase, 2013; Olanrewaju et al., 2016; Zubala et al., 2017). Public health intervention strategies tend to emphasise the health benefits of PA to older adults, with an underlying assumption that older adults with insufficient levels of PA may need to learn about the benefits of an active lifestyle or have access to more appealing forms of PA, such as modified sport and exercises. This thesis highlights the need for a more person-centred approach, emphasising the need for a greater understanding of people's sense of purpose in life, needs, goals, and social and physical environments that shape their PA behaviour. The findings show that older individuals may understand the health benefits of PA and even have access to suitable forms of PA. However, due to a lack of purpose in life, value in good health and access to activities that hold meaning to them, these health promoting messages may have little impact. Older adults who are currently not meeting the recommended levels of PA set by the WHO (WHO, 2016) cannot be assumed to share similar barriers to, and facilitators of PA, to one another. Therefore, by developing a more person-centred approach to intervention design, we can better understand what it is that is meaningful to older adults and use this information to facilitate engagement in PA behaviours.

7.3. Research implications

The present thesis adds to the current literature on the relationship between purpose in life and PA, suggesting that not only can PA provide a sense purpose in life for older adults, but by maintaining purpose in life older adults may continue to engage in meaningful activities where PA is involved. Future research into PA behaviour may want to consider the role of purpose in life within the development and design of person-centred PA interventions. By maintaining a sense of purpose in later life, older adults may have more meaningful sources of PA to engage in, along with an increased desire to maintain good health. Maintaining good health may seem irrelevant to older adults who lack purpose in life, which may explain the relative ineffectiveness of public health initiatives that continue to promote the health benefits of PA. The final study within this thesis identified how the concept of health held value when it was tied to more meaningful components of an individual's life, such as maintaining independence or the ability to spend quality time with loved ones. Without these meaningful facets of life 'good health' may hold little value. Therefore, the present thesis adds value to the field as the findings provide a reasonable explanation for why PA levels amongst older adults remain low despite investment in public health programmes. Researchers and other stakeholders with an invested interest in the health and well-being of older adults may want to use qualitative research methods to develop an understanding of an individual's purpose in life and what is meaningful to them. This deeper understanding of the individual can then be used to design more meaningful PA intervention strategies, developed from the personal needs and goals of the targeted individual. Future research may also want to develop interventions to help increase purpose in life in older adults and how this influences PA behaviour.

Additionally, the transitions explored within this thesis are key stages whereby older adults may lose sense of purpose in life, due to the losses that can occur. Therefore, future research may also want to consider the timing of such interventions to map onto these transitions, as appropriate. By taking the person-centred approach to intervention design used within this study, researchers can explore these transitions associated with older adults and design intervention strategies to help regain a sense of purpose in life, develop a new identity and find new meaning in old age. For example, by encouraging a voluntary role in old age the targeted older adult can find a purpose in life through a new role, regain lost structure, develop a new identity within the role (or social identity with fellow workers), and accumulate PA through their engagement in meaningful daily activities (e.g., walking to work).

Finally, this thesis adds to the current body of research on the use of self-regulatory techniques in PA interventions for older adults. A systematic review by French et al. (2014) suggests that self-regulatory techniques such as setting behavioural goals, self-monitoring of behaviour, supplying normative information and providing feedback on performance were associated with lower levels of PA. The findings within this thesis indicate that these self-regulatory techniques may be beneficial in promoting PA behaviour in older adults under certain circumstances, by allowing older adults to identify current PA levels and make informed decisions to apply conscious effort towards engaging in increased amounts PA behaviour. Future research may want to explore how best to apply such techniques to influence greater engagement in PA in older adults and to explore their effectiveness for health and psychosocial variables of importance for older adults, as this was not possible in the current thesis.

7.4. Theoretical implications

The SEM focuses on the relationship between people and their physical and sociocultural environments and suggests that environmental contexts are a significant predictor of health behaviour (Sallis & Owen, 2015). SEMs can be used to inform research and practice when applied to a specific behaviour, such as PA (Giles-Corti et al., 2005). The findings from this study suggest that the SEM provides a supportive framework for designing multi-level PA interventions for older adults. By identifying influencers of PA at each level of the SEM, stakeholders concerned with the PA levels of older adults can develop appropriate intervention strategies to encourage PA engagement in older adults. Previous research has used the SEM to explore barriers and facilitators to PA engagement in older adults (Bethancourt et al., 2014), identifying factors at all levels of the SEM. This is the first study to highlight the need for the consideration of life transitions at the intrapersonal level of the SEM, due to their potential influence on purpose, meaning and identity, and consequently PA behaviour in later life. Contributing to the body of research on multi-level influencers of PA behaviour in older adults.

The present thesis highlighted how purpose in life may contribute to an individual's value of health, thus stimulating behaviours that help maintain or enhance good health, such as PA. Self-efficacy theory (Bandura, 1977) proposes that self-efficacy expectations, outcome expectancy and outcome value all contribute to determine behaviour in an individual. More specifically, outcome value relates to the value placed on the desired outcome (Thatcher et al., 2011). This is supported by the present thesis, which suggests that lack of purpose in life can result in a decreased value of health. Improved health is often promoted as a key outcome of

PA behaviour in older adults (Reis et al., 2016), which may not be a desired outcome for those who lack purpose in life.

SCT (Bandura, 2004) also identifies a core set of psychosocial determinants for health behaviours, including PA. These determinants include self-efficacy, outcome expectations, facilitators and inhibitors, and goals. It is a purpose in life that provides us with goal directedness, therefore, a life which lacks purpose, will be bereft of goals and direction. Thus, the findings of this thesis support the theoretical underpinnings of SCT, suggesting that a purpose in life is needed in order to develop goals and our commitment to achieving them. Consequently, contributing to our behaviours. By establishing a clear purpose in life, we may encourage engagement in behaviours related to a desired goal, which in turn can increase PA. For example, an older adult who finds a sense of purpose in maintaining their independence may pursue the goal of taking care of their household chores. This behaviour results in increased PA, as an in-direct means of participating in a more meaningful activity to the individual.

7.5. Practical implications

The findings from this research project reveal several practical implications for stakeholders involved in promoting the health and well-being of older adults. First, residential estates that offer housing for older adults provide a suitable setting for the design and implementation of person-centred, multi-level PA interventions. Older adult residential estates offer a unique environment whereby barriers to, and facilitators of, PA can be identified, and intervention strategies can be developed to suit the needs of older adults located around a single geographic location. Moreover, working with organisations that are in direct contact with large groups of older adults, provides researchers and those responsible for the health and well-being of older adults with access to factions of the target population.

The person-centred, multi-level PA intervention was generally well accepted by the participants. However, future interventions may need to consider the concept of purpose in life within the targeted audience, as those who took part within the intervention generally volunteered on the basis that they had an interest in living a healthy life, potentially limiting to reach of the intervention. The findings from this thesis suggest that those who lack purpose in life may not have such goals, therefore it may be difficult to reach those who have lost several sources of purpose as they transitioned into later life. Interventions may want to include components such as volunteering roles (Konrath et al., 2012), well-being therapy (Ruini &

Fava, 2009), and meditation (Jacobs et al., 2011), which have been shown to increase purpose in life in older adults. This may increase the value of health behaviours, such as PA, and increase PA through increased engagement in meaningful daily activities. Organisations similar to that within this thesis may also have access to information regarding life transitions, such as bereavement and relocation, which can be instrumental in changes in purpose in life and an appropriate time to deliver interventions.

7.6. Summary

This thesis presents an appropriate strategy to develop, design and implement a person-centred, multi-level PA intervention for older adults within a residential estate. The SEM provided an applicable framework to identify influencers of PA within the targeted participants and intervention strategies were designed specifically to meet their needs. Although the effectiveness of the intervention cannot be established, the intervention strategy was successfully implemented and showed potential benefits to a small group of older adults living within the residential estate. Limitations have been identified and recommendations were given for future research. Additionally, the findings highlighted the importance of purpose in life and its influence on the PA behaviour of older adults. Older adults who have experienced several of the key transitions associated with old age may be vulnerable to a loss of purpose in life, thus experience reduced daily PA and low motivation to maintain good health. It is hoped that the findings from this thesis, along with future research into PA behaviour in older adults, can improve our understanding of PA behaviour and allow for further development of person-centred, multi-level PA interventions for older adults.

8. Personal Reflection

Throughout the research project presented within this thesis, I faced several challenges along the way. Firstly, working with several stakeholders throughout my journey meant that frequent communication with members from Derwen and Swansea University was essential for ensuring that the objectives of both parties were being met. During my time conducting the research, Derwen was merged with, and renamed as, Pobl. With this change, the health and well-being team who I worked with changed repeatedly. This made it a challenge to ensure that each of the representatives that I had to work with was happy with the work that I was conducting. This would require meetings with the new representatives and an update of the 'journey so far'.

My aim was to make sure that the housing association was going to benefit from my research and be able to use the information to better the health and well-being of its residents. Alongside this, it was important for me to contribute to the current body of literature on PA in older adults and produce a thesis deserving of a Doctor of Philosophy. Initially, a member of the housing association had ideas about me providing more of an exercise-based service to the residents, to get them more active. However, my objective was to design a programme that could be easily implemented after I had finished my research, so that the delivery was not reliant on my personal involvement. Through frequent communication and regular meetings with both parties, I was able to ensure the needs of both were satisfied.

Secondly, there was my own personal involvement in the research process, particularly within the final study. The data collection of this study featured conversation that evoked deep emotions, where participants talked through personal experiences of bereavement, the loss of life purpose and identity. These conversations were difficult for some of the participants to recall and would frequently result in broken voices as they tried to explain their experiences through their tears. This was difficult for me personally, as it was my questions that were triggering such an emotional response. So, I would often mention that they did not have to continue the interview if it was too challenging for them, however, they were happy to continue, stating that it was just 'difficult to speak about'. Part of me felt uncomfortable having to ask them to speak about such experiences, but another part of me felt a sense of pride in developing a relationship with the residents where they were comfortable opening up about such raw and emotionally evoking events. Research involving student researchers suggests that quality academic supervision is essential in supporting them to cope with the emotional demands of

research (Simpson & Wilson-Smith, 2017), and I felt that I received the necessary support to help discuss these challenges with my supervisor through weekly meetings. Being able to reflect upon my experiences allowed me to process the experiences of conducting the interviews.

By establishing a relationship with the participants, it allowed them to open up about sensitive topics in great detail. This highlighted the multiple roles that I took as a researcher throughout the course of the research process. Cartwright and Limandri (1997) previously highlighted the different relationships between researchers and participants, such as stranger-stranger, researcher-participant, friend-friend etc. Once data collection had started in the final study, I was no longer a stranger to the participants, and opening up about such sensitive topics was something they were comfortable with. For me personally, this was a challenge. As the fundamental meaning of my research to me is about how can I help improve the health and well-being of older adults. So, as my conversations would start to trigger emotional responses, it was not something that I was comfortable with as reliving distressing life experiences may have been harmful to the resident's well-being. However, once I had finished the interviews, the residents often acknowledged that they appreciated me taking the time to listen to their stories reassuring me that it was, in general, a positive experience. This also led to me developing my data collection skills as a qualitative researcher, understanding that exploring sensitive topics with participants can be constructive for the individual being explored, increasing my confidence when conducting interviews on sensitive topics in the future.

As an interpretivist researcher and using qualitative inquiry to explore the lives of older adults, it is important to reflect on my positioning throughout the research process, and how I perceive myself in relation to the project, analysis of the data, and ultimately the creation of knowledge. This knowledge is created through interaction between the researcher and the researched, therefore, acknowledging my role in the interpretation of the older adults' lived experiences is important. As an interpretivist/constructivist researcher, the research findings are inevitably influenced by my perspectives, values, and life experiences (Snape & Spencer, 2003). Thus, I cannot ignore what I know, and how this will influence my research. Being a researcher in the field of PA and a frequent exerciser, I am someone who fully understands the benefits of an active lifestyle, which results in PA and exercise being at the forefront of my priorities and a key feature in my daily routine. When I approached the first study, I was keen to explore factors directly related to encouraging an active lifestyle. However, as I got further into my research, I came to understand that this is deeper than just being more physically active, and that to

encourage an active lifestyle, a greater sense of purpose may be needed. This led to me taking a step back and exploring the participants' lives 'as a whole', to help me with my understanding of their physical activity behaviour. This became an exciting venture in the final study.

Specifically in study 2, I had the dual role of researcher and deliverer of the intervention. As I was engaging in bi-weekly calls (check-in calls as they were called in the intervention), not only was I offering support for the participants, but I was living through the intervention with them. This would allow me to understand challenges they were facing and hear how their confidence in their abilities was growing as the weeks were developing. Additionally, through the research process, the time I spent at the residential estate and the frequent interactions I experienced with the residents, I transitioned from a stranger and researcher, to someone who understood this specific group of individuals on an extremely deep and meaningful level. Thus, the findings of this thesis were constructed through a combination of my personal experiences and the experiences of the residents. The closest older adult to myself is my father. Ever since my father became 65 years, he has always stated he is not 'old'. Now, at 75 years old he still makes this claim. He is extremely physically active and always states how 'great' he feels after engaging in physical activities such as exercise or a day of physical work. Throughout my conversations with the older adults within this thesis, I would ask myself 'what makes these different to my father'. My father is still married, still works full-time, has close friends and family, and is still in good health. I feel that when you consider the transitions explored within this thesis that are often associated with later life, maybe he is not 'old'. It was then I started to explore the individuals within the residential estate through these transitions and not just their chronological age.

Within qualitative research, it is important to acknowledge that researcher "subjectivity" can influence the interaction with research participants, the emotional experience of the researcher and the interpretive lens they use (Alvesson & Sköldbberg, 2000). For example, the data in the final study was presented as a meaningful story, to report experiences that are usually not easily accessible. As the researcher, there is a subjective element to the presentation of the data and ideas that it portrays, using my own personal experiences, including those with my elderly relatives and my interactions with the residents within the Gaer through the years of my PhD, to interpret the stories. When interpreting qualitative data, a researcher may consider the past, and other existing data to try and understand what is being told within the stories. This part of the analysis is where the researcher's creativity comes into play, using their knowledge and understanding, professional expertise and personal experiences to understand what is being

told by the participants (Bumbuc, 2016). Thus, I feel that my position as the researcher, and interpreter, of the participants' stories was robust, as I feel there was no one who understood these individuals, and their context, better than myself.

9. Appendices

9.1. Study 1

APPLICATION FOR ETHICAL COMMITTEE APPROVAL OF A RESEARCH PROJECT

In accordance with A-STEM and College of Engineering Safety Policy, all research undertaken by staff or students linked with A-STEM or in the College of Engineering more widely must be approved by the College of Engineering Research Ethics Committee.

RESEARCH MAY ONLY COMMENCE ONCE ETHICAL APPROVAL HAS BEEN OBTAINED

The researcher(s) should complete the form in consultation with the project supervisor. After completing and signing the form students should ask their supervisor to sign it. The form should be submitted electronically to Coe-researchethics@swansea.ac.uk.

Applicants will be informed of the Committee's decision via email to the project leader/supervisor.

1. TITLE OF PROJECT

Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment

2. DATE OF PROJECT COMMENCEMENT AND PROPOSED DURATION OF THE STUDY
--

01/10/2017- 01/10/2020

3. NAMES AND STATUS OF THE RESEARCH TEAM
--

<i>State the names of all members of the research group including the supervisor(s). State the current status of the student(s) in the group i.e. Undergraduate, postgraduate, staff or other (please specify).</i>

Taylor Waters- Main researcher

Jo Hudson- 1 st Supervisor

Kelly Mackintosh- 2 nd Supervisor
--

Denise Brennan- Head of Active Aging (Derwen Housing Association)

4. RATIONALE AND REFERENCES

<i>With reference to appropriate sources of information (using the Harvard system), describe in no more than 200 words the background to the proposed project.</i>

Research has identified the importance of being active throughout older adulthood to maintain and enhance both physiological and psychosocial health (Bauman et al., 2016). For older adults, physical activity can help to manage chronic health conditions, and reduce the chances of suffering from acute ill-health (e.g., stroke; US Department of Health and Human Services, 2008). Older people are at increased risk of loneliness and social isolation, often exacerbated by the fear of falling (Yardley & Smith, 2003). In

contrast, being physically active can contribute to maintaining wellbeing and mental health (Hamer & Stamatakis, 2013).

The age-related declines seen in physical activity are likely associated with deeply ingrained perceptions of a physically inactive self in older adults, hence, are difficult to change (e.g., Hudson et al., 2015). Indeed, interventions aimed at behaviour change at the individual level only have limited success as they depend on the availability of appropriate opportunity and support to change behaviour (Cochrane & Davey, 2008). Instead, it is recommended that behaviour change interventions employ a more holistic approach that encompasses a range of different levels of behavioural influence, such as that offered by a social-ecological approach to behaviour change (e.g., McLeroy et al., 1988). Retirement communities present an ideal environment in which to explore the effectiveness of multi-level interventions that employ a social-ecological approach for increasing physical activity (Kerr et al., 2015). Our proposed project will therefore be amongst a small body of research that adopts a multi-level intervention approach within this context.

5. OBJECTIVES

State the objectives of the project, i.e. one or more precise statements of what the project is designed to achieve.

- *Objective 1:* Determine the Gaer residential community's needs, PA barriers and facilitators, and, current levels of health and wellbeing.
- *Objective 2:* Co-design community-led interventions to increase older people's PA in an older adults residential community, using the formative outcomes obtained from objective 1 and within a social-ecological framework.

6.1 STUDY DESIGN

Outline the chosen study design (e.g., cross-sectional, longitudinal, intervention, RCT, questionnaire etc)

- Qualitative 1-1 will be used to acquire information on the barriers and facilitators to physical activity from residents of Derwen Housing Association living in the Gaer.
- Semi-structured interviews.
- Photo elicitation will be used to enhance the quality of data extracted from the interviews. Allowing the participants to identify barriers and facilitators using photos, which will act as a prompt for factors which may be harder to recall from their memory.

6.2. STUDY DESIGN

- *state the number and characteristics of study participants*
- *state the inclusion criteria for participants*
- *state the exclusion criteria for participants and identify any requirements for health screening*
- *state whether the study will involve vulnerable populations (i.e. young, elderly, clinical etc.)*
- *state the requirements/commitments expected of the participants (e.g. time, exertion level etc)*

- Approximately 24 participants will be recruited for the current study, males and females.
- The participants are from a vulnerable population (Older Adults) but in this study they will not be required to complete any physical activity or take part in any activities beyond those they normally complete.

Inclusion criteria

- Participants must be aged 65+ years.
- Speak English

- Participants must be willing to cooperate with the research team and take part in the proposed data collection methods identified in section 6.1.
- The participants must be willing to openly discuss potential barriers and facilitators that they encounter in an interview situation.
- Participants must be living in accommodation provided by Derwen Housing Association.
- Participants must be willing to cooperate with the research team for the duration of the study.
- Participants must be willing to travel to the location of the study.

Exclusion Criteria

- Participants will be excluded from the project if they have any psychological issues that may put them at risk (e.g. social anxiety disorder).
- Feel uncomfortable sharing information on factors relating to their physical activity participation
- Feel they are not able to cooperate with the research team for the duration of the project
- Unable to understand and converse in fluent English

6.3. PARTICIPANT RECRUITMENT

How and where will participants be recruited?

- Participants will be recruited from the Derwen Housing Association in Newport.
- Recruitment poster will be displayed by Derwen using their social media pages.
- Recruitment poster (see appendix for example) will explain what the aims and objectives of the project are and what the participants will be required to do. The poster asks for members for a focus group, although interview sessions will now take place.
- The project will be advertised to members of Derwen Housing Association prior to an event held at the end of January. During this event, a presentation will be delivered by the main researcher to the members of Derwen and any questions will be answered. Participants then can register themselves to take part in the study.
- Derwen have collected information of residents that would like to improve their health and fitness levels. They have given permission to the research team to contact these residents and ask if they would like to take part in the study.
- Informed consent will be collected at the event at the end of January, and I will check for informed consent a second on the day of the interviews, prior to taking part.

6.4 DATA COLLECTION METHODS

- describe all of the data collection/experimental procedures to be undertaken
 - state any dietary supplementation that will be given to participants and provide full details in Section 6.5
 - state the inclusion of participant information and consent forms (in appendices)
 - refer to the use of the ACA/ACSM health screening questionnaire where appropriate (usually for high intensity/maximal effort exercise. Note that the ACSM have updated their guidelines in a consensus statement dated 2015. Any questions regarding this please contact the chair of the committee.)

- Data collection methods will be 1-1 interviews along with photo elicitation techniques.
- Interviews will be carried out within the household of the participant or the community centre within the Gaer will be carried out on two separate occasions.

- During the interviews, participants will be asked to look through several photos and give their perception of the activity that is being shown.
- The participant will also be shown locations surrounding the new facility and the Gaer and address any issues that may impact their physical activities.
- 3 questionnaires will also be carried out with the residents. These will include the Perceived isolation scale, SF-36 health survey questionnaire and GPAQ. This will be done to gain a better understanding of the current profile of the residents.
- Data already collected by Derwen will be used to inform interview questions (See Appendix)

6.5 DATA ANALYSIS TECHNIQUES

- describe the techniques that will be used to analyse the data

- Interviews will be recorded via a digital voice recorder and transcribed verbatim.
- Thematic analysis will be used to identify barriers to, and facilitators of, physical activity in the interviews.
- Questionnaires will be entered into SPSS.

6.6. STORAGE AND DISPOSAL OF DATA AND SAMPLES

describe the procedures to be undertaken for the storage and disposal of data and samples
- identify the people who will have the responsibility for the storage and disposal of data and samples
- identify the people who will have access to the data and samples
- state the period for which the data will be retained on study completion (normally 5 years, or end of award)

- Data will be stored on the laptop of the main researcher. The laptop will be locked and will only be able to be accessed by the main researcher.
- Once the recordings have been analysed they will be kept for the duration of the project in case they need to be analysed again. Any hard copies of video recordings and transcripts will be kept within the university and stored in a locked cabinet, where keys will be kept by the main researcher.
- Data will be shared with the supervisors of the research project.
- Once the research project has been completed, data will be kept for 5 years and then removed from the device that they are being stored on.

6.7 HOW DO YOU PROPOSE TO ENSURE PARTICIPANT CONFIDENTIALITY AND ANONYMITY?

- Any personal information provided by the participants will be kept confidential by the research team.
- When reporting data from the interviews, the participants will be referred to as a number or code (e.g. Participant1234) to ensure that no personal information is being reported.

- Personal information will be recorded when collecting the questionnaires. These will be collected to in the case of any participants providing worrying data that needs to be re-visited. These participants will then be anonymized following these checks.
- Questionnaires will contain no personal information.

7. LOCATION OF THE PREMISES WHERE THE RESEARCH WILL BE CONDUCTED.

- list the location(s) where the data collection and analysis will be carried out
- identify the person who will be present to supervise the research at that location
- If a first aider is relevant, please specify the first aider

- Derwen Housing Association (Newport)
- Participant houses located at the Gaer.
- To ensure student safety, procedures related to Lone Working (section 3.5 of the Swansea University-Guidance on Safety in Fieldwork) will be completed. I will inform my supervisor Dr. Joanne Hudson on the location and time that I will be carrying out the interviews. I will also inform my supervisor when I am going to enter the participants house and when I leave the house to ensure they are aware that the interview has been carried out successfully and safely.
- Consent will also be obtained from Derwen Housing Association to ensure access to their properties has been given, before entering.

8. POTENTIAL PARTICIPANT RISKS AND DISCOMFORTS

- identify any potential physical risk or discomfort that participants might experience as a result of participation in the study.
- identify any potential psychological risk or discomfort that participants might experience as a result of participation in the study.
- Identify the referral process/care pathway if any untoward events occur

Psychological risks

- Participants may feel uncomfortable speaking of the barriers to physical activity in front of other participants during interviews.
- Being made aware of the low levels of physical activity that participants are currently taking part in may have a negative impact on the participants' psychological state (e.g. increased stress/feelings of anxiety). If the participants become distressed at any point of the project, then the appropriate steps will be taken in reference to the distress management flow chart (See appendix).

Participants will be informed to report any feelings of discomfort to the main researcher and will be told that they are able to remove themselves from the research project at any time. Any data that they have provided to the research team will also be destroyed if this is what the participant desires. Dr Joanne Hudson, who is part of the research team, is a Registered Psychologist, and participants will be able to get in contact if they are feeling distressed.

9.1. HOW WILL INFORMED CONSENT BE SOUGHT?

Will any organisations be used to access the sample population?

Will parental/coach/teacher consent be required? If so, please specify which and how this will be obtained and recorded?

- Consent will be sought from Derwen Housing Association in order to be allowed to approach its members.
- Participants in the research project will be required to sign a consent form (see appendix) to give evidence of their consent to take part in the research project.

9.2 INFORMATION SHEETS AND CONSENT/ASSENT FORMS

- Have you included a participant information sheet for the participants of the study? YES
- Have you included a parental/guardian information sheet for the parents/guardians of the study? NO
- Have you included a participant consent (or assent) form for the participants in the study? YES
- Have you included a parental/guardian consent form for the participants of the study? NO

10. IF YOUR PROPOSED RESEARCH IS WITH VULNERABLE POPULATIONS (E.G., CHILDREN, PEOPLE WITH A DISABILITY), HAS AN UP-TO-DATE DISCLOSURE AND BARRING SERVICE (DBS) CHECK (PREVIOUSLY CRB) IF UK, OR EQUIVALENT NON-UK, CLEARANCE BEEN REQUESTED AND/OR OBTAINED FOR ALL RESEARCHERS? EVIDENCE OF THIS WILL BE REQUIRED.

11. STUDENT DECLARATION

Please read the following declarations carefully and provide details below of any ways in which your project deviates from these. Having done this, each student listed in section 2 is required to sign where indicated.

- ***"I have ensured that there will be no active deception of participants.***
- ***I have ensured that no data will be personally identifiable.***
- ***I have ensured that no participant should suffer any undue physical or psychological discomfort (unless specified and justified in methodology).***
- ***I certify that there will be no administration of potentially harmful drugs, medicines or foodstuffs.***
- ***I will obtain written permission from an appropriate authority before recruiting members of any outside institution as participants.***
- ***I certify that the participants will not experience any potentially unpleasant stimulation or deprivation.***
- ***I certify that any ethical considerations raised by this proposal have been discussed in***

detail with my supervisor.

- ***I certify that the above statements are true with the following exception(s):"***

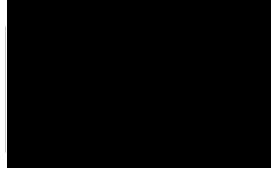
Student/Researcher signature: T.Waters

Date:

12. SUPERVISOR'S APPROVAL

Supervisor's signature:

Date:



PARTICIPANT INFORMATION SHEET
(Version 1.1, Date: 29 /01/2018)

Project Title: Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment

Contact Details: Taylor Waters

Contact email: [REDACTED]

Invitation Paragraph

Ensuring active aging is a key objective of Derwen Housing Association and living an active lifestyle is essential in maintaining good health as we age. You have been invited to participate in a research project which aims to collect information for Derwen Housing Association on how to improve the health and well-being of its residents. The information will be used to provide residents with facilities and opportunities, whilst helping them overcome potential barriers that they may face when taking part in physical activity.

2. What is the purpose of the study?

The study will look to collect information on factors that may increase the physical activity levels of the residents of Derwen. The information will be used to help design a future study held at Derwen and allow Derwen to address the challenges raised by its residents in becoming physically active.

3. Why have I been chosen?

You have been chosen as you are a resident of Derwen Housing Association and meet the requirements of the study, making you the ideal candidate.

4. What will happen to me if I take part?

To take part in this study you will need to take part in a 1-1 interview session, which will be approximately 1 hour in length. The session can be held in your own home or at the community centre in the Gaer, depending on your preference. The researcher will ask questions and you will be allowed to answer them as you wish. You will be allowed to give any information you desire and do not have to stick to the set questions. The sessions will be recorded using a voice recorder so that the researcher can analyse the conversations after the sessions are finished.

5. What are the possible disadvantages of taking part?

However, it is unlikely, you may feel mild discomfort in a discussion with others. However, you can refuse to answer any questions that you do not feel comfortable answering and if you want to remove yourself from the study then you can do so at any time.

6. What are the possible benefits of taking part?

You will have the opportunity to play a part in deciding what kinds of activities will be on offer at Derwen. Findings from the study will also be used to help improve the health and well-being of the residence. The outcomes from the study will have a direct benefit to you and your friends within Derwen.

7. Will my taking part in the study be kept confidential?

Any personal information that you give within the study will only be accessed by the main researcher. For example, you will be given a code name so that you can be identified, whilst keeping your name strictly confidential.

8. What if I have any questions?

If you would like to know any more about the research project, then you can contact the main researcher via post or email. The current project has been approved by the research committee at Swansea University. If you have further questions or have concerns/ complaints please contact Dr Joanne Hudson, Associate Professor, Applied Sports Technology, Exercise and Medicine (A-STEM) Research Centre, Swansea University.



PARTICIPANT CONSENT FORM
(Version 1.1, Date: 29/01/2018)

Project Title:

Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment

Contact Details: Taylor Waters

Contact email: [REDACTED]

Please initial box

- | | |
|---|--------------------------|
| 1. I confirm that I have read and understood the information sheet dated //20 (version number) for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2. 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. | <input type="checkbox"/> |
| 3. I understand that sections of any of data obtained may be looked at by responsible individuals from the Swansea University or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to these records. | <input type="checkbox"/> |
| 1. I understand that data I provide may be used in reports and academic publications in anonymous fashion | <input type="checkbox"/> |
| 2. I agree to take part in the above study. | <input type="checkbox"/> |

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature
Researcher	Date	Signature

PARTICIPANT DISTRESS

Procedures to follow in the event of participant distress during Interviews/Focus Groups

Prior to the interview:

Prior to conducting interviews, pilot interviews will be conducted in liaison with the supervisor. These interviews will provide the researcher with an opportunity to identify any questions that might lead to distress and where appropriate, take steps to rephrase or change these questions.

Before conducting the first formal interview, the student will meet with their supervisor to discuss to procedures that are in place in case a participant becomes distressed during an interview. The supervisor will also ensure the student feels prepared for the interview. The supervisor must be satisfied that the researcher is competent in conducting interviews before giving approval for the commencement of data collection.

Students will inform their supervisor where and when they are completing all interviews and in turn the supervisor will ensure the student has a means of contacting them when they are conducting interviews.

During the interview:

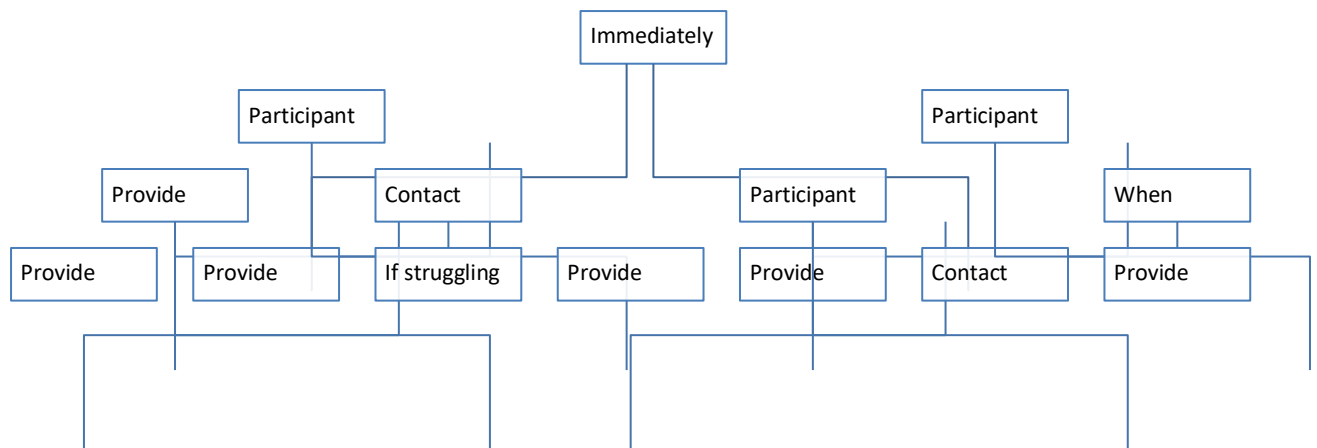
At the beginning of the interview the student will remind the participant that they can stop the interview at any time, that they can choose not to answer questions, and that there are no right or wrong answers to questions (so there is no fear of 'saying the wrong thing').

Once the interview begins, the researcher will be required to be aware of any potential indications of distress (e.g., withdrawing, visible upset, declining to answer numerous questions, shifting in seat, looking away from the interviewer, asking for the interview to end) and should air on the side of caution in all instances. If there is even the slightest indication that participants might be distressed students must immediately follow the procedure below:

- 1) The recording will be immediately stopped and the participant will be asked if they are ok. At this point the participant will be asked if they want to take a break/end the interview/continue talking – the participant's decision will be final. If the participant decides to take a break and continue with the interview, confirmation will be sought that the participant is actually comfortable continuing and they will be reminded there is no penalty for withdrawing.
- 2) If the participant wishes to continue but remains distressed, the interviewer will make the decision to draw the interview to an end. At this point, the interviewer will commit to providing the participant with an opportunity to talk and ensure the participant is not visibly distressed when leaving the interview.
- 3) If the participant remains distressed and the researcher does not feel capable of managing the situation they will contact their respective supervisor who will be available at all times during interviews by phone contact. Depending on the situation, the supervisor will either provide guidance to the student, speak directly to the participant over the phone, or make attempts to go and meet with the researcher and the participant.
- 4) If the participant has become distressed at any point in the interview, the student will ensure the participant has the contact details of the rest of the research team and remind them that they are free to contact any member of the research team if there is anything further they would like to discuss.
- 5) The interviewer will also offer to provide the participants with a list of local contacts (e.g., counselling services, sport psychology services) if they would like them.

- 6) Following the interview, the student will debrief the interview with their supervisor and (if necessary) other senior members of the research team. A written record of the incident and the procedures followed will be made.

Management of Distressed Participants During Interviews



If participant has become distressed at any point you must debrief with supervisor and write up the steps that were taken throughout to manage the situation.

Participant recruitment poster

The poster features three logos at the top: Derwen (a pink tree icon with the text 'derwen Housing for older people'), Prifysgol Abertawe Swansea University (the university crest and name), and pobl (a colorful 'pobl' logo with the tagline 'people making a difference').

Focus Group Participants Needed!

We want to find out:

- What activities you'd like to see in their the community hub as part of the new Gaer development
- Help us understand how best we can help you access these activities
- Use information to help design physical activities and improve the health and well-being of Derwen's residents

Do you want to:

- Have a say on what opportunities are available to you?
- Be part of a research project?
- Have an impact on the health and well-being of the residents of Derwen?

We Are Looking For

Derwen residents who are willing to attend two small local focus groups (groups of 4-6 people) in February to discuss barriers to and things that would support physical activity

Please Contact:
Email: [Redacted]
Telephone: [Redacted]

A cartoon illustration of an elderly man with grey hair, glasses, and a beard, wearing an orange shirt, is positioned in the center of the poster.

Semi-structured interview questions

Intrapersonal

1. Could you give, in as much detail as possible, information on your physical activity over a general week (what kinds, how much, reasons for etc)
<ul style="list-style-type: none">• Why is it you chose to do these activities.....
<ul style="list-style-type: none">• Do you make a conscious decision to take part in these activities.....
<ul style="list-style-type: none">• What are your general reasons to take part in physical activities?

2. When taking part in your day to day physical tasks, exercises or other kinds of physical activity, do you ever face situations which stop or discourage you from taking part
<ul style="list-style-type: none">• Why is it you chose to do these activities.....
<ul style="list-style-type: none">• Do you make a conscious decision to take part in these activities.....
<ul style="list-style-type: none">• What are your general reasons to take part in physical activities?

3. What do you know about the recommended physical activity levels guidelines for older adults and how do you feel about your own ability to achieve these?
<ul style="list-style-type: none">• What do you classify as physical activity?
<ul style="list-style-type: none">• Do you have any personal issues which stop you being able to be active?
<ul style="list-style-type: none">• What do you think could be done to help you participate in higher levels of physical activity, if that is what you'd like.....

Interpersonal

4. Can you tell me about the people close to you and how they do or do not impact your physical activity levels? (e.g. do you have active friends? Do you family encourage you to be more active?)
<ul style="list-style-type: none">• Do your friends or family try to help when you are required to do certain activities? Do you like being receiving help from these people?
<ul style="list-style-type: none">• Is there a social environment within Derwen? Do you think that social activities could be a good way to increase activity? How would you like to see this?
<ul style="list-style-type: none">• Can you tell me about current social activities you take part in? would you like to do more? What is it you like about them?

5. How do you feel about the social aspect of physical activities? For example, being in groups and being by yourself?
<ul style="list-style-type: none">• What are the differences between group and individual activities for yourself?
<ul style="list-style-type: none">• How do you feel about taking part in physical activities in a group setting?
<ul style="list-style-type: none">• In your general day to day activities, do you like spending time on your own or with others? What types of activities would you like to see Derwen provide?

Organisational

6. How do you feel about the new Hub within the Gaer and its location?
<ul style="list-style-type: none">• Do you feel comfortable travelling to and from the new facility? Do you think it has a convenient location?

- | |
|--|
| <ul style="list-style-type: none"> • What activities would you like to see at the new HUB? |
| <ul style="list-style-type: none"> • Do you feel the Hub is going to be a good addition to the residents of Derwen? |

- | |
|--|
| 7. How would you feel about paying for opportunities for physical activities? |
| <ul style="list-style-type: none"> • If you are willing to pay, how much would you expect to pay? |
| <ul style="list-style-type: none"> • Are you more inclined to take part in physical activities if they were free? |
| <ul style="list-style-type: none"> • Can you give me examples of activities you would like to see and how much you would expect to pay? |

- | |
|---|
| 8. What would you suggest would be the best way for Derwen to promote the types of activities that are on offer? |
| <ul style="list-style-type: none"> • Are there any specific times of day you are more active and why is this? |
| <ul style="list-style-type: none"> • Would you prefer having scheduled exercise activities with an instructor, or an increase in opportunities to be active on your own accord? E.g. exercise class vs walking routes. |

Community

- | |
|---|
| 9. How do you feel about the opportunities for being active within the Gaer? E.g. walking routes, sport clubs etc. |
| <ul style="list-style-type: none"> • Do you feel comfortable walking in and around the surrounding areas of the HUB and within the Gaer? |
| <ul style="list-style-type: none"> • What physical activity opportunities would you like to see in the Gaer? And what is it about the activities that interests you? |

- | |
|---|
| 10. How do you feel about working with other local organisations, for example, schools, to organise activities with people from different generations or backgrounds? |
| <ul style="list-style-type: none"> • What do you think about the benefits that intergenerational activities may bring? |
| <ul style="list-style-type: none"> • How do you feel about the potential of part-time opportunities to care for animals? |

BCT Questions (Based on successful BCT according to French, 2014 systematic review)

- | |
|--|
| 11. If you were going to increase your physical activity levels, in which way would you like to do this? And why? (Exercise, sport, general) |
| <ul style="list-style-type: none"> • What is it that you like about these activities? |
| <ul style="list-style-type: none"> • What makes other types (e.g. exercise) less appealing? |

- | |
|---|
| 12. How do you feel about being provided with information on how to increase your physical activity levels? |
| <ul style="list-style-type: none"> • How would you like this information to be delivered to you? |
| <ul style="list-style-type: none"> • Do you feel more information on physical activity would encourage you to do more? |
| <ul style="list-style-type: none"> • What kind of information do you think would be beneficial? (e.g. benefits, locations, types, instruction) |

13. How do you feel about being able to monitor your own physical activity levels?

- This may be achieved using devices such as accelerometers and pedometers, how would you feel about wearing a physical activity tracker?
- If you realised you were under achieving in your physical activity levels, would you be more likely to attempt to increase them?

14. Do you currently set yourself PA goals? How do you feel about doing this?

- Are you motivated by setting goals?
- How do you feel about the combination of setting goals and monitoring your own PA levels?

15. How do you feel about the use of technology? For example, using APP's or smartphones to monitor your physical activity levels?

- If you were shown how to use these, do you think you would use it? If so why or why not?

16. What do you think Derwen could do/ help with in relation to a physical activity intervention?

- What do you think could be done to help you increase your physical activity levels?

Interview photo elicitation images (Types of PA)

















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10880188
Lisa F. Young | Dreamstime.com





Interview photo elicitation images (Images of the surrounding area)











































Example of interview transcription

1 Interview session 1 Participant RL2404 (24/04/2018)

2 Interviewer: Ok, so in as much detail can you give me as much information on your current
3 physical activity over the course of a week?

4 RL2404: Generally I don't do a lot...I cant walk too much because I got bad knees, I got chest
5 problems, I got this in my stomach, these operations that I've been having. So generally I am not that
6 active. So mostly it is compliant too...local. Just anything in general...

7 Interviewer: general day to day activity...so you don't choose to do purposeful activity, you just do
8 what you do?

9 RL2404: yeah, I just do what I do. Normal everyday things you know. I don't go to fitness clubs or
10 anything. I couldn't do it.

11 Interviewer: and when you say you couldn't do it, it is cause of the physical things...

12 RL2404: physical disabilities yes.

13 Interviewer: ok, so say you wake up in the morning...

14 RL2404: it takes me a long time to get ready...

15 Interviewer: ok, and is that cause of the physical issues as well.

16 RL2404: yes, it is. It takes me a long time to get ready.

17 Interviewer: yeah, ok. If you don't mind speaking about them, what are the physical issues. You
18 said about your knee?

19 RL2404: yeah, I have had a replacement knee that plays up now afterwards. You think its going to
20 get better but it's not a full-time thing. Its gone back again. So, I have got arthritis in my knees and a
21 bit in my back. So, when I get up in the morning I am a bit stiff like, you know. So, it takes me a long
22 time to get ready.

23 Interviewer: has that got worse over time as well.

24 RL2404: umm, it has got slowly worse yes, but it has got to the point where it has stayed there for a
25 while now. And I am hoping it is not going to get any worse.

26 Interviewer: cause of the issues you are having, is that impacting your activity level?

27 RL2404: id like to be more active yes. But I can't.

28 Interviewer: so, it is those issues that are stopping you from something that you would like to do...

29 RL2404: I'd like to do more of it yes.

30 Interviewer: ok brilliant. So, when taking part in you day to day tasks, obviously you said you don't
31 choose to do exercise, your activity is just general...

32 RL2404: it's just general yes...

33 Interviewer: and then the thigs you said that are stopping you, you said the things like your knees
34 and your back. You got the operations with your stomach.

35 RL2404: yeah, I had them yeah. And I got chest problems as well. Bit of a mess (laughs)

37 **people over 65?**

38 RL2404: not really no. I'm not into that no.

39 **Interviewer: you haven't come across them at all?**

40 RL2404: No.

41 **Interviewer: ok, well they are made by the national organisations and they say it is 150 minutes of**

42 **physical activity over the course of a week...and that is of moderate intensity, where your heart**

43 **rate is elevated and so on. And they advise some balance work and other things. So, in your mind,**

44 **what would you classify as physical activity...**

45 RL2404: if I wanted to do it?

46 RL2404: well if I wanted to do anything at all, I wouldn't go to a gym because it would be too much

47 for me. But if I was in the house, I would like to do normal physical exercises. You know, like this sort

48 of thing (demonstrates pulling) and that (demonstrates pushing).

49 **Interviewer: like resistance bands?**

50 RL2404: yeah that sort of thing.

51 **Interviewer: ok, so when you said going to a gym would be too much, in what way?**

52 RL2404: I mean if I did any lifting, that would hurt (points at stomach)...it definitely would and I am

53 being serious.

54 **Interviewer: ok, so if you don't mind me asking, what has happened?**

55 RL2404: well, I have got hernias, I have had a bit of bowel removed in my last operation, which was a

56 major operation. And this is an ongoing part of it, I have to wait for the same surgeon to do it and at

57 the moment it is difficult to get it done, you know, with the beds and everything.

58 **Interviewer: when did all this start?**

59 RL2404: oh, I have had it for years, quite a few years ago now. It was going back years, but it has

60 kept on coming back again. And um, it is awkward to explain really. It's just reoccurring, the problem

61 is reoccurring. And what he has done has seemed to stay alright. I will never be right. I will always be

62 a bit uncomfortable, in a bit of discomfort. Bending down is awkward, you know, things like that. I

63 am not a very good subject (laughs)

64 **Interviewer: no it is perfect. So, do you think from your perspective, is there anything that could**

65 **help you become more active?**

66 RL2404: I don't know. I don't know...until its...yeah...its hard to find out. I wouldn't like to try

67 anything, because I know if I am in the house and move something or do something afterwards, I am

68 paying for it. I really am. If I wanted to try and move anything. You know, whereas before I could do

69 it easy. I can't now. You know I am 76, or near enough.

70 **Interviewer: so, when you decide to do something...**

71 RL2404: it, it, it concerns me of course. So, I have got to be very careful and maybe ask somebody to

72 give me a hand.

73 Interviewer: yeah. I guess that rolls in perfectly. When you say that you have to ask someone to
74 give you a hand. Who do you have around you, in terms of friends and family?

75 RL2404: I could ask my cousin, he would come down. There is a chap in there, who is close to where
76 I live, he would come and help me if I wanted him to. He's not too bad himself. I got my brother,
77 although he is not 100%. Between two of us it wouldn't be too bad, but actually, I am probably
78 going to get someone to come in and help me. I'll have to see what I can do. Its only, I wouldn't want
79 somebody there all the time obviously, but if I want something done. Like if I want the garden done,
80 ill have to get somebody in to do the garden because I can't do it like I used to.

81 Interviewer: so, would you enjoy doing the gardening?

82 RL2404: I used to, I didn't mind doing the garden. I wasn't a big gardener. I just like doing a few little
83 things here and there. Like I don't mind doing a couple of tomatoes, beans, onions, you know things
84 like that. But I just can't do the garden anymore now.

85 Interviewer: it must be a lot more difficult. So, you get a lot of pain as well?

86 RL2404: oh yes it does hurt. If I do anything it hurts, that's why I have to be very careful with what I
87 do.

88 Interviewer: yeah, it is tricky. Is there much of a social environment around you?

89 RL2404: it is not too bad, people talk to each other yes.

90 Interviewer: yeah, you feel comfortable asking people to give you a hand?

91 RL2404: oh yes. Sometimes, it alright.

92 Interviewer: ok, is there any social activities you know of that go on in Derwen?

93 RL2404: not a lot. I tend to keep myself to myself a bit.

94 Interviewer: would you like there to be more social things?

95 RL2404: umm, I'm not sure. It might be, dependant on what it is. You know Joyce? That's my friend,
96 we go and have a cup of tea every now and again, and things like that. That's all I do. Yeah, I don't do
97 much at all.

98 Interviewer: would you be interested, if they arranged anything else? Like group activities? Do you
99 like being in groups? Or do you keep yourself to yourself?

100 RL2404: I do mostly to be honest.

101 Interviewer: by choice? Or because there is not much going on?

102 RL2404: its sort of by choice. I am not big on it...

103 Interviewer: not a big social butterfly?

104 RL2404: no.

105 Interviewer: ok, do you have an interest in being social?

106 RL2404: no, I am a bit poring actually, I watch the tele, and that's about it. There is not an awful lot

109 Interviewer: yeah. Ok, how do you feel about group walking sessions and things?

110 RL2404: id like to. I used to be in one, but now I just can't...

111 Interviewer: because of the knees and things?

112 RL2404: yeah.

113 Interviewer: when you get the physical issues, it can be real difficult cant it. And you don't think
114 that it is going to get much better?

115 RL2404: no, no. it is not. And I don't want another operation on it if I can help it. No.

116 Interviewer: ok, you said that in your general day to day activities that you would rather do things
117 by yourself.

118 RL2404: yeah, because then I haven't got anyone to, I haven't got anyone else to, because I don't
119 want to try something that I can't take part in. so I just keep myself to myself. You know, I will go to
120 a meeting like this, or sometimes Derwen have a meeting. if I am not doing anything then I will go
121 down, but other than that I won't do anything.

122 Interviewer: do you feel comfortable in groups?

123 RL2404: I think that, if it is just talking like we are now, like if it is a few of you talking then I don't
124 mind. Like we were talking in there the other month. I am alright with that, because I am not doing
125 anything. I just do that, then make my way back home.

126 Interviewer: if it was a group activity, would you maybe be a bit worried about going there and
127 not being able to do it?

128 RL2404: yes. Yes.

129 Interviewer: if there were people in a group who were similar to yourself, who also had issues,
130 physically, do you think you would be a bit more comfortable within that...

131 RL2404: Probably not, I would probably get into conversation with them but.... i mean it would
132 depress me...you know, it would depress me...

133 Interviewer: ok, what seeing others?

134 RL2404: yes, because it reminds me of me...it reminds me of myself.

135 Interviewer: ok, well how do you feel about the new hub down there?

136 RL2404: umm, well it sounds like a good idea. For the people living there especially, because they
137 are going to have a little from what they say a few little things going on there. And there will be a
138 little café thing down there. If I could get down there I wouldn't mind going down. I wouldn't mind
139 doing that.

140 Interviewer: yeah, ok. You say if you could get down there, how do you feel about travelling back
141 and forth?

142 RL2404: I can get down there in the car. But I can't walk. I don't like to let myself do too much
143 walking...

9.2. Study 2

APPLICATION FOR ETHICAL COMMITTEE APPROVAL OF A RESEARCH PROJECT

In accordance with A-STEM and College of Engineering Safety Policy, all research undertaken by staff or students linked with A-STEM or in the College of Engineering more widely must be approved by the College of Engineering Research Ethics Committee.

RESEARCH MAY ONLY COMMENCE ONCE ETHICAL APPROVAL HAS BEEN OBTAINED

The researcher(s) should complete the form in consultation with the project supervisor. After completing and signing the form students should ask their supervisor to sign it. The form should be submitted electronically to Coe-researchethics@swansea.ac.uk.

Applicants will be informed of the Committee's decision via email to the project leader/supervisor.

1. TITLE OF PROJECT
Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment (Part 1B)
2. DATE OF PROJECT COMMENCEMENT AND PROPOSED DURATION OF THE STUDY
01/10/2017- 01/10/2020
3. NAMES AND STATUS OF THE RESEARCH TEAM
<i>State the names of all members of the research group including the supervisor(s). State the current status of the student(s) in the group i.e. Undergraduate, postgraduate, staff or other (please specify).</i>
Taylor Waters- Main researcher Jo Hudson- 1 st Supervisor Kelly Mackintosh- 2 nd Supervisor Denise Brennan- Head of Active Aging (Derwen Housing Association)
4. RATIONALE AND REFERENCES
<i>With reference to appropriate sources of information (using the Harvard system), describe in no more than 200 words the background to the proposed project.</i>
Research has identified the importance of being active throughout older adulthood to maintain and enhance both physiological and psychosocial health (Bauman et al., 2016). For older adults, physical activity can help to manage chronic health conditions, and reduce the chances of suffering from acute ill-health (e.g., stroke; US Department of Health and Human Services, 2008). Older people are at increased risk of being lonely, and social isolation, often exacerbated by the fear of falling (Yardley & Smith, 2003). In contrast, being physically active can contribute to maintaining wellbeing and mental health (Hamer & Stamatakis, 2013). The age-related declines seen in physical activity are likely associated with deeply ingrained perceptions of a physically inactive self in older adults, hence, are difficult to change (e.g., Hudson

et al., 2015). Indeed, interventions aimed at behaviour change at the individual level only have limited success as they depend on the availability of appropriate opportunity and support to change behaviour (Cochrane & Davey, 2008). Instead, it is recommended that behaviour change interventions employ a more holistic approach that encompasses a range of different levels of behavioural influence, such as that offered by a social-ecological approach to behaviour change (e.g., McLeroy et al., 1988). Thornton et al., (2017) identified all correlates of physical activity in older adults were evident at all levels of the social ecological model and believe that multi-level interventions would be more effective at increasing physical activity in older adults. Retirement communities present an ideal environment in which to explore the effectiveness of multi-level interventions that employ a social-ecological approach for increasing physical activity (Kerr et al., 2015). Boulton et al., (2018) carried out semi-structured interviews and interviews with older adults aged 50-87. They identified influencers of physical activity on all levels of the social ecological model and proposed PA for older adults should be enjoyable, sociable, affordable, accessible, flexible and seasonal. These factors were believed to be more important than the health benefits that can be achieved from physical activity participation. Our proposed project will therefore be amongst a small body of research that adopts a multi-level intervention approach within this context.

5. OBJECTIVES

State the objectives of the project, i.e. one or more precise statements of what the project is designed to achieve.

- Design and implement a community-led intervention to increase older people's PA in an older adults residential community, using the formative outcomes obtained from prior qualitative study.

6.1 STUDY DESIGN

Outline the chosen study design (e.g., cross-sectional, longitudinal, intervention, RCT, questionnaire etc)

The intervention aims to identify the effectiveness and feasibility of the proposed physical activity intervention. The objectives of the intervention are as follows:

1. Recruit suitable number of participants for the intervention.
2. Collect informed consent from participants.
3. Take baseline measurements.
4. Implement 12-week intervention.
5. Collect post intervention measurements.
6. Assess and evaluate the effectiveness of the intervention and provide recommendations moving forward.

Assessment points of effective intervention:

- Recruitment rate
- Participation and retention
- Practical application
- Participant feedback
- Appropriateness of methodology and assessment tools
- Physiological impacts
- Psychological impacts

Methods/ design

The study is an RCT of a 12-week physical activity intervention compared with a control group. A mixed methods approach (Both quantitative and qualitative methods) will be used to assess its effectiveness. Quantitative data will be collected from both intervention and control group at baseline and immediately post-intervention. These measures will be used to assess physiological and psychological effects of the intervention. Qualitative measures will be carried out shortly after the intervention has concluded. These will be used to assess the acceptability of the intervention by the participants, any problems they felt during the intervention and how they feel it could be improved.

6.2. STUDY DESIGN

- state the number and characteristics of study participants
- state the inclusion criteria for participants
- state the exclusion criteria for participants and identify any requirements for health screening
- state whether the study will involve vulnerable populations (i.e. young, elderly, clinical etc.)
- state the requirements/commitments expected of the participants (e.g. time, exertion level etc)

Participants will be recruited within the Gaer, Newport. They will be contacted by the main researcher via phone call or face to face contact. The Hub located within the Gaer, which houses approximately 60 Derwen residents, will be a focus point for participant recruitment. I will hold a presentation in the social room located within the Hub and provide the residents the opportunity to take part in the study. Members of the Derwen housing association will be contacted via information provided by the housing association. Derwen carried out questionnaires with their participant, consisting on general health and well-being related questions. This questionnaire also asked if the participants could be contacted for further research. Derwen provided the main researcher with this contact information so that contact could be made directly to the participants. Therefore, participants had given consent to be contacted about taking part in further research regarding physical activity, health and well-being.

Participants will be given full instructions on what will be required of them for the duration of the study and informed consent will need to be collected before any participant can take part in the study. Approximately 16 participants will be recruited to take part in the study (8= intervention, 8=control). Participants will need to pass through both inclusion and exclusion criteria.

Once baseline measurements have been collected and all participants have been provided with the pedometers used for objective measurements of physical activity, the intervention will begin with the main researcher delivering the information leaflet (component 1&4) to the participants of the intervention group. On the same day a sign posts will be placed around the site of the new hub (component 3), whereby the residents can monitor their own steps and assess the difficulty of the walking terrain at the site. Telephone interviews will be carried out by the main researcher bi-weekly (component 2). These interview sessions will be used to support the older adult's physical activity behaviors by giving advice on how they can increase their PA, overcome barriers, set goals and increase motivation for physical activity behaviors. The intervention aims to improve knowledge and understanding on physical activity, offer social support via telephone interviewing and manipulate the environment to ensure a safe and comfortable walking environment for the residents of the area. (See appendix for further information on intervention components).

Inclusion criteria

- Community dwelling older adult aged 65+ years old.
- Participants must be willing to cooperate with the research team and take part in the proposed data collection methods identified in chapter 6.1.
- Participants must be living in accommodation provided by Derwen Housing Association.
- Participants must be willing to cooperate with the research team for the duration of the study.

- Participants must be physically mobile.
- Able and willing to give written informed consent.
- Must be able to understand English and be able to complete questionnaires provided by the participants.

Exclusion Criteria

- >65 years old.
- Currently participating in another physical activity intervention.
- Currently living a physically and socially active life.
- Unable to understand English or complete required questionnaires.
- Participants will be excluded from the project if they have any physical/ psychological issues that may put them at risk.
- Feel uncomfortable sharing information on factors relating to their physical activity participation.
- Feel they are not able to cooperate with the research team for the duration of the project.

6.3. PARTICIPANT RECRUITMENT

How and where will participants be recruited?

- Participants will be recruited from the Derwen Housing Association in Newport. The Hub located within the Gaer, which houses approximately 60 Derwen residents, will be a focus point for participant recruitment. I will hold a presentation in the social room located within the Hub and provide the residents the opportunity to take part in the study.
- Members of the Derwen housing association will be contacted via information provided by the housing association. Derwen carried out questionnaires with their participant, consisting on general health and well-being related questions. This questionnaire also asked if the participants could be contacted for further research. Derwen provided the main researcher with this contact information so that contact could be made directly to the participants. Therefore, participants had given consent to be contacted about taking part in further research regarding physical activity, health and well-being.
- The research project will be promoted via social media, e-mail and post to allow members of Derwen housing association to get in touch with the main researcher and volunteer to take part in the project.

6.4 DATA COLLECTION METHODS

- describe all of the data collection/experimental procedures to be undertaken
- state any dietary supplementation that will be given to participants and provide full details in Section 6.5
- state the inclusion of participant information and consent forms (in appendices)
- refer to the use of the ACA/ACSM health screening questionnaire where appropriate (usually for high intensity/maximal effort exercise. Note that the ACSM have updated their guidelines in a consensus statement dated 2015. Any questions regarding this please contact the chair of the committee.)

Quantitative

- Health Related Quality of Life, Medical Outcomes Study 36-item Short Form Health Survey (Ware & Sherbourne, 1992)- The 36-Item Short Form Health Survey (SF-36) is widely validated and popularly used in assessing the subjective quality of life (QOL) of patients and the general public. The SF-36 questionnaire can provide a direct quantitative

indication of an individual's health status and, as it is easy to administer, it has become the most widely-used QOL evaluation tool in the world.

- Loneliness (de Jong-Gierveld scale; de Jong-Gierveld, 1987)- The 6-item De Jong Gierveld Loneliness Scale is a reliable and valid measurement instrument for overall, emotional, and social loneliness.
- Self-efficacy (Re-designed Exercise Self-Efficacy Measure, Resnick et al., 2000)- The Resnick SEEB is a 9-item scale that measures self-efficacy to overcome barriers to physical activity. It has a 10-point response pattern with one representing not confident and 10 very confident. Scores from the Resnick SEEB are also created by averaging responses. A higher total score indicates higher self-efficacy for overcoming barriers to exercise.
- Outcome expectancy (Re-designed Outcome Expectancy for exercise scale, Resnick et al., 2000). This scale was developed based on Bandura's theory of self-efficacy and the work of prior researchers in the development of measures of outcome expectations. OEE scale can help identify older adults with low outcome expectations for exercise.
- Testing battery validated by Rikli and Jones (1999). This test is used to evaluate functional fitness in older adults. This includes being able to perform everyday activities (e.g. personal care, shopping, housework) which require the ability to perform functional movements, such as walking, stair climbing and standing up.
- Pedometer measures will be used to measure physical activity of the residents. Kim and Lee (2010) claim that the use of a pedometer to monitor walking as a physical activity in older adults appears to be reliable and valid. Pedometers have been chosen for objective measurements of physical activity due to their ease of use and because older adults tend to spend the largest portion of their day performing light-intensity physical activities, such as walking (Westerterp, 2008).

Qualitative

- 1-1 semi-structured interviews will be used once the intervention is complete. The interviews will follow a pre-set interview guide to identify the acceptability, strengths, weaknesses and potential improvements moving forward. The semi-structured nature of the interviews allow the interviewer to explore any other avenues that arise within the interview if they feel it is necessary. The style of interview will also allow for a more informal style conversation, whilst keeping the key objectives of the interview at the forefront. Interviews will be transcribed verbatim and thematically analysed to identify key themes that arise.
- Interviews will also include conversations on how their current physical activity level has been impacted by the current COVID-19 lockdown. These will be carried out with both intervention and control participants.

6.5 DATA ANALYSIS TECHNIQUES

- describe the techniques that will be used to analyse the data

- Interviews will be recorded, transcribed and thematically analysed.
- Psychological scales will be calculated and entered into SPSS, along with other quantitative data, for further analysis.

6.6. STORAGE AND DISPOSAL OF DATA AND SAMPLES

describe the procedures to be undertaken for the storage and disposal of data and samples

- *identify the people who will have the responsibility for the storage and disposal of data and samples*
- *identify the people who will have access to the data and samples*
- *state the period for which the data will be retained on study completion (normally 5 years, or end of award)*

- Data will be stored on the laptop of the main researcher. The laptop will be locked will only be able to be accessed by the main researcher.
- Data will be shared with the supervisors of the research project.
- Once the research project has been completed, data will be kept for 5 years and then removed from device that they are being stored upon.

6.7 HOW DO YOU PROPOSE TO ENSURE PARTICIPANT CONFIDENTIALITY AND ANONYMITY?

- Any personal information provided by the participants will be kept confidential by the research team.
- When reporting data from the interviews, the participants will be referred to as a number or code (e.g. Participant1234) to ensure that no personal information is being reported.
- Personal information will not be recorded when reporting quotes from transcriptions.

7. LOCATION OF THE PREMISES WHERE THE RESEARCH WILL BE CONDUCTED.

- *list the location(s) where the data collection and analysis will be carried out*
- *identify the person who will be present to supervise the research at that location*
- *If a first aider is relevant, please specify the first aider*

- Swansea University
- Derwen Housing Association (Newport)

8. POTENTIAL PARTICIPANT RISKS AND DISCOMFORTS

- *identify any potential physical risk or discomfort that participants might experience as a result of participation in the study.*
- *identify any potential psychological risk or discomfort that participants might experience as a result of participation in the study.*
- *Identify the referral process/care pathway if any untoward events occur*

Physical risks

- Participants may feel discomfort when wearing pedometers.
- Although the appropriate procedures will be followed to minimize risk, there is a potential injury risk when taking part in physical assessments.

Psychological risks

- Participants may feel uncomfortable speaking of issues within the intervention in front of other participants during focus groups.
- Being made aware of the low levels of physical activity that participants are currently taking part in may have a negative impact on the participants' psychological state (e.g. increased stress/ feelings of anxiety).

Participants will be informed to report any feelings of discomfort to the main researcher and will be told that they are able to remove themselves from the research project at any time. Any data that they have provided to the research team will also be destroyed if this is what the participant desires.

All participants aged ≥ 65 years old will complete a health screening questionnaire based on ACSM guidelines (2015) prior to enrolment (see Appendix). Triggering of the ACSM algorithm (see ACSM; Riebe *et al.*, 2015) by an older adult during health screening will not automatically exclude them from the study. Each case will be dealt with on an individual basis and the participant will be asked to gain written medical clearance from their GP or Hospital Consultant Team, where indicated and appropriate, or to sign a medical disclaimer, if, they still wish to participate in the stud.

9.1. HOW WILL INFORMED CONSENT BE SOUGHT?

Will any organisations be used to access the sample population?

Will parental/coach/teacher consent be required? If so, please specify which and how this will be obtained and recorded?

- Consent will be sought from Derwen housing association in order to be allowed to approach its members.
- Participants in the research project will be required to sign a consent form (see appendix) to give evidence of their consent to take part in the research project.

9.2 INFORMATION SHEETS AND CONSENT/ASSENT FORMS

- Have you included a participant information sheet for the participants of the study?
YES/NO
- Have you included a parental/guardian information sheet for the parents/guardians of the study? YES/NO
- Have you included a participant consent (or assent) form for the participants in the study?
YES/NO
- Have you included a parental/guardian consent form for the participants of the study?
YES/NO

10. IF YOUR PROPOSED RESEARCH IS WITH VULNERABLE POPULATIONS (E.G., CHILDREN, PEOPLE WITH A DISABILITY), HAS AN UP-TO-DATE DISCLOSURE AND BARRING SERVICE (DBS) CHECK (PREVIOUSLY CRB) IF UK, OR EQUIVALENT NON-UK, CLEARANCE BEEN REQUESTED AND/OR OBTAINED FOR ALL RESEARCHERS? EVIDENCE OF THIS WILL BE REQUIRED.

11. STUDENT DECLARATION

Please read the following declarations carefully and provide details below of any ways in which your project deviates from these. Having done this, each student listed in section 2 is required to sign where indicated.

- ***"I have ensured that there will be no active deception of participants.***
- ***I have ensured that no data will be personally identifiable.***
- ***I have ensured that no participant should suffer any undue physical or psychological discomfort (unless specified and justified in methodology).***
- ***I certify that there will be no administration of potentially harmful drugs, medicines or foodstuffs.***
- ***I will obtain written permission from an appropriate authority before recruiting members of any outside institution as participants.***
- ***I certify that the participants will not experience any potentially unpleasant stimulation or deprivation.***
- ***I certify that any ethical considerations raised by this proposal have been discussed in detail with my supervisor.***
- ***I certify that the above statements are true with the following exception(s):"***

Student/Researcher signature: (include a signature for each student in research team)

Date:

12. SUPERVISOR'S APPROVAL

Supervisor's signature:

Date:

PARTICIPANT INFORMATION SHEET

(Version 1.1, Date: XX /XX/20)

Project Title: Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment

Contact Details:

Name: Taylor Waters

Telephone: [REDACTED]

Email: [REDACTED]

Invitation Paragraph

We are looking for participants to help us improve the health and well-being of the residents at Derwen. Physical activity is a key aspect of living a healthy and fulfilling lifestyle, and we are looking for residents to take part in a study which can identify strategies to increase physical activity and improve the quality of life of the residents of Derwen.

2. What is the purpose of the study?

The study aims to implement an intervention strategy, which aims to increase physical activity, physical function and reduce feelings of loneliness and social isolation within the residents of Derwen.

3. Why have I been chosen?

You have been chosen as you are resident of Derwen and have the potential to play a key role in the health and well-being of current and future residents.

4. What will happen to me if I take part?

If you take part in the study, you will be required to liaise with the research team, who will provide you with numerous tools aiming to help you increase your physical activity levels. The full period of the intervention will be 12-weeks, so you will be asked to liaise with the research team for the full duration. You will be asked to read some information leaflets and provided equipment to help you be physically active. Whether you try and increase your physical activity levels will be up to you and you will be not be forced to do anything you do not wish to do.

5. What are the possible disadvantages of taking part?

There are no disadvantages of taking part, as you will be free to remove yourself from the study at any point.

6. What are the possible benefits of taking part?

You will be provided with help and support to encourage you to live a more active lifestyle. The research project may help improve the health and well-being of you and your surrounding residents.

7. Will my taking part in the study be kept confidential?

Any information that you provide the research team will be kept strictly confidential. Information will be kept by the head researcher and any personal information not be reported in the final outcomes. Information will be kept on a locked computer which is only accessible by the head researcher.

Data Protection and Confidentiality

Your data will be processed in accordance with the Data Protection Act 2018 and the General Data Protection Regulation 2016 (GDPR). All information collected about you will be kept strictly confidential. Your data will only be viewed by the researcher/research team.

All electronic data will be stored on a password-protected computer file on the laptop owned by the head researcher. All paper records will be stored in a locked filing cabinet at Swansea University engineering east. Your consent information will be kept separately from your responses to minimize risk in the event of a data breach.

Please note that the data we will collect for our study will be made anonymous. Anonymisation of the data will take place once data has been collected, where codes will be given to represent the names of the participant, thus it will not be possible to identify and remove your data at a later date, should you decide to withdraw from the study. Therefore, if at the end of this research you decide to have your data withdrawn, please let us know before you leave.

Data Protection Privacy Notice

The data controller for this project will be Swansea University. The University Data Protection Officer provides oversight of university activities involving the processing of personal data, and can be contacted at the Vice Chancellors Office.

Your personal data will be processed for the purposes outlined in this information sheet. Standard ethical procedures will involve you providing your consent to participate in this study by completing the consent form that has been provided to you.

The legal basis that we will rely on to process your personal data will be processing is necessary for the performance of a task carried out in the public interest. This public interest justification is approved by the College of Engineering Research Ethics Committee, Swansea University.

The legal basis that we will rely on to process special categories of data will be processing is necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes.

How long will your information be held?

We will hold any personal data and special categories of data for 5 years after the data has been collected. Once this time has passed, all data will be removed from the main researchers' laptop. This will allow the data to be stored long enough for the project to be finished and re-visited in needs be.

What are your rights?

You have a right to access your personal information, to object to the processing of your personal information, to rectify, to erase, to restrict and to port your personal information. Please visit the University Data Protection webpages for further information in relation to your rights.

Any requests or objections should be made in writing to the University Data Protection Officer:-

University Compliance Officer (FOI/DP)
Vice-Chancellor's Office

Swansea University
Singleton Park
Swansea
SA2 8PP
Email: dataprotection@swansea.ac.uk

How to make a complaint

If you are unhappy with the way in which your personal data has been processed you may in the first instance contact the University Data Protection Officer using the contact details above.

If you remain dissatisfied then you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at: -

Information Commissioner's Office,
Wycliffe House,
Water Lane,
Wilmslow,
Cheshire,
SK9 5AF
www.ico.org.uk

8. What if I have any questions?

Re-iterate that further information can be obtained from the researcher contact stated above. Also state that the project has been approved by the College of Engineering Research Ethics Committee at Swansea University. If you have any questions regarding this, any complaint, or concerns about the ethics of this research please contact Dr Andrew Bloodworth, Chair of the College of Engineering Research Ethics Committee, Swansea University. [REDACTED] The institutional contact for reporting cases of research conduct is Registrar & Chief Operating Officer Mr Andrew Rhodes. Email: researchmisconduct@swansea.ac.uk. Further details are available at the Swansea University webpages for Research Integrity. <http://www.swansea.ac.uk/research/researchintegrity/>.

PARTICIPANT CONSENT FORM
(Version 1.1, Date: xx/xx/20xx)

Project Title:

Helping Older People Manage their Environment for decreasing Loneliness, Increasing Functionality and Enjoyment

Contact Details:

Name: Taylor Waters

Telephone: [REDACTED]

Email: [REDACTED]

Please initial box

- 4. I confirm that I have read and understood the information sheet dated //20 (version number) for the above study and have had the opportunity to ask questions.

- 5. 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.

- 6. I understand that sections of any of data obtained may be looked at by responsible individuals from the Swansea University or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to these records.

- 3. I understand that data I provide may be used in reports and academic publications in anonymous fashion

- 4. I agree to take part in the above study.

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature
Researcher	Date	Signature

PARTICIPANT DISTRESS

Procedures to follow in the event of participant distress during Interviews/Focus Groups

Prior to the interview:

Prior to conducting interviews, pilot interviews will be conducted in liaison with the supervisor. These interviews will provide the researcher with an opportunity to identify any questions that might lead to distress and where appropriate, take steps to rephrase or change these questions.

Before conducting the first formal interview, the student will meet with their supervisor to discuss to procedures that are in place in case a participant becomes distressed during an interview. The supervisor will also ensure the student feels prepared for the interview. The supervisor must be satisfied that the researcher is competent in conducting interviews before giving approval for the commencement of data collection.

Students will inform their supervisor where and when they are completing all interviews and in turn the supervisor will ensure the student has a means of contacting them when they are conducting interviews.

During the interview:

At the beginning of the interview the student will remind the participant that they can stop the interview at any time, that they can choose not to answer questions, and that there are no right or wrong answers to questions (so there is no fear of 'saying the wrong thing').

Once the interview begins, the researcher will be required to be aware of any potential indications of distress (e.g., withdrawing, visible upset, declining to answer numerous questions, shifting in seat, looking away from the interviewer, asking for the interview to end) and should air on the side of caution in all instances. If there is even the slightest indication that participants might be distressed students must immediately follow the procedure below:

- 7) The recording will be immediately stopped and the participant will be asked if they are ok. At this point the participant will be asked if they want to take a break/end the interview/continue talking – the participant's decision will be final. If the participant decides to take a break and continue with the interview, confirmation will be sought that the participant is actually comfortable continuing and they will be reminded there is no penalty for withdrawing.
- 8) If the participant wishes to continue but remains distressed, the interviewer will make the decision to draw the interview to an end. At this point, the interviewer will commit to providing the participant with an opportunity to talk and ensure the participant is not visibly distressed when leaving the interview.
- 9) If the participant remains distressed and the researcher does not feel capable of managing the situation they will contact their respective supervisor who will be available at all times during interviews by phone contact. Depending on the situation, the supervisor will either provide guidance to the student, speak directly to the participant over the phone, or make attempts to go and meet with the researcher and the participant.
- 10) If the participant has become distressed at any point in the interview, the student will ensure the participant has the contact details of the rest of the research team and remind them that they are free to contact any member of the research team if there is anything further they would like to

discuss.

- 11) The interviewer will also offer to provide the participants with a list of local contacts (e.g., counselling services, sport psychology services) if they would like them.
- 12) Following the interview, the student will debrief the interview with their supervisor and (if necessary) other senior members of the research team. A written record of the incident and the procedures followed will be made.

Senior fitness test (Rikli and Jones, 1999)

1. Chair stand test (lower body strength): Here the participant is expected to sit on a chair with their feet flat on the floor and shoulder width apart. Arms should be crossed across their chest. The participant will repeatedly stand and sit as many times as possible within a 30 second period.
2. Arm curl test (upper body strength): The participant should be sitting on a chair holding a dumbbell (8lbs for males and 5lbs for females) in their hand with their arm hanging vertically to one side of the chair, with the upper arm placed against the body and held in a fixed position. The participant curls the arm through the full range of motion until fully flexed and controls the weight back down to full extension. The participant should repeat the sequence as many times as possible within the 30 second period.
3. Chair sit and reach test (Lower body flexibility): The participant is asked to sit on the edge of a chair and straighten one leg out in front of the body. The participant must reach forwards with the same hand down towards the toes as far as possible. The score is measured as the distance between the tip of the finger and the toe. If the finger doesn't reach the toes this is scored minus and if it surpasses the toes, then it is scored as a plus. Scores are measured from both arms.
4. Back scratch test (Upper body flexibility): Here the participant must reach one arm behind their back from over their shoulder. The opposing arm reaches behind the back from under the shoulder. The participant should be aiming to touch their fingers together behind their back. The score is measured as the distance between the fingertips of each hand. If the fingertips do not reach, then this scored as a minus and if their fingertips overlap one another then this is scored as a plus. Scores are measured from both arms.
5. 2 min step test (aerobic endurance): Here the participant must stand next to a wall, with one side of their body facing the wall. They must raise their knee with a bent leg until the upper leg is parallel with the floor and a mark must be made on the wall to provide a set point for the test. The participant must then alternate steps, raising each leg up to the marked line on the wall. Each time both legs are stepped over the marked line, equals one rep. They must complete as many reps as possible within the 2-minute time.
6. 8 foot get up and go test (Agility and dynamic balance): Here the participants must sit in a chair that is stable. A cone is placed that marks 8 feet away from the chair. On the tester's command, the participant must get out of the chair, walk across to, and around the cone and return to the chair as quickly as possible. They are scored on the total time taken to complete the walk.
7. 6 min walk test (Aerobic endurance): Here the participants walk round a 45.7m course for a total of 6 minutes. They must walk as far as they can in the full 6 minutes and their final score is the full distance covered within the set time. Only one of the aerobic tests (2 min step test and 6 min walk test) should be used, depending on weather and space limitations.

As the present study was conducted within the homes of the residents, the 2min step test was the preferred option.

Performance standards are set for both male and female older adults and normal range scores are provided, which are defined as 50% of the normal population. Therefore, if the individual scores above the normal score for their age group, they are deemed as above average, if they score below the normal score, they are deemed as below average. The normal scores are presented in Tables 1 and 2.

Normal range scores for males							
	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Chair stand							
(No. of stands)	14-19	12-18	12-17	11-17	10-15	8-14	7-12
Arm curl							
(no. of reps)	16-22	15-21	14-21	13-19	13-19	11-17	10-14
6-min walk							
(no. of yards)	610-735	560-700	545-680	470-640	445-605	380-570	305-500
2-min step test							
(no. of steps)	87-115	86-116	80-110	73-109	71-109	59-91	52-86
Chair sit & reach							
(inches +/-)	-2.5-+4.0	-3.0-+3.0	-3.5-+2.5	-4.0-+2.0	-5.5-+1.5	-5.5-+0.5	-6.5- -0.5
Back scratch							
(inches +/-)	-6.5-+0.0	-7.5- -1.0	-8.0- -1.0	-9.0- -2.0	-9.5- -2.0	-10.0-3.0	-10.5- -4.0
8-foot get-up & go							
(seconds)	5.6-3.8	5.7-4.3	6.0-4.2	7.2-4.6	7.6-5.2	8.9-5.3	10.0-6.2

Table 1: Normal range of scores for males, with normal defined as the middle 50% of the population: Rikli & Jones, 2002

Normal range scores for females							
	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Chair stand							
(no. of stands)	12-17	11-16	10-15	10-15	9-14	8-13	4-11
Arm curl							
(no. of reps)	13-19	12-18	12-17	11-17	10-16	10-15	8-13
6-min walk							
(no. of yards)	545-660	500-635	480-615	480-585	385-540	340-510	275-440
2-min step test							
(no. of steps)	75-107	73-107	68-101	68-100	60-91	55-85	44-72
Chair sit & reach							
(inches +/-)	-0.5-+5.0	-0.5-+4.5	-1.0-+4.0	-1.5-+3.5	-2.0-+3.0	-2.5-+2.5	-4.5- +1.0
Back scratch							
(inches +/-)	-3.0-+1.5	-3.5- +1.5	-4.0- +1.0	-5.0- +0.5	-5.5- +0.0	-7.0- -1.0	-8.0- -1.0
8-foot get-up & go							
(seconds)	6.0-4.4	6.4-4.8	7.1-4.9	7.4-5.2	8.7-5.7	9.6-6.2	11.5-7.3

Table 2: Normal range of scores for females, with normal defined as the middle 50% of the population: Rikli & Jones, 2002

Intervention measures

Health-related quality of life (SF-36 HRQoL)

Please choose **(tick)** one response for each of the following questions, as shown below:

<i>Example question</i>	<i>1 Much better than one year ago</i>	<i>2 Somewhat better than one year ago</i>	<i>3 About the same</i>	<i>4 Somewhat worse than a year ago</i>	<i>5 Much worse than one year ago</i>
<i>Compared to one year ago, how would you rate your social life in general now?</i>		✓			

Question	1 Excellent	2 Very good	3 Good	4 Fair	5 Poor
1. In general, would you say your health is:					

Question	1 Much better than one year ago	2 Somewhat better than one year ago	3 About the same	4 Somewhat worse than a year ago	5 Much worse than one year ago
2. Compared to one year ago, how would you rate your health in general now?					

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?	Yes, limited a lot	Yes, limited a little	No, not limited at all
3 Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports			
4 Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf			
5 Lifting or carrying groceries			
6 Climbing several flights of stairs			
7 Climbing one flight of stairs at a time			
8 Bending, kneeling or stooping			
9 Walking more than a mile			
10 Walking several blocks			

11 Walking one block			
12 Bathing or dressing yourself			

During the past 4 weeks have you had any of the following problems with your regular daily activities as a result of your physical health?	Yes	No
13 Cut down the amount of time you spent on your daily activities		
14 Accomplished less than you would like		
15 Were limited in the kind of activities that you do		
16 Had difficulty performing your daily activities (for example, it took extra effort)		
During the past 4 weeks, have you had any of the following problems with your regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)		
17 Cut down on the amount of time you have spent on your daily activities		
18 Accomplished less than you would like		
19 Didn't do your daily activities as carefully as usual		

Question	1 Not at all	2 Slightly	3 Moderately	4 Quite a bit	5 Extremely
20 During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups?					

Question	1 None	2 Very mild	3 Mild	4 Moderate	5 Severe	6 Very severe
21 How much bodily pain have you had during the past 4 weeks?						

Question	1 Not at all	2 A little bit	3 Moderately	4 Quite a bit	5 Extremely
22 During the past 4 weeks, how much did pain interfere with your normal work (Including both work outside the home and housework)?					

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks:	All of the time	Most of the time	A good bit of time	Some of the time	A little of the time	None of the time
23 Did you feel full of pep?						
24 Have you been a very nervous person?						
25 Have you felt so down in the dumps that nothing could cheer you up?						
26 Have you felt calm and peaceful?						
27 Did you have a lot of energy?						
28 Have you felt downhearted and blue?						
29 Did you feel worn out?						
30 Have you been a happy person?						
31 Did you feel tired?						

Question	1 All of the time	2 Most of the time	3 Some of the time	4 A little of the time	5 None of the time
During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc)?					

How TRUE or FALSE is each of the following statements for you	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
33 I seem to get sick a little easier than other people					
34 I am as healthy as anybody I know					
35 I expect my health to get worse					
36 My health is excellent					

Loneliness 6-item scale (De Jong Gierveld and Van Tilburg 2006)

Please indicate for each of the statements, the extent to which they apply to your situation, the way you feel now. Please **tick** the appropriate answer:

Statement	Yes	More or less	No
Example question: I enjoy spending time in social environments			
1. I experience a general sense of emptiness			
2. I miss having people around			
3. I often feel rejected			
4. There are plenty of people I can rely on when I have problems			
5. There are many people I can trust completely			
6. There are enough people I feel close to			

Self-efficacy for physical activity scale (Adapted from Self efficacy for exercise scale; Resnick and Jenkins, 2000)

How confident are you right now that you could take part in physical activity 30 minutes per day, 5 days per week if: (Please **circle** the following)

	Negative Positive										
Example question: You were busy at work	0	1	2	3	4	5	6	7	8	9	10
1. The weather was bothering you	0	1	2	3	4	5	6	7	8	9	10
2. You were bored by the activity	0	1	2	3	4	5	6	7	8	9	10
3. You felt pain when being active	0	1	2	3	4	5	6	7	8	9	10
4. You had to participate alone	0	1	2	3	4	5	6	7	8	9	10
5. You did not enjoy it	0	1	2	3	4	5	6	7	8	9	10
6. You were too busy with other activities	0	1	2	3	4	5	6	7	8	9	10
7. You felt tired	0	1	2	3	4	5	6	7	8	9	10
8. You felt stressed	0	1	2	3	4	5	6	7	8	9	10
9. You felt depressed	0	1	2	3	4	5	6	7	8	9	10

Outcome expectations for physical activity (Adapted from Outcome expectations for exercise scale, Resnick et al., 2000)

Please read the following statements in relation to physical activity and **tick** in the box which best represents if you agree or disagree with the statement:

Physical activity:	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Example question: Is fun when carried out with friends			✓		
1. Makes me feel better physically					
2. Makes my mood better in general					
3. Helps me feel less tired					
4. Makes my muscles stronger					
5. Is an activity that I enjoy doing					
6. Gives me a sense of personal accomplishment					
7. Makes me more alert mentally					
8. Improves my endurance in performing daily activities					
9. Helps to strengthen my bones					

Thank you for completing these questionnaires! Please ensure **all** questions are answered to the best of your ability and return to the researcher.

Intervention components

Information leaflet (Intrapersonal; Lack of knowledge)

One of the barriers highlighted within the first study was lack of knowledge. This varied in not being aware of physical activity recommendations, where to go to carry out physical activity, how much to do, what physical activities are safe and what activities are available etc. The first component of the intervention is an information leaflet that will be delivered to the participants. Leaflet dropping was identified as a good way to contact the participants within study 1. The information will contain the following PA information:

- Definition of PA
- Physical activity guidelines
- Benefits of an active lifestyle
- How to increase your physical activity
- How to overcome key barriers identified in study 1
- Walking locations within the Gaer (Along with information on safety and difficulty)

Telephone support (Interpersonal; Social support)

The second component of the intervention will be telephone interviews. The first study identified lack of social support as a barrier to physical activity within the residents. The telephone interviews will be carried out by the main researcher bi-weekly. These interview sessions will be used to support the older adult's physical activity behaviours by giving advice on how they can increase their PA, overcome barriers, set goals and increase motivation for physical activity behaviours. Kolt et al., (2007) used telephone support for increased physical activity in older adults and carried out a frequency of 8 interviews over the 12- week intervention (weekly for first 4 weeks and bi weekly final 8 weeks). This strategy was effective for increasing physical activity. The current study will be incorporating other strategies alongside the intervention, therefore will use a slightly reduced frequency of interview sessions. Bi-weekly interviews will be carried out within the intervention to focus on:

- Expressing empathy
- Increasing knowledge of the benefits of physical activity;
- Increasing awareness of the risks of a sedentary lifestyle;
- Increasing awareness of physical activity opportunities;
- Identifying motivators;
- Problem-solving barriers;
- Improving physical activity self-efficacy;
- Discussing safe methods to exercise.

Restructuring/ adding to the physical environment (Environmental)

Restructuring the environment around the older adults living facility is an attempt to provide safety and understanding of the walking environment around them. Sign posts will be added around the facility to identify how many steps are being carried out when following

pathways around the area. Sign posts will also be colour coded to allow residents to know the difficulty of the terrain that they are likely to face. E.g.

Green= Flat terrain

Orange= moderate terrain

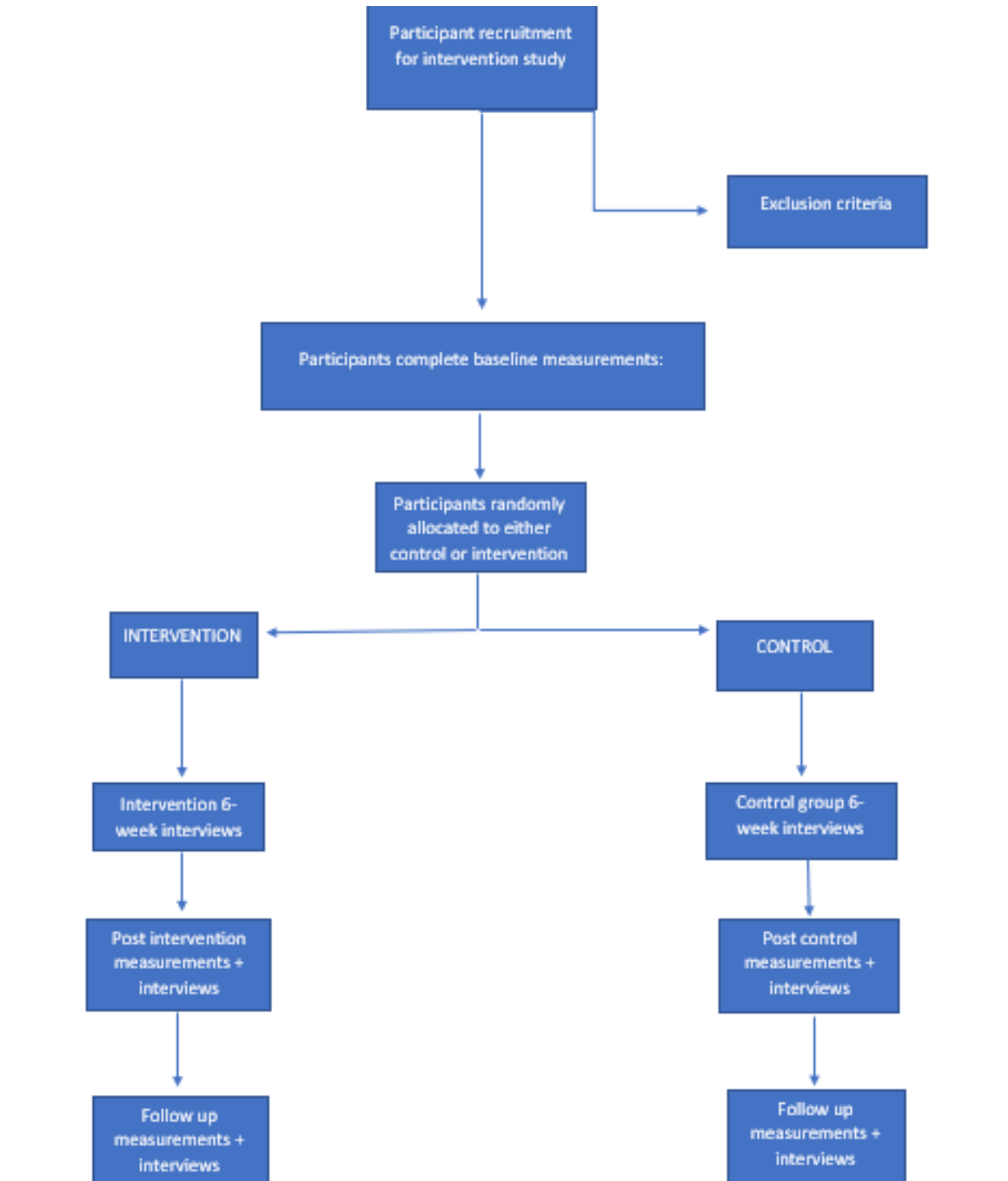
Red= steep terrain

This will allow older adults to be aware of how many steps they are taking as they walk around the local area. It will also allow them to feel confident and choose appropriate walking routes to suit their own abilities. The signposts will also act as prompts to carry out the physical activity behaviour (walking).

Promotion/ Information about health consequences (Organisational)

Within the interviews collected within study 1, leaflet dropping was identified as an accepted method of promotion/ contact. The leaflet will contain information on the health benefits of an active lifestyle/ negative impacts of physical activity. Although these aspects will be related to the ability to remain independent. Health benefits, although can facilitate physical activity behaviours, may not be key motivators. The first study identified the importance of maintaining independence. Therefore, the leaflet will promote physical activity as a means of maintaining independence.

Intervention study overview



PRE-PARTICIPATION HEALTH SCREENING QUESTIONNAIRE (ADULT)

Please mark all TRUE statements

Step 1

SYMPTOMS

Do you experience:

- chest discomfort with exertion
- fainting /dizziness /blackouts
- unreasonable breathlessness
- ankle swelling
- unpleasant awareness of a forceful, rapid or irregular heart rate
- burning or cramping sensations in your legs when walking a short distance

Step 2

CURRENT ACTIVITY

Do you currently perform planned, structured physical activity of at least 30 minutes at moderate intensity on at least 3 days per week and have you done so for the last 3 months?

YES NO

Step 3

MEDICAL CONDITIONS

Do you currently have, or have you ever had:

- a heart attack
- heart surgery or cardiac angiogram or insertion of stents
- angina
- a pacemaker or implantable cardiac defibrillator (ICD)
- rhythm disturbance (irregular or fast heart rate)
- heart valve disease
- heart failure
- heart transplantation
- congenital heart disease
- high blood pressure
- diabetes
- renal disease
- asthma or any other lung condition
- any musculoskeletal (joint or muscle) problems that may limit your physical activity

Do you currently take any prescription medications? YES NO

(Based on: Exercise preparticipation health screening questionnaire for exercise professionals; Magal & Riebe, 2016)

I confirm that to the best of my knowledge the information provided above is correct. I take full personal responsibility and liability for my participation and will inform the researcher immediately of any change in my medical status.

Name of Participant

Date Completed

Signature

MEDICAL DISCLAIMER FORM

(Version 1.1, Date: 18/02/2019)

Project Title: Helping Older People Manage their Environment for decreasing Loneliness,
Increasing Functionality and Enjoyment

Contact Details: Taylor Waters and Joanne Hudson

Contact emails: [REDACTED] and [REDACTED]

Please initial box

1. I have obtained written medical clearance to participate (please see attached)
- OR
2. I declare to the best of my knowledge that:
- a. any medical condition(s) I have identified in the Health Screening Questionnaire are controlled and stable, and will not pose any detrimental risk to my health through my choice to participate in the study
 - b. I have never been advised that my medical condition(s) prohibits or limits my participation in physical activity

Name of Participant

Date

Signature

Researcher

Date

Signature

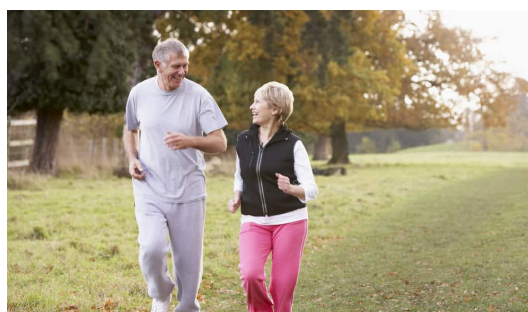
‘Get Moving’ at Derwen

Take part in the ‘Get Moving’ programme at Derwen. The programme is designed to get residents more active and improve their health and well-being. You will also have the opportunity to take part in a research project being held at Derwen, where we are looking to see how best to improve the health and well-being of our residents. You will be required to complete some questionnaires and interviews related to the 12-week get moving programme.

A free step counter, which is yours to keep!



An information leaflet for helpful advice and get active tips!



Telephone support for the full duration of the programme.



The programme is run by Taylor Waters, a PhD student from Swansea University, who is working together with Derwen to help get residents more active! The programme is free of charge and requires no specific commitment from yourself. To take part, please speak with one of the staff members at Derwen, or contact Taylor at:

- Telephone: [REDACTED]
- E-mail: [REDACTED]


Recruitment poster for intervention study

'Get Moving' at Derwen


Take part in Derwen's own physical activity programme. The programme is free of charge and designed to help our residents get more physically active and improve your health and well-being.

What's included?


A **free** pedometer to help you count your daily steps.



Telephone support from our own PhD student. Taylor is here to help you set your physical activity goals and manage any issues you are having when trying to become physically active.



A **free** physical activity guide and goal setting map. This was developed from speaking with the residents to best understand how to encourage you to get more active.



What else?

You will also have the opportunity to take part in a study carried out by Taylor and Swansea University, who are partnering up with Derwen to find out how best to improve the health and well-being of our residents. All that you will be required to do is:

- Take part in the programme for 12-weeks
- Take part in 8 telephone support sessions over the 12-weeks to help with your progress (approx. 15 mins each)
- Fill out a questionnaire related to your physical activity, health and well-being
- Provide feedback on the 12-week programme once it is complete

Once you have signed up for the programme you do not have to finish it. If you decide you no longer want to participate, then you can let a member of the research team know. You will still be able to keep the pedometer and information booklet even if you decide to opt out from the research.

For more information about the project, or if you would like to take part, please contact Taylor on:
Telephone: [REDACTED]
Email: [REDACTED]

Improving Health, Well-being & Maintaining our Independence

**Information for increasing physical
activity, health and well-being for
the residents of derwen**





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Introduction

This booklet has been created after speaking with residents of the Gaer and designed to give you information on how to help you maintain your independence by increasing your levels of physical activity and living a healthy lifestyle. The booklet will give you information on how much physical activity you should be doing, types of physical activity and ways to self-monitor your activity levels. This booklet will give you tailored information to help you achieve a healthy and independent life, allowing you to do the things that you enjoy doing for as long as possible.

Active Ageing

Derwen aim to ensure a great quality of life to its residents as they grow older. We promote active ageing and are trying to help our residents live a socially and physically active lifestyle, continue to pursue your favourite hobbies and interests, learn new skills and feel valued within your community.

Physical activity can help us stay healthy, energetic and live independently as we age. So, we aim to encourage our residents to spend less time sitting and lying down, and more time doing activities we enjoy, such as gardening and walking.

Maintaining Independence

After speaking with many of the residents at Derwen, many of the residents mentioned the importance of maintaining their independence. That includes being able to live on your own, do your own shopping, hobbies and activities that you enjoy, without having to rely on others.



*I don't have nobody in,
I do my own cooking,
my own washing.*

Physical Activity

One thing you can do to maintain your independence is keep on being physically active. This can keep you mobile and allow you to move freely and safely when doing the things that you like. The information in this booklet will help you be physically active, maintain your independence, freedom and well-being throughout your adult life.

Although it is expected that we will experience challenges with our physical functioning as we age, by living an active lifestyle we can not only stop these age-related challenges, but we can also improve our physical function in old age. As the saying goes 'if you don't use it, you lose it!'

'For me, not for anybody else, but for me myself, so I can move better. I can do better; I can nip into town now and again'. - A resident speaks of why she wants to remain physically active.

Being physically active can:

- ✓ Maintain our independence
- ✓ Be enjoyable
- ✓ Help us socialise
- ✓ Give us purpose
- ✓ Improve sleep

Taking part in physical activities on a daily base is good for your health, both physically and mentally. But more importantly it helps up maintain our independence as we age. Remaining physically active allows us to do our daily tasks and socialise more easily.

You don't need to visit exercise classes and gyms to be physically active. Just walking to the shops, doing household chores, exercising at home or walking the dog. It all counts!

Things you may not know:

- 👉 Physical activity is just as important as we age
- 👉 Even small amounts of physical activity can bring great benefits
- 👉 Physical activity can also reduce symptoms of existing health problems

There are plenty of physical activities that can keep us moving. These include aerobic activities (using our heart and lungs), muscle-strengthening activities (using our muscles, arms and legs) and balance activities (keep us moving without falling over).

These activities can be practised when shopping, gardening, socialising with friends and family, whilst being fun and can keep you moving. You don't have to be the fittest, fastest or strongest! Even small

amounts of physical activity can go a long way! Below we will explain these activities in more detail.

Aerobic Activity

Aerobic activities are any movements where you use your heart and lungs. This includes walking, gardening, dancing and playing bowls. It is recommended that we do 150 minutes per week. This would be 30 minutes per day, 5 days per week. This isn't possible for everyone, so it is important to remember that you can achieve long lasting benefits from just small amounts of physical activity. Here are some tips to help increase your physical activity:

1. Find an activity that you enjoy, that will always be the best one for you.
2. Be active with friends or family. This will be more enjoyable and give opportunities to socialise. Having support from friends and family can also make you feel safer when walking on hills or more challenging terrain.
3. Get outdoors when the weather is nice. And when the weather is bad, find an alternative indoors, just like Edith!
4. Set yourself some goals each week. For example, I aim to walk to the shops 2x this week. Write them down and achieve them!

Aerobic activities are a great way to keep your independence and can be fun, social and a great way to spend time with others. But knowing how active we are isn't always easy, which is why we advise counting your steps!



Counting Your Steps

A great way to see how active you are is to count your steps! By wearing a step tracker, you can easily see how many steps you are doing per day. If we can average 7,100-10,000 steps per day, we are doing the equivalent of the 150 minutes of physical activity per week, which is what is recommended for adults over 65 years of age.

Some of us may not be able to achieve so many steps per day, but we can still receive benefit from increasing our steps just a little bit. Achieving anything up to 4,600 steps per day has been shown to give us some benefits.

Number of steps (per day)	Level of benefit
≤ 4,600	Some benefit
4,600-7,000	Increased benefit
7,000-10,000+	Maximum benefit

This can sound like an awful lot at first, but once you get out and about you will realise how quickly your steps can add up. Here are some examples of how many steps it would take to walk around some areas of the Gaer.



Anything above 10,000 steps is only going to provide you with even more benefits. You can use a pedometer to set yourself daily step goals and start walking towards an active lifestyle and maintaining your independence.

Walking with others can be an enjoyable experience!
'I like walking with friends and going for a little walk anywhere, like to Tesco I think, like their trolleys are ideal'

Walking Routes Within the Gaer

One of the more challenging walks within the Gaer is from the bottom to the top of Drinkwater Gardens. This is relatively steep hill, but has benches to stop and rest, as well as handrails for assistance. The number of steps this would take is approximately 435.



Walking from the curve to the local newsagents is a more relaxing, less challenging walk. Although the walk is longer, it isn't as steep as Drinkwater gardens. Walking to the newsagents and back again would

be approximately 2000 steps, a large portion of the daily recommendations!



The walking path around 'The Curve' is a pleasant walk, which a nice flat pathway, handrails and areas to stop and rest, this walk is perfect for getting those extra steps in. Walking around the new facility will count as around 550 steps!

Muscle-Strengthening Activities

Muscle-strengthening activities are a great way to maintain our independence as we age. They can also increase our confidence when doing our day to day tasks. Using your muscles can also help with your balance, allowing you to do daily tasks without relying on the help of others.



'It's like the old saying, if you don't use it, you lose it. And the gardening, alright, next day you ache, but if it's good for you'

By using our muscles, we can re-gain muscle we have lost and keep it there! These activities keep us mobile, give us stronger bones and can improve our overall well-being.

Here are some examples of some muscles strengthening activities:

- Getting up and out from our chair
- Lifting our shopping.
- Using steps (this can be done going up flights of stairs or just up and down on the first step).
- Lifting items onto shelves.

Balance Activities

Keeping good balance as we age can help us remain independent, give us confidence when carrying out daily tasks and lower our risk of falling.

Practising good balance can be done at home, at your local park or when socialising with friends. Activities, like walking, can help you keep good balance as we become older. Walking with friends or family members can offer support if it is needed, and it is always good to socialise!

*I'm alright if I've got
my friends with me.*

I'm safer with them'

– One of the
residents speaks
about how she feels
safer with her
friends

Adults aged 65+ are recommended to do balance exercises 2-3x per week. You can start off practicing easier balance exercises and then more challenging exercises if you feel you can. Activities, such as tai chi and yoga, can be good ways to practice your balance in groups, which can make the experience more social and enjoyable. Here are some tips to help you practice you balance:

- Try not to spend too much time seated. If you are seated for long periods of time, ensure you get up and have a little walk every 30 minutes.



- Carrying shopping and doing the gardening are good ways to practise your balance. So rather than having shopping delivered to the house, try getting out and about and practising that balance. You may also want to help a fellow resident with their gardening or shopping. This is a great way to socialise and another way to practise your balance.

Yes, and you get tips off each other. I'm growing tomatoes again this year, around the corner there, and I've got blueberries around there. I did grow potatoes here last year as well, because he had an allotment. I went and I got them, you know. I didn't grow potatoes this year. It's nice to eat your home-grown stuff". - a resident of Derwen speaking about Gardening with others in the Gaer.

- Going up and down stairs. This is an everyday activity where balance will always be needed. If possible, take the stairs rather

than using a lift. You can also use the handrail if you need some help.

- Dance classes are a great opportunity to socialise, have fun and practise your balance.
- Balance exercises. Like standing on one leg and raising your arms. These can be easily done at home and can greatly improve your balance.



Social and Physical Activities

From speaking with the residents, they mentioned that socialising with other residents was important. Physical activities are a great way to socialise with others and can make them that much more enjoyable. When going out and about, make sure to invite someone else with you!

'Yeah, that is ideal, because besides getting people together, when walking you've got to get two or four people, with that, you've got to get a crowd of people, or you should do, once it kicks off. Getting people together, I like that, yeah'. – One of the residents spoke about socialising whilst having a walk



Walking with a friend or within groups not only allows you to socialise with others, but it also offers support and safety when walking. The social side of physical activity can make it an enjoyable experience for everyone involved. You can learn about the people who live around you, build friendships with them and encourage each other to become more active.

'Oh it's being with others, definitely with other people.....social interaction with people is, is the essence of everything' - A resident speaking about what she enjoys about getting out and about.




Daily socialising can have a big impact on our well-being and is an important part of living a healthy and happy life. The Gaer is a prime location to socialise with the people around you and by joining both social and physical activities, living a happy and healthy life has never been so easy.

Goal-Setting For Active Ageing

Setting goals can help you stay motivated and keep you on track. You can use goal setting to help your physical health and social life. Long-term goals are goals which you want to achieve in the future. Short-term goals are more specific and will help you achieve your bigger goals. Below is an example of both short and long-term goals:

Long-term goal: *'I want to increase my physical activity'*

Short-term goals:







-  *'I will go for a walk twice per week'*
-  *'I will walk 50 more steps today'*
-  *'I will start mowing my lawn, rather than hire a gardener'*

Setting goals are a great way to keep yourself motivated. Think about what is important to you and how you can achieve it. This leaflet provides you with an easy to use goal setting guide, which can help you easily set some goals to help improve your health and well-being!



Summary

We hope this booklet has helped you understand the benefits of physical activity and how it can improve your health, well-being and help you maintain your independence. Not everyone can run a marathon or jump up and down the stairs, but we can all do little bits to increase our physical activity. Here are some of the key points from the booklet:

-  Physical activity is good for both our physical and mental health.
-  Benefits of physical activity can be seen with just small increases in our activity levels.
-  Walking is a great form of physical activity, which is safe, free, easy to do and can be done at nearly any time.
-  Physical activity can provide a great opportunity to socialise with others.
-  Setting physical activity goals can be a great way to stay active.
-  Physical activity can help us stay mobile, healthy and maintain our independence.



'Get Moving' at Derwen

Take part in the 'Get Moving' programme at Derwen. The programme is designed to get residents more active and improve their health and well-being. You will also have the opportunity to take part in a research project being held at Derwen, where we are looking to see how best to improve the health and well-being of our residents. You will be required to complete some questionnaires and interviews related to the 12-week get moving programme.

What's included?

A free step counter, which is yours to keep!



An information leaflet for helpful advice and get active tips!



Telephone support for the full duration of the programme.



The get moving programme is run by Taylor Waters, a PhD student from Swansea University, who is working together with Derwen to help get residents more active! The programme is free of charge and requires no specific commitment from yourself. To take part, please speak with one of the staff members at Derwen, or contact Taylor at:

Telephone: [REDACTED]

E-mail: [REDACTED]

Step tracking booklet (self-monitoring)



Goal Setting and Step Counts

Introduction

This is your goal setting and step count tracker. You can use this to set yourself weekly step goals and monitor how many steps you are doing each day. You can also use these step goals to discuss your progress and any potential problems you are facing during your physical activity telephone support sessions.

At the beginning of the week you can enter your target for steps at the top right of the page where it says **Average daily step goal**. At the end of each day you can then record your daily **step count** in the table and any **notes** that may be relevant. At the end of each week, you will then be able to calculate your **daily average per week** and identify whether you achieved your step goal.

To calculate your daily average for each week, you can add up your steps for each day of the week and divide them by the number of days they have been recorded. See example below:

Mon: 4898	} ÷ 7 = 5378
Tues: 6012	
Wed: 3101	
Thurs: 6570	
Fri: 3999	
Sat: 6189	
Sun: 6872	

If you forget to record a day, you can still get your average by dividing by how many days you are able to record, e.g., you can divide by 5 days if you miss 2 days of the week.



Goal Setting and Step Counts

Example 1

Average daily step goal: 5000/day

Day	Step count	Notes
Monday	4898	Walked to the newsagents to pick up paper.
Tuesday	6012	Went for a walk in the park as the weather was nice.
Wednesday	3101	Spent more time in the house as waiting for parcel.
Thursday	6570	Did weekly shop in Tesco.
Friday	3999	Raining, so stayed indoors.
Saturday	6189	Did some gardening and house work.
Sunday	6872	Went for a walk with family after Sunday dinner.
Daily average	5378	Overall, a good week. Achieved goal regardless of poor weather conditions.

Goal achieved: Yes / No



Goal Setting and Step Counts

Week 1

Average daily step goal:

Day	Step count	Notes
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		
Daily average		

Goal achieved: Yes / No



Pull up posters (walking routes)

'Get Moving' at Derwen

Here at Derwen, we are trying to encourage our residents to be more active. Walking is a great way to get more active. Achieving 7,000 to 10,000 steps per day can have great benefits to our health and well-being, as well as helping us maintain our independence and social life. Here are some walking routes around the Gaer:



Walking up Drinkwater Gardens is one of the more challenging walks at the Gaer. The hill is steep, but fortunately there are handrails for assistance and new benches to be used to stop and rest. Walking up to the top of the hill will be around **500** steps!

Walking from the Curve, up Masefield Vale and to the local shops is a more moderate walk. This allows you to avoid walking up the steep hill, offering a less strenuous, leisurely walk. Walking up to the shops with one of your friends is a great way to socialise and would reach a whopping **2000** steps. That's nearly a quarter of your way to the 10,000!



The bottom of Masefield Vale offers a nice, flat walking route for those who have difficulty with steeper hills. You will see many of the residents walking around these parts so make sure you introduce yourself to others when getting in those steps! Walking from the Curve and down the shops via Masefield Vale would equal to over **1000** steps!



Questions post intervention/ COVID19

Motivation

- Can you talk me through your reasons for taking part in the programme? What were your thoughts before taking part? Is it something you would normally do?
- What made you see the intervention through to the end?
- Have you continued any part of the programme since it finished? Why/why not?

Intervention

- How did you feel the programme went?
- If at all, what did you find helpful about the programme? (self-monitoring, goal setting, telephone support)
- Have you changed your day to day habits at all as a result of the programme? Do you do things differently?
- Did you learn anything about yourself or anything else when taking part in the programme?
- Would you change any aspect of the programme?

Effect of Covid-19

- How has the lockdown impacted your activity levels?
- How has the lockdown impacted you in general? Mood? Social life etc?
- Have you managed to stay in contact with many people since the lockdown? If so how?
- Have you managed to stick to the guidelines set by the government? Social distancing? Exercising once per day?

Study 2 post intervention interview transcript

- 2 TW: Could you tell me a little bit about your reasons for taking part in the programme, so what did
3 you think before you started? Is it something that you would normally do?
- 4 KT: Yeah, well I have always had an interest in sort of health and exercise. Um, ever since I can
5 remember I have had an interest in that. And at my age now it was just a way of getting it out.
- 6 TW: Ok so it was you have always had an interest in it, and it was an opportunity for you to
7 explore it a little more?
- 8 KT: Yeah. Yeah. ~~That's~~ it.
- 9 TW: And out of interest you took part in the programme, is there anything in particular that made |
10 you see it through? You could have just stopped after 2 weeks?
- 11 KT: Well, in the couple of weeks that we were doing it I improved myself and I felt the improvements
12 and I just wanted to keep it up. There is no point in just doing it for a few weeks and just forgetting
13 about it again. I wanted to keep it going. And I did keep it going for quite a while after. You know,
14 keeping a record of it.
- 15 TW: So you did actually continue part of the programme itself?
- 16 KT: Yes ~~was~~.
- 17 TW: Can you tell me a little bit about that?
- 18 KT: Well if you remember, with the step thing, step count, when we started off I was just over 2000
19 or something, but when I stopped keeping a record I was up in the 4 or 5000. So, you know it was a
20 marked improvement as far as I am concerned.
- 21 TW: Well that is over a 100% increase.
- 22 KT: Yeah ~~well~~ I found myself you know, doing a bit more exercise in order to keep the figure up.
- 23 TW: Great, so you enjoyed seeing the progress, you liked the progress you were getting, so you
24 just continued. Well the next question was, have you continued any part of the programme since?
- 25 KT: Well it was only 2 weeks ago that I stopped doing it. I made up my own sheets. The record
26 sheets. Kept a daily log.
- 27 TW: And were you able to keep the steps up?
- 28 KT: Oh yeah. I had one week it was a week when I ~~have to~~ have a colonoscopy and that put me back
29 for a few days.
- 30 TW: I can imagine. Well I guess the next question was how did you feel the programme went?
- 31 KT: Very well I thought I was pleased with it yeah.
- 32 TW: And what did you find most helpful about the programme?
- 33 KT: The fact that I improved because of the programme. Without the programme I ~~wouldn't~~ have
34 improved, I just would have carried on like I always have. And being in the programme, you know
35 you are part of the programme so that you put a little bit more effort into it.

36 TW: And when you first started monitoring your steps, did you learn anything? About yourself?

37 KT: Well, when I first started, I was surprised with how little steps I did.

38 TW: Yeah. Yeah. And what was that like, was that a bit of a shock?

39 KT: It was actually. I always thought I was pretty fit. But I was surprised. I would have hoped for
40 better than that. But I was pleased with the outcome at the end of it.

41 TW: Well you were doing far more by the end so you were probably far happier then.

42 KT: Yeah. Yeah.

43 TW: Ok brilliant. So have you changed your day to day habits as a result of the programme?

44 KT: Uhhh. I still try and keep it up. This last week I haven't because myself and Helen have had a bad
45 week this week. We were both pretty poorly this week and I think it is, well hopefully I will be back
46 to normal again and I can start with where I left off.

47 TW: I think when we spoke before, you mentioned how you were doing more tasks just to get
48 your steps up?

49 KT: Yeah that's right. Helen as well. She can't wait now. She is setting herself goals, which helps me as
50 well.

51 TW: Well I guess when Helen could see how much you improved, it can open her eyes a bit. If he
52 can, why can't I. So I guess the goal setting side of it helped as well?

53 KT: Yeah, yeah definitely.

54 TW: So would you change any part of the programme?

55 KT: Uhh. I don't think so. Because it wasn't a programme like uhhh. Like going into a gym and having
56 a set programme. It was sort of a gradual thing, that you didn't really realise you were in. That was a
57 good thing I thought because you can improve without really knowing that you're doing anything.

58 TW: Ok great. Ok so obviously we are in a lockdown. No one is allowed out so I just wanted to
59 touch on that a little bit as well. So how would you say the lockdown has impacted your activity
60 levels?

61 KT: I don't think it has to be honest. The downstairs we have that room, where we have that bike
62 machine and all that. I go down there every now and again and have a little go on the bike.

63 TW: Oh brilliant. So you are keeping up with things.

64 KT: Yeah. Yeah.

65 TW: And what is driving you to do that then?

66 KT: I was just having a little wonder one evening all by myself and I was having a little game of darts.
67 And I saw the bike and I thought ill have a go. And I thought 'this is good, it got me out of breath and
68 that' yeah that's just what I wanted.

69 TW: Oh great. So you're keeping it up at least. So how has the lockdown impacted you in general?
70 So your sort of well-being?

- 71 KT: Social life, well we miss the rest of the residents here. Because we were a close nit group. Having
72 said that, we have started to get together down the cuisse and we are all well aware of the
73 regulations. But we have all been in lockdown so there is no real danger.
- 74 TW: No, unless someone is going out and bringing it back.
- 75 KT: That's right. Well none of us have been going out at all. Well we did do one thing. I managed to
76 get on the telephone and got some bags of potatoes and carrots and various vegetables. I got the
77 caretaker to pick them up for us and we distributed them around the residents. You know, we sort
78 of made the most with what we got.
- 79 TW: Ok brilliant. And have you managed to stay in contact with many people?
- 80 KT: Uhh yeah. You know, I have just had a messaged actually from one of the girls. She's got an order
81 going to go and if anybody wants anything she will pick it up. You know angela? Its her daughter
82 who does it for her.
- 83 TW: Ok great. So you got some support there as well. I guess the final question from me is, you
84 know the guidelines set by the government, are you able to abide by those?
- 85 KT: Yes well. We were up last night and hele and me went for a walk round and I was saying to
86 how how much her walking had improved. She is doing really well. I have's been walking out, but
87 yesterday we went on the mobility scooter and we went for a ride up to the shops. I needed some
88 butter of all things. She waited outside with it. It was nice to get some fresh air. There was no one
89 about anyway.
- 90 (End of interview)
- 91

9.3. Study 3

APPLICATION FOR ETHICAL COMMITTEE APPROVAL OF A RESEARCH PROJECT

All research with human participants, or on data derived from research with human participants that is not publicly available, undertaken by staff or students linked with A-STEM or in the College of Engineering more widely must be approved by the College of Engineering Research Ethics Committee.

RESEARCH MAY ONLY COMMENCE ONCE ETHICAL APPROVAL HAS BEEN OBTAINED

The researcher(s) should complete the form in consultation with the project supervisor. After completing and signing the form students should ask their supervisor to sign it. The form should be submitted electronically to coe-researchethics@swansea.ac.uk.

Applicants will be informed of the Committee's decision via email to the project leader/supervisor.

1. TITLE OF PROJECT
Exploring the transitions into later life and how these impact the physical activity levels of older adults.

2. DATE OF PROJECT COMMENCEMENT AND PROPOSED DURATION OF THE STUDY
04/2020-10/2020

3. NAMES AND STATUS OF THE RESEARCH TEAM
<i>State the names of all members of the research group including the supervisor(s). State the current status of the student(s) in the group i.e. Undergraduate, postgraduate, staff or other (please specify).</i>
Taylor Waters- Lead researcher Dr Joanne Hudson- 1 st Supervisor Dr Kelly Mackintosh- 2 nd Supervisor Vic Mills- Head of active ageing at Derwen

4. RATIONALE AND REFERENCES

*Describe in **no more than 200 words** the background to the proposed project.
In all sections below that detail your study and its aims please use language suitable for a lay audience.*

Older adults are often defined as having a chronological age of 65 years and older (World Health Organisation, 2010). However, individuals do not tend to see growing old as an event and view it more as a process over a time period. This period is often dictated by several transitions associated with later life, which often influence the health of the individual (Schumacher, Jones, & Meleis 1999). A transition can be described as a passage between two relatively stable periods of time, in this case a transition from middle-aged to older adulthood. Transition outcomes can be both healthy and unhealthy, which can be identified by certain characteristics and indicators (Schumacher, Jones, & Meleis, Helping elderly persons in transition: A framework for research and practice, 1999). Transitions associated with later life include retirement, bereavement and relocation, which are often related to losses (loss of employment) but can also provide opportunity for gain (more free time to pursue hobbies and interests).

These transitions can have an impact on an individual's identity (Schumacher & Meleis, 1994), social environment (Schumacher et al., 1999) and purpose in life (Irving et al., 2017), all of which influence our physical activity behaviours. Supporting individuals experiencing these transitions into older age may encourage more healthy transitions, and positively influence their health behaviours into later life. However, little research has explored these transitions in older adults and how they may influence physical activity in later life. This study will explore these transitions, identify how they influence physical activity and how we can encourage healthy transitions in order to support active ageing.

5. OBJECTIVES

State the objectives of the project, i.e. one or more precise statements of what the project is designed to achieve.

- Objective 1- The study will aim to explore the narratives of individuals who have recently experienced transitions associated with later life. These transitions include bereavement, relocation, empty nest syndrome, onset of chronic disease, retirement etc.

- Objective 2- The narratives will be analysed in order to identify strategies to support older adults through these transitions and encourage a healthy transition to an active later life.

6.1 STUDY DESIGN

Outline the chosen study design (e.g., cross-sectional, longitudinal, intervention, RCT, questionnaire etc)

- The study will be a qualitative research study.
- A phenomenological approach will be adopted in order to explore the lived experiences of older individuals in their transitions into old age.
- Semi-structured interviews will be used to collect data from individuals who have recently (within 5 years) experienced one or more of the transitions often associated with later life.
- Narrative inquiry will be used to extract stories about individual experiences through these transitions in later life.
- Due to the in-depth nature of the research approach, repeat interviews will be conducted with participants until the lead researcher feels no new data can be withdrawn from the participant, resulting in data saturation.

6.2. STUDY DESIGN

- *state the number and characteristics of study participants*
- *state the inclusion criteria for participants*
- *state the exclusion criteria for participants and identify any requirements for health screening*
- *state whether the study will involve vulnerable populations (i.e. young, elderly, clinical etc.)*
- *state the requirements/commitments expected of the participants (e.g. time, exertion level etc)*

- Between 4 and 8 participants will be recruited for the study.
- At least 1 participant will be recruited for each of the transitions associated with later life (some participants may address multiple transitions).
- Participants may be required to take part in several interviews, until the researcher feels the data from the participant has been saturated.
- The study does include vulnerable populations, but the nature of the study should not put the participants at any further risk. Procedures are in place to offer support as needed, if this arises (see Section 8).

Inclusion criteria

- Aged 65+ years old.
- Must have experienced 1 or more of the transitions associated with older adults within the past 5 years.
- Must be willing to speak freely about these transitions with the lead researcher.
- The participants must be willing to take part in repeated interviews if it is required for the research purposes.
- Participants must be members of Derwen Housing Association.

- Participants must be able to converse comfortably in the English language.

Exclusion Criteria

- Participants will be excluded from the project if they have any psychological issues or diagnoses (self-declared on providing informed consent) that may put them at risk (e.g. social anxiety disorder, depression).
- Feel uncomfortable sharing information related to the transitions into later life. More importantly, some subjects such as bereavement or chronic ill health may be especially sensitive for some participants.
- Feel they are not able to cooperate with the research team for the duration of the project.
- Unable to understand and converse in fluent English.

6.3. PARTICIPANT RECRUITMENT

How and where will participants be recruited? How will you ensure that these methods of recruitment do not compromise the ability of the research participant to freely consent to and withdraw from the study?

- Participants will be recruited from a pool of residents from Derwen Housing Association in Newport.
- Purposive sampling will be used to recruit participants for the proposed study. This is to ensure the participants have lived through the experiences that are being explored within the present study.
- Participants will be recruited from Derwen housing, where the lead researcher has already conducted two studies and has developed professional relationships and developed a rapport with potential participants. Residents of the estate will be approached by the researcher, who will explain the focus of the research, the subjects that are to be explored, why they are particularly valuable participants for the study and what I require from the participant. From there the participant can decide whether or not they would like to participate in the study.
- Informed consent will be collected once participants have decided to take part in the study, prior to taking part in the first interview.

6.4 DATA COLLECTION METHODS

- describe all of the data collection/experimental procedures to be undertaken
- state any dietary supplementation that will be given to participants and provide full details in Section 6.5
- state the inclusion of participant information and consent forms (and assent forms where necessary in appendices)
- Where you are asking research participants to undertake physical activity consider appropriate health screening processes. Note that the ACSM have updated their guidelines in a consensus statement dated 2015.

- Data collection methods will be 1-1 semi structured interviews. Interviews have been chosen due to the potentially sensitive subjects that will be explored during the data collection process.

- Prior to the interviews, participants will be primed with a 'pre interview' letter (see appendix). This will allow the participants to think about the topics prior to the interview so that they will be able to provide a richer data set.
- Interviews will be carried out within the household of the participants or a small private room located within the residential estate. This will be at the choice of the participant.
- Once the initial interview has taken place, the interviewer will review the audio recordings, make notes and arrange a new interview to follow-up on any specific constructs evident within the interview.

6.5 DATA ANALYSIS TECHNIQUES

- describe briefly the techniques that will be used to analyse the data

- Interviews will be recorded via a digital voice recorder and transcribed verbatim.
- Once interviews have been transcribed, interpretive phenomenological analysis (IPA) will be used for data analysis.
- The approach to data analysis will be used to explore the lived experiences of the older adults and aims to make sense of these personal experiences. These individual experiences will be analysed and the key essence from the narratives will be identified.
- The analysis process will start with identifying themes and patterns within the raw data. Raw data themes will be identified that capture the essence of the phenomenon being researched. Emergent themes for each interview will be highlighted. Themes will be grouped within each individual interview according to level of importance. This process will be carried out for all interview transcripts and a master list of most important and least important themes will be created.

6.6. STORAGE AND DISPOSAL OF DATA AND SAMPLES

describe the procedures to be undertaken for the storage and disposal of data and samples

- *identify the people who will have the responsibility for the storage and disposal of data and samples*
- *identify the people who will have access to the data and samples*
- *state the period for which the raw data will be retained on study completion (normally 5 years, or end of award. But data should not be retained for longer than is necessary for the purposes of the research project.)*
- *Please confirm that where data is being stored away from Swansea University (for example on cloud based services) that procedures are still in line with GDPR legislation.*

- Data will be stored on the laptop of the main researcher. The laptop will be locked and will only be able to be accessed by the main researcher.
- Once the recordings have been analysed they will be kept for the duration of the project in case they need to be analysed again. Any hard copies of audio recordings and transcripts will be kept

within the university and stored in a locked cabinet, where keys will be kept by the main researcher.

- Data will be shared with the supervisors of the research project.
- Once the research project has been completed, data will be kept for 5 years and then removed from the device that they are being stored on.

6.7 HOW DO YOU PROPOSE TO ENSURE PARTICIPANT CONFIDENTIALITY AND ANONYMITY?

- Any personal information provided by the participants will be kept confidential by the research team.
- When reporting data from the interviews, the participants will be referred to as a pseudonym (e.g. John, 56) to ensure that no personal information is being reported, but a representation of the individual is being reported for the reader to interpret the profile of the participant.

7. LOCATION OF THE PREMISES WHERE THE RESEARCH WILL BE CONDUCTED.

- *list the location(s) where the data collection and analysis will be carried out*
- *identify the person who will be present to supervise the research at that location*
- *If a first aider is relevant, please specify the first aider and confirm that they possess the first aid qualifications appropriate for this form of research*

- Derwen Housing Association (Newport)
- Participant houses located at the Gaer.
- To ensure student safety, procedures related to Lone Working (section 3.5 of the Swansea University-Guidance on Safety in Fieldwork) will be completed. I will inform my supervisor, Dr. Joanne Hudson, on the location and time that I will be carrying out the interviews. I will also inform my supervisor when I am going to enter the participant's house and when I leave the house to ensure they are aware that the interview has been carried out successfully and safely.
- Consent will also be obtained from Derwen Housing Association to ensure access to their properties has been given, before entering.

8. POTENTIAL PARTICIPANT RISKS AND DISCOMFORTS

- *identify any potential physical risk or discomfort that participants might experience as a result of participation in the study.*
- *identify any potential psychological risk or discomfort that participants might experience as a result of participation in the study.*
- *Identify the referral process/care pathway if any untoward events occur*

- Participants may feel uncomfortable speaking about subjects such as bereavement, empty nest syndrome and retirement in the company of the interviewer.
- Telling stories of sensitive subjects that are likely to be discussed within the interviews may cause feelings of stress, anxiety, depression or other related psychological feelings. If the participants become distressed at any point of the project, then the appropriate steps will be taken in reference to the distress management flow chart (See appendix).

Participants will be informed to report any feelings of discomfort to the main researcher and will be told that they are able to remove themselves from the research project at any time. Any data that they have provided to the research team will also be destroyed if this is what the participant desires. Dr Joanne Hudson, who is part of the research team, is a Registered Psychologist, and participants will be able to get in contact if they are feeling distressed. She will signpost them to relevant support services that all participants will be made aware of at the end of the interview (e.g., local bereavement counselling services).

9.1. HOW WILL INFORMED CONSENT BE SOUGHT?

Will any organisations be used to access the sample population?

Will parental/coach/teacher consent be required? If so, please specify which and how this will be obtained and recorded?

- Consent will be sought from Derwen Housing Association in order to be allowed to approach its members.
- Participants in the research project will be required to sign a consent form (see appendix) to give evidence of their consent to take part in the research project.
- Participants will be approached from the residential estate owned by Derwen Housing (sponsor company). Some of the participants have participated in previous studies with the lead researcher and other will be approached from the social HUB located within the estate.

9.2 INFORMATION SHEETS AND CONSENT/ASSENT FORMS

Please ensure that your forms are written in clear, simple language enabling research participants to fully understand the project.

- Have you included a participant information sheet for the participants of the study? YES
- Have you included a parental/guardian information sheet for the parents/guardians of the study? NO
- Have you included a participant consent (or assent) form for the participants in the study? YES
- Have you included a parental/guardian consent form for the participants of the study? NO

10. IF YOUR PROPOSED RESEARCH IS WITH VULNERABLE POPULATIONS (E.G., CHILDREN), HAS AN UP-TO-DATE DISCLOSURE AND BARRING SERVICE (DBS) CHECK (PREVIOUSLY CRB) IF UK, OR EQUIVALENT NON-UK, CLEARANCE BEEN REQUESTED AND/OR OBTAINED FOR ALL RELEVANT RESEARCHERS?.

If appropriate please provide a list below including the name of the researcher, and confirming that they have an up to date DBS check. Please also confirm the type of check (i.e. basic/enhanced).

N/A

11. HUMAN TISSUE ACT

Does your research involve the collection or storage of human tissue samples?

Where not relevant please respond N/A. Where appropriate please provide further details. Please note that University ethics committee approval is not sufficient to comply with legislation for the storage of relevant material for research.


N/A

12. STUDENT DECLARATION

Please read the following declarations carefully and provide details below of any ways in which your project deviates from these. Having done this, each student listed in section 2 is required to sign where indicated.

- ***"I have ensured that there will be no active deception of participants.***
- ***I have ensured that no data will be personally identifiable.***
- ***I have ensured that no participant should suffer any undue physical or psychological discomfort (unless specified and justified in methodology).***

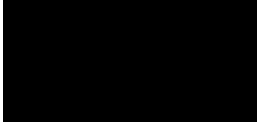
- *I certify that there will be no administration of potentially harmful drugs, medicines or foodstuffs.*
- *I will obtain written permission from an appropriate authority before recruiting members of any outside institution as participants.*
- *I certify that the participants will not experience any potentially unpleasant stimulation or deprivation.*
- *I certify that any ethical considerations raised by this proposal have been discussed in detail with my supervisor.*
- *I certify that the above statements are true with the following exception(s):*

Student/Researcher signature:  (include a signature for each student in research team)

Date: 06/03/2020

Where submitted electronically we will accept the lead supervisor/researcher's email of the application as confirmation that both they and other researchers on the project have discussed and are happy to adhere to the above.

13. SUPERVISOR'S APPROVAL

Supervisor's signature: 

Date: 6/3/20

PARTICIPANT INFORMATION SHEET

(Version 1.1, Date: 27 /02/20)

Project Title:

Exploring the transitions into later life and how these impact the physical activity levels of older adults.

Contact Details:

Taylor Waters

Telephone: [REDACTED]

Email: [REDACTED]

Invitation Paragraph

Ensuring active aging is a key objective of Derwen Housing Association and living an active lifestyle is essential in maintaining good health as we age. You have been invited to participate in a research project which aims to collect information for Derwen Housing Association on how to improve the health and well-being of its residents. The information will be used to help Derwen provide support for residents transitioning into later life and promote active ageing in the current and future residents within the Gaer.

What is the purpose of the study?

The purpose of the present study is to explore the transitions often associated with later life, which impact the way we behave as we progress into old age. The study aims to identify how these transitions may impact our physical activity levels and how Derwen can offer support to those going through such transitions, in order to make a healthy transition into old age.

Why have I been chosen?

You have been chosen because you are current resident of Derwen and through your lived experiences, you have the ability to provide information which can help individuals, who will likely go through similar experiences, to deal with them in a healthy way and make a smooth transition into older adulthood.

4. What will happen to me if I take part?

To take part in this study you will need to take part in a 1-1 interview session, which will be approximately 1 hour in length. The session can be held in your own home or at the health and well-being room within the Gaer, depending on your preference. The researcher will ask questions and you will be allowed to answer them as you wish. You will be allowed to give any information you desire and do not have to stick to the set questions. The sessions will be recorded using a voice recorder so that the researcher can analyse the conversations after the sessions are finished. You may also be asked to partake in follow-up interviews if the researcher feels you may be able to provide more information.

5. What are the possible disadvantages of taking part?

Although it is unlikely, you may feel mild discomfort in a discussion with others. However, you can refuse to answer any questions that you do not feel comfortable answering and if you want to remove yourself from the study then you can do so at any time.

6. What are the possible benefits of taking part?

The benefits of taking part include the opportunity to take part in a research project which may influence the way Derwen supports their residents in the future. Taking part in the project will also mean you can play a key role in the health and well-being of current and future residents of Derwen.

7. Will my taking part in the study be kept confidential?

Any information that you provide within the study will be kept strictly confidential. No personal information gets reported within the study. Any personal information that you give within the study will only be accessed by the main researcher. For example, you will be given a code name so that you can be identified, whilst keeping your name strictly confidential.

Data Protection and Confidentiality

Your data will be processed in accordance with the Data Protection Act 2018 and the General Data Protection Regulation 2016 (GDPR). All information collected about you will be kept strictly confidential. Your data will only be viewed by the researcher/research team.

All electronic data will be stored on a password-protected computer file belonging to the lead researcher at the university. All paper records will be stored in a locked filing cabinet within the office of the lead researcher. Your consent information will be kept separately from your responses to minimise risk in the event of a data breach.

Please note that the data we will collect for our study will be made anonymous, when being presented within the findings or reports, thus it will not be possible to identify and remove your data at a later date, should you decide to withdraw from the study. Therefore, if at the end of this research you decide to have your data withdrawn, please let us know before you leave.

Data Protection Privacy Notice

The data controller for this project will be Swansea University. The University Data Protection Officer provides oversight of university activities involving the processing of personal data, and can be contacted at the Vice Chancellors Office.

Your personal data will be processed for the purposes outlined in this information sheet. Standard ethical procedures will involve you providing your consent to participate in this study by completing the consent form that has been provided to you.

The legal basis that we will rely on to process your personal data will be processing is necessary for the performance of a task carried out in the public interest. This public interest justification is approved by the College of Engineering Research Ethics Committee, Swansea University.

The legal basis that we will rely on to process special categories of data will be processing is necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes.

How long will your information be held?

We will hold any personal data and special categories of data for up to 5 years after the completion of the project. Once this time is over, all data will be removed from the lead researcher's computer.

What are your rights?

You have a right to access your personal information, to object to the processing of your personal information, to rectify, to erase, to restrict and to port your personal information. Please visit the University Data Protection webpages for further information in relation to your rights.

Any requests or objections should be made in writing to the University Data Protection Officer:-

University Compliance Officer (FOI/DP)
Vice-Chancellor's Office
Swansea University
Singleton Park
Swansea
SA2 8PP
Email: dataprotection@swansea.ac.uk

How to make a complaint


If you are unhappy with the way in which your personal data has been processed you may in the first instance contact the University Data Protection Officer using the contact details above.

If you remain dissatisfied then you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at: -

Information Commissioner's Office,
Wycliffe House,
Water Lane,
Wilmslow,
Cheshire,
SK9 5AF
www.ico.org.uk

8. What if I have any questions?

Further information can be obtained from the researcher contact stated above. The project has been approved by the College of Engineering Research Ethics Committee at Swansea University. If you have any questions regarding this, any complaint, or concerns about the ethics of this research please contact Dr Andrew Bloodworth, Chair of the College of Engineering Research Ethics Committee, Swansea University.

 The institutional contact for reporting cases of research conduct is Registrar & Chief Operating Officer Mr Andrew Rhodes. Email: researchmisconduct@swansea.ac.uk. Further details are available at the Swansea University webpages for Research Integrity. <http://www.swansea.ac.uk/research/researchintegrity/>.

PARTICIPANT CONSENT FORM

(Version 1.1, Date: 27/02/2020)

Project Title:

Exploring the transitions into later life and how they may influence the physical activity levels of older adults.

Contact Details:

Name: Taylor Waters

Telephone: [REDACTED]

Email: [REDACTED]

Please initial box

1. I confirm that I have read and understood the information sheet dated 27/02/2020 (version 1.1) and have no psychological issues that will prevent me from taking part in the above study and have had the opportunity to ask questions.
2. 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.
3. I understand that sections of any of data obtained may be looked at by responsible individuals from the Swansea University or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to these records.
1. I understand that data I provide may be used in reports and academic publications in anonymous fashion
2. I agree to take part in the above study.

Name of Participant

Date

Signature

Name of Person taking consent

Date

Signature

Researcher

Date

Signature

PARTICIPANT DISTRESS

Procedures to follow in the event of participant distress during Interviews/Focus Groups

Prior to the interview:

Prior to conducting interviews, pilot interviews will be conducted in liaison with the supervisor. These interviews will provide the researcher with an opportunity to identify any questions that might lead to distress and where appropriate, take steps to rephrase or change these questions.

Before conducting the first formal interview, the student will meet with their supervisor to discuss to procedures that are in place in case a participant becomes distressed during an interview. The supervisor will also ensure the student feels prepared for the interview. The supervisor must be satisfied that the researcher is competent in conducting interviews before giving approval for the commencement of data collection.

Students will inform their supervisor where and when they are completing all interviews and in turn the supervisor will ensure the student has a means of contacting them when they are conducting interviews.

During the interview:

At the beginning of the interview the student will remind the participant that they can stop the interview at any time, that they can choose not to answer questions, and that there are no right or wrong answers to questions (so there is no fear of 'saying the wrong thing').

Once the interview begins, the researcher will be required to be aware of any potential indications of distress (e.g., withdrawing, visible upset, declining to answer numerous questions, shifting in seat, looking away from the interviewer, asking for the interview to end) and should air on the side of caution in all instances. If there is even the slightest indication that participants might be distressed students must immediately follow the procedure below:

- 1) The recording will be immediately stopped and the participant will be asked if they are ok. At this point the participant will be asked if they want to take a break/end the interview/continue talking – the participant's decision will be final. If the participant decides to take a break and continue with the interview, confirmation will be sought that the participant is actually comfortable continuing and they will be reminded there is no penalty for withdrawing.
- 2) If the participant wishes to continue but remains distressed, the interviewer will make the decision to draw the interview to an end. At this point, the interviewer will commit to providing the participant with an opportunity to talk and ensure the participant is not visibly distressed when leaving the interview.
- 3) If the participant remains distressed and the researcher does not feel capable of managing the situation they will contact their respective supervisor who will be available at all times during interviews by phone contact. Depending on the situation, the supervisor will either provide guidance to the student, speak directly to the participant over the phone, or make attempts to go and meet with the researcher and the participant.
- 4) If the participant has become distressed at any point in the interview, the student will ensure the participant has the contact details of the rest of the research team and remind them that they are free to contact any member of the research team if there is anything further they would like to discuss.
- 5) The interviewer will also offer to provide the participants with a list of local contacts (e.g., counselling services, sport psychology services) if they would like them.

6) Following the interview, the student will debrief the interview with their supervisor and (if necessary) other senior members of the research team

Interview schedule for initial interview:

Please identify which of the following experiences you have experienced within the past 5 years (tick which ones are relevant to the participant):

- Retirement
- Bereavement
- Decline in physical health
- Chronic illness
- Relocation
- Empty nest (children left home)

Semi-structured interviews questions

I would like you to take a few minutes to think about this transition in your life. I would like you to think about how your life was before, during and after the experience. How your life changed as a result of the transition.....(Here you will give them a pen and paper if they need to make any notes. Give them as much time as they like. Once they are ready, proceed with the interview).

So, can you talk me through how your life was before the transition. What would you do day to day? Who would you spend time with? Your hobbies? What was your purpose in life at that time? Why did you choose to do what you did with your day? How would you have described yourself at that time in your life?

Ok, so now I would like you to explain this time in your life to me (retirement, bereavement etc). How was your life at the time? How did it affect or change you? How did your life around you change? What would you do day to day and why did you choose to do such things? How did that affect your purpose in life? How did your identity change? Did your social circle change?

Finally, I would like you to tell me about your life once this experience has passed. How was your life then? What did you do with your time after the experience? How would your daily activities be structured? Did your roles and responsibilities change? What about your purpose in life? How did this affect the people around you? How do you feel you dealt with this experience in hindsight?

Topics to be explored:

- Retirement
- Bereavement

- Decline in physical health/ Chronic illness
- Relocation
- Empty nest (children left home)

Constructs to be considered throughout the interview:

- Individual identity and social identity
- Purpose in life
- Physical activity
- Day to day behaviours

Pre-interview letter

Thank you for taking part in the research project on the transitions into later life and their impact on physical activity

The research project will hopefully help us understand how we can help our residents through the transitions into later life and achieve optimal health and well-being as we age. By now, you would have arranged a date and time to meet with the lead researcher, so we are pleased to let you know some of the topics that we will want to speak to you about. We will be wanting to talk to you about your experiences with:

- Retirement
- Bereavement
- Relocation
- Chronic disease
- Decline in physical health
- Empty nest

Now not all of these may be relevant to you, but we would like to hear about your experiences of the ones which you have lived through within the past 5 years. When thinking about these experiences, we want to hear stories about how your life changed as a result of these experiences. Please consider your roles and responsibilities, social life, day to day tasks, hobbies and interests, and how you dealt with such experiences. The more information you can provide on these subjects the more we can learn about how to help individuals in the future, so please put some thought into it before the time of the interview! I look forward to speaking to you!

Thanks,

Taylor (PhD student at Swansea University)

Table of key quotes from study 3

Finding purpose in old age			
Quote	Theme	Related transition	Interpretation
<p>Did anything help you manage the bereavement process? You did mention you keep yourself very busy? Oh gosh yes, I think that really helped. It helps in a lot of ways. Since Helen has the stroke, that has changed my life more than anything. Because I have had to learn different skills for a start. Cooking being the main one. And I take a pleasure now in cooking a meal. I help her out with the</p> <p>It gives me the 'I got to be strong anyway, because I am all she's got'.</p>	Importance of meaningful activities	Bereavement/Carer	The transition of bereavement transition was also helped by the fact that he had found purpose in other areas of his life. Having the responsibility of looking after his spouse (who had had a stroke) encouraged him to learn more skills and find 'pleasure' in his life.
<p>Before Helen fell ill, I took for granted a lot. I took it for granted that she would do the housework and things like that. Things like cooking, I took it for granted that Helen did things like that. It was a bit worrying at the start, but when she was in hospital I started cooking things like sausage and chips and things like that. Egg and chips, things like. So I got used to using the cooker. Afterwards, when she came out, then main thing I was concerned about was to get Helen walking again. We would focus on it daily, we would try and go walking down the sea front. We would walk to the first bench, then onto the next one, then you're up to two benches and so on. Eventually she was walking around the town down there you know.</p>	Importance of meaningful activities	Carer	The responsibility of looking after his spouse gives him purpose. The added responsibility in his life gives him the need to be 'strong'.
<p>I feel good for being able to help. It makes you feel good.</p>	Importance of meaningful activities	Carer	Acting as a carer for his partner encouraged physical activity behaviours as a means of exercise. Having the responsibility of a carer give him a reason to get up do things and learn new skills.
<p>I really loved my last job. I always liked what I did, but [...] you don't appreciate till you get older. You usually think 'oh god, I don't want to do this for the rest of my life' but then when the time goes on, I really loved my job. And of course my husband died while I was working in the off license, and he died when I was 65. And I was so glad that I had the discipline of something in my life. Because when you have a partner, you have some sort of discipline. You have your meals at certain times, you do things at certain times but when you suddenly live on</p>	Importance of meaningful activities	Bereavement	There is an internal satisfaction related to being able to care for his spouse.
			She mentions the loss of discipline when her husband passed away, due to the loss of structure to her day, which was related to her husband. But how work allowed her to keep some structure to her day and give her a reason to 'get out of bed' in the morning. As we become older and pass through more of these transitions, we may lose even more of our purpose/structure to our day, making it important to find the next purpose.

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