



**London  
South Bank  
University**

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***“Getting the old limbs going”:*  
Exploring the emotional and cognitive  
benefits of exercise and the barriers to  
participation in older adults**

by

Zsafia Eva Szekeres

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*“Life is like riding a bicycle. To keep your balance, you must keep moving.”*

Albert Einstein

# Abstract

The aim of this thesis was to explore how community-based exercise brings cognitive and emotional benefits to older people and which barriers prevent the participation of inactive older adults. The thesis was designed into a series of 6 research studies. Chapter 2 synthesised the quantitative and qualitative evidence regarding the impact of community-based exercise programmes on cognitive function and emotional wellbeing. Although exercise positively impacts emotional wellbeing, there were few studies regarding cognitive benefits. Also, adherence was influenced by factors at different levels of the ecological model. Chapters 3 and 4 explored the perspectives of older adults actively engaged in community-based exercise programmes and their exercise instructors. These studies used qualitative methods to identify which factors participants perceive as crucial for short-term and long-term adherence. The results showed that the perspectives of older adults and their instructors were aligned; the instructors had an accurate understanding of the needs and preferences of older adults and purposefully targeted them. Program design and teaching style were key for successful sessions, and both skill development and socialising sustained the long-term engagement of older adults in exercise. Importantly, the recognition of benefits to cognitive function and emotional wellbeing also contributed to continued adherence. Chapters 5 and 6 focused on older adults who are inactive or who are transitioning to/from being inactive. Chapter 5 was a feasibility study for a randomised control design that included measures of adherence as well as pre-and post-intervention measures of cognitive function and emotional wellbeing. It followed previously inactive older adults who took part in a 12-week exercise programme, either indoor cycling or cheerleading. The findings demonstrated the positive impact of both programmes on emotional wellbeing, cognitive function, and blood pressure reactivity. Cheerleading, which was more cognitively challenging, also produced superior executive function and emotional resilience improvements than indoor cycling. Chapter 6 explored what may facilitate the engagement of inactive older adults. As this coincided with major changes happening at the policy, environmental and organisational levels, because of the Covid-19 pandemic, the study also explored how previously active older adults responded to the closure of community-based exercise programmes. Mixed methods were used to investigate the facilitators and barriers to physical activity in both inactive and previously active older adults. The interviews showed that having a sense of purpose was a key source of motivation to exercise. It was influenced by both the belief in the importance of exercise and

the affective valence participants assigned to exercise. For previously inactive older adults, missing the social context of exercise led to inactivity. However, all participants found a renewed purpose in walking and outdoor activities as a response to the lockdown restrictions. Throughout the studies of this thesis, several characteristics of exercise programmes that suit the intrapersonal factors, health needs and preferences of older adults were identified, and recommendations were developed to improve current community-based services.

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# Preface

This thesis includes a series of research studies that were designed, led and written up as manuscripts for publication by Zsofia Szekeres. The author was the main contributor to stakeholder engagement, design, ethics, data collection and analysis, and presentation. Nevertheless, these studies were completed using a collaborative approach; the ‘we’ personal pronoun is used throughout the thesis to represent this collaborative approach and includes supervisor guidance and the contribution of research interns. Chapters 2-6 follow the format of manuscripts written for publication in academic peer-reviewed journals.

Rita de Oliveira, as main supervisor, Lisa Zaidell and Katya Mileva provided supervisory guidance in setting the order of the studies, shaping the research design and methodology as well as reviewing the manuscripts. Also, each chapter had a further contribution from a contributor. In Chapter 2, RO provided supervisor guidance, screened the identified titles, abstracts, and full texts independently from the author and discussed the screening results with her to reach an agreement regarding the list of articles that were fully analysed. In Chapter 3, Noelia Agustín-Sierra (research intern) contributed to the transcription and acted as a critical friend in the qualitative analysis process. In Chapter 4, Sanya Maglani (research intern) contributed to the transcription and acted as critical friend in the qualitative analysis process. In Chapter 5, LZ and KM provided guidance and supervision to the completion of lab-based measures. In Chapter 6, Noelia Agustín-Sierra and RO both acted as critical friends, discussed themes and sub-themes to reach the final coding framework during data analysis. This was a collaboration between women at different stages of their careers which provided a rich, supportive, and woman-friendly environment for independent research.

To conduct high-quality systematic reviews, independent screening of identified studies by at least two independent researchers has been suggested as best practice guidance to avoid potential errors and bias of single screening (Polanin et al., 2019; Rosenthal, 1991). Similarly, including critical friends in the process of qualitative analysis can be used to explore different perspectives and interpretations; improve the validity of the findings and work towards research rigour (Ronkainen & Wiltshire, 2021; Smith & McGannon, 2018). A collaborative approach to research is widely accepted and recommended for early-career researchers (Bouchie, 2001; Lee & Bozeman, 2005; Lindahl et al., 2021). Collaboration enhances researchers’ productivity and the visibility of the research (Lee & Bozeman, 2005).

Publications and presentations related to this thesis

## **Publications**

Szekeres Z., Zaidell, L., Agustín-Sierra N., Mileva K., de Oliveira, R. (submitted) Inactive by choice or inactive by force: a mixed-method study of barriers and motivation to exercise in inactive older adults during a pandemic. *International Journal of Sport and Exercise Psychology*

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Szekeres Z., de Oliveira, R., Zaidell, L., Mileva K. (2018). Dance-based exercise may be more effective for improving mental health in older adults than conventional exercise. Poster presentation at *BASES Student Conference 2018*, Northumbria, United Kingdom, April 2018.

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# CHAPTER ONE

## Introduction

Exercise has been considered as *medicine* that has the potential to cure several physical and mental health diseases (Butler, 1978; Taylor, 2014). In our opinion, this is only partly true. Taking exercise for only a course of treatment like medicine cannot cure high blood pressure, obesity, diabetes or mental health problems however when taken regularly as part of an active lifestyle, exercise can prevent the onset of, and manage a number of chronic diseases, through the improvement of physical health. We could consider physical activity more like a vitamin that has to be part of our day-to-day life otherwise the benefits to long-term health are not realised. Exercise is a structured form of physical activity that has several different beneficial effects on physical and mental health, therefore it can be considered as a multi vitamin. Exercise can be performed individually and in a group. Exercise can take place in several formats and can be categorized by the population it targets. In older adults, an optimal level of physical activity helps slow down the negative changes in the cognitive and physical function caused by structural changes in the human body as part of the natural ageing process (Moreno-Agostino et al., 2020; Taylor et al., 2004). Declining health, negative life events and reduction of social interaction often have a negative impact on emotional wellbeing in older adults. Sustained exercise participation prevents a decline in physical function (Gillespie et al., 2012; Giné-Garriga et al., 2014) and has the potential to maintain cognitive health and emotional wellbeing (Ballesteros et al., 2015; Whitehead & Blaxton, 2017; Windle et al., 2010).

In this thesis, we are interested in the components of the ‘exercise multi-vitamin’ which is beneficial for both physical and mental health and can promise a high level of user compliance in community-living older adults. This thesis aims to explore the benefits of community-based exercise programmes in older adults, and also the barriers to their participation. In what follows, we will start by explaining the background of this research and defining the most commonly used terms of the thesis (Table 1.1), finally we identify the gaps in the current evidence that we will address throughout the chapters.

**Table 1.1** Definitions of the main terms used in the thesis

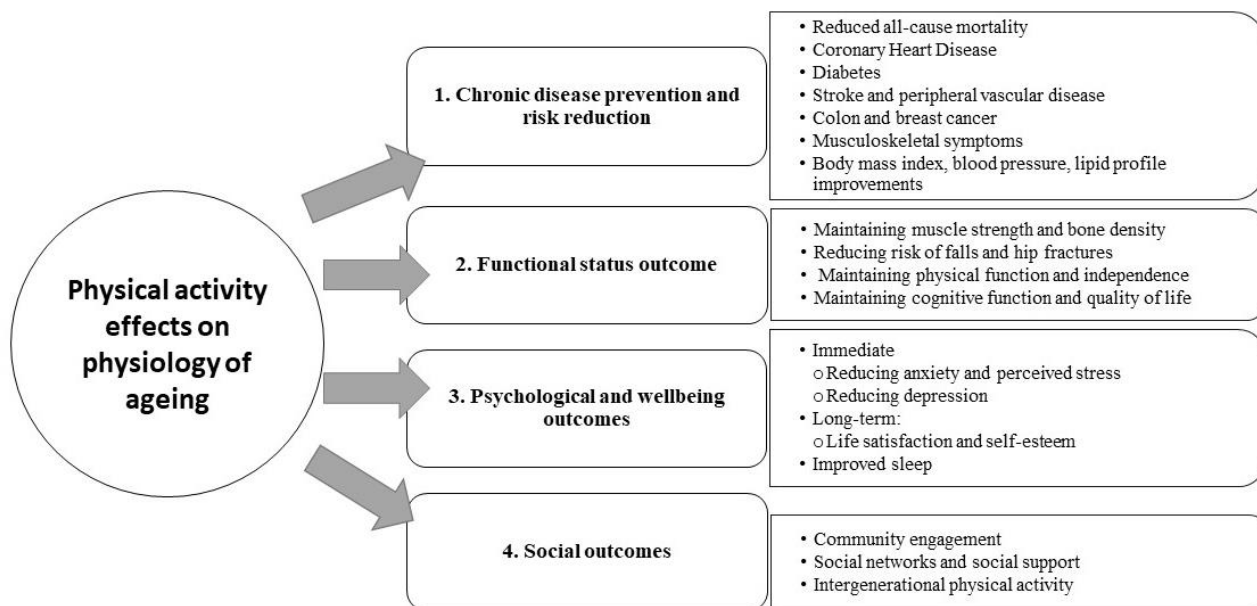
	<b>Definition</b>
<b>Cognitive function</b>	“Cognitive function is a broad term that refers to mental processes involved in the acquisition of knowledge, manipulation of information, and reasoning. Cognitive functions include the domains of perception, memory, learning, attention, decision making, and language abilities.” (Kiely, 2014, online encyclopedia)
<b>Community-based group exercise programmes</b>	Exercise programmes that emphasise social interactions including the programmes that are implemented in community settings and not in primary or secondary healthcare settings (McLeroy et al., 2003).
<b>Emotional wellbeing</b>	A dimension of subjective wellbeing that refers to satisfaction with life and the presence of perceived feelings of happiness (Keyes, 2007).
<b>Engagement/adherence</b>	Engagement is an umbrella term used for uptake or short/long-term adherence to exercise (including regular walking as exercise) in daily life. It is important to note that long-term engagement is necessary to maintain the benefits of physical activity on physical and mental health regardless of age or physical abilities.
<b>Exercise</b>	A structured form of physical activity, which is planned, repeated and has a final or intermediate objective for improvement or maintenance of physical fitness (Caspersen et al., 1985). WHO extended this definition by explaining that “exercise” and “exercise training” can be used interchangeably and both terms refer to leisure time physical activity with the focus of improving or maintaining physical fitness, physical performance, or health. (WHO, 2020; Ploughman et al., 2015)
<b>Functional ability</b>	Includes the physical and mental capacities of an individual), all the factors of the environmental context of an individual’s life, and the interactions between the these factors (Beard & Bloom, 2015).
<b>Healthy ageing</b>	Is “the process of developing and maintaining the functional ability that enables wellbeing in older age” (WHO, 2015; p.13)
<b>Moderate-intensity physical activity</b>	On an absolute scale, moderate-intensity refers to the physical activity that is performed between 3 and less than 6 times the intensity of rest. On a scale relative to an individual’s personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10. (WHO, 2020)
<b>Multicomponent exercise</b>	A type of exercise that combines aerobic, muscle strengthening, and balance training. Multicomponent exercise programmes have been shown to effectively improve physical function and decrease the risk of falls or injury from a fall in older adults. For example, dancing or a programme including walking (aerobic activity), lifting weights (muscle strengthening), and balance training (standing on one leg or walking in different directions) is multicomponent. (WHO, 2020)
<b>Older adult</b>	The conventional definition refers to the chrono-logical age of 65 years old or older (as used in NICE, 2015; WHO, 2020).
<b>Optimal mental health</b>	The combination of cognitive function and emotional wellbeing which enables an individual to realize his or her own abilities, to cope with the normal stresses of life, to work productively and to make a contribution to his or her community (Jeste, Depp & Vahia, 2010).
<b>Physical activity</b>	Any voluntary bodily movement that requires energy expenditure and is produced by the skeletal muscles. This includes any bodily movement performed during leisure time, for transport to get to and from places, or as part of a person’s work (WHO, 2020).

<b>Physically active</b>	Sufficient physical activity level to meet present physical activity recommendations (WHO, 2020).
<b>Physically inactive</b>	An insufficient physical activity level to meet present physical activity recommendations (see sufficient physical activity) (WHO, 2020).
<b>Physical function</b>	The capacity of an individual to perform bodily movements and physical activities of daily living (Dias, 2014)
<b>Sedentary behaviour</b>	Any waking behaviour in a sitting reclining, or lying posture characterised by an energy expenditure of 1.5 metabolic equivalents or lower (for example desk-based office work, driving a car, and watching television; these can also apply to wheelchair users). The metabolic equivalent (MET) is the physiological measure that refers to the intensity of physical activities. One MET is the energy equivalent at seated rest. (WHO, 2020).
<b>Physical Activity Recommendation for Older Adult</b>	<p>Adults aged 65 years and older should undertake regular physical activity. For substantial health benefits, it is strongly recommended that they undertake physical activity that includes the followings (WHO, 2020):</p> <ul style="list-style-type: none"> <li>• at least 150–300 minutes of moderate-intensity aerobic physical activity; or at least 75–150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week</li> <li>• muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week</li> <li>• varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week, to enhance functional capacity and to prevent falls.</li> </ul>
<b>Vigorous intensity physical activity</b>	On an absolute scale, vigorous intensity refers to physical activity that is performed at 6.0 or more METS. On a scale relative to an individual's personal capacity, vigorous-intensity physical activity is usually a 7 or 8 on a scale of 0-10. (WHO, 2020)

## 1.1 Background

As life expectancy is constantly increasing, it is a global challenge to reduce the number of people losing their independence at an older age due to poor mental health and physical function. For example, hip fractures are one of the main causes of losing independence in older adults and the cost of hip fractures alone are an estimated £6 million per day or £2.3 billion per year. The latest analyses reported three key areas of concern in the UK regarding older adults: high prevalence of mental health problems with depression and dementia (Royal College of Psychiatrists, 2018); loneliness affecting about one-third of people aged over 50 years (Age UK, 2019), and low physical activity level with the sharpest decline above the age of 75 (Sport England, 2021). The decline in physical and mental capacity is not an inevitable part of ageing and there is high variance in the age when it occurs (WHO, 2020). Healthy life expectancy,

which reflects the number of years spent in good health after the age of 60, is an indicator of healthy ageing (Table 1.1). It can be increased by regular physical activity, therefore it is paramount to reduce the number of older adults who are inactive. The most recent Active Life Survey shows that 39.6% of adults aged 55-75 years and 59.2% of adults aged 75 years old or older are inactive (Sport England, 2021; Figure 1.2). The Decade of Healthy Ageing, an initiative announced by the WHO in 2020, targets the five aspects of functional ability: 1) ability to meet one’s basic needs; 2) ability to learn, grow and make decisions; 3) mobility; 4) ability to build and maintain relationships; and 5) ability to contribute to society. These are aligned with the UK-wide main targets for interventions, which according to the National Institute for Health and Clinical Excellence include the maintenance of optimal physical and mental health and the prevention of social isolation (NICE, 2018). Regular physical activity has a crucial role to facilitate healthy ageing, especially in the four target areas that are presented in Figure 1.1 (Bauman et al., 2016; Biddle, Mutrie, Gorely, & Faulkner, 2021; Taylor et al., 2004).



**Figure 1.1** Conceptual framework for the benefits of physical activity in older adults (Bauman et al., 2016)

The human body responds to physical activity, especially when performed regularly, with a series of integrated functional changes that involve nearly all physiological systems. The major effects are on the cardiovascular, respiratory and musculoskeletal systems, but benefits on the functioning of metabolic, endocrine, and immune systems are also considerable for people of all ages, both male and female (Figure 1.1). Optimizing neuroendocrine stress

(hypothalamic–pituitary–adrenal axis and sympathetic nervous system) responses, reducing inflammation, increasing blood flow and growth factor expression and leading to neuromuscular plasticity are amongst the major possible biological mechanisms underlying the beneficial effect of physical activity on physical fitness (Silverman & Deuster, 2014). Strong evidence from large cohort studies and controlled randomised trials shows that physical activity is a protective factor against diabetes, cardiovascular disease, stroke, some forms of cancer and musculoskeletal problems, therefore, contributing to healthy ageing (Daskalopoulou et al., 2017; Reiner et al., 2013; Tremblay et al., 2017). Furthermore, physical activity positively influences the quality of life (Musich et al., 2015), cognitive function (Firth et al., 2015) and emotional wellbeing (Windle et al., 2010). There is a growing body of evidence showing that regular and sustained engagement in physical activity has a positive impact on all aspects of health across the lifespan (McPhee et al., 2016) and prevents early mortality (Paterson et al., 2007; Taylor, 2014). Physical activity has been shown to improve physical function, metabolic health and the defence mechanisms of the immune system in older individuals as well (Hall et al., 2020). By delaying physical and mental health declines that develop with ageing, physical activity appears particularly effective for maintaining independent living (Hamer et al., 2014; MCPhee et al., 2016).

Exercise has the objective of improving or maintaining physical fitness (Caspersen, Powell, & Christenson, 1985, Table 1.1). Performing regular exercise can further improve physical function, cognitive function and emotional wellbeing (McPhee et al., 2016; Nusselder et al., 2008; Paterson & Warburton, 2010; Taylor et al., 2004). Clinical or rehabilitation exercise interventions target people who have been admitted to the hospital and the exercise is included as a form of therapy in their recovery from an illness or disease. Exercise programmes in community-based settings, on the other hand, can encourage physical activity and provide access to safe activity experiences for older adults (Watson et al., 2016). Community-based exercise programmes are designed for people who live independently in the community; they commonly involve a group of people of a similar age exercising under the supervision of a physiotherapist or a fitness instructor, with the goal of promoting and continuing regular exercise in the community (Montgomery et al., 2017).

Community-based exercise programmes have shown great promise in effectively facilitating engagement in physical activity and promoting healthy ageing (Farrance et al., 2016; Franco et al., 2015; van der Bij et al., 2002). Individual exercise may be problematic for older adults due to a lack of confidence and knowledge about the amount and format of exercise

that is beneficial for their age. Community-based exercise programmes, however, give opportunities to many older adults to be physically active as well as to have stimulating social interactions and build social ties with their peers. Recent evidence suggests that community-based group exercise programmes have high adherence rates and improve physical function and emotional wellbeing in older adults (Farrance et al., 2016; Franco et al., 2015; McPhee et al., 2016). As with individual exercise, group exercise has been shown to lead to the same benefits to physical function such as increased flexibility, strength (Fisken et al., 2015; Sales et al., 2017; Seguin et al., 2010) and balance (Fisken et al., 2015; Iliffe et al., 2015; Sales, Polman, Hill, & Levinger, 2017), and can prevent falls in older adults (Baker et al., 2007; Sherrington et al., 2020); however, exercise performed as part of a group may have enhanced benefits to improving mental health and offers social support in older adults. Group-based exercise programmes were found to improve emotional wellbeing (Bennett et al., 2018; Du et al., 2017; Hartley & Yeowell, 2015; Killingback et al., 2017; Lacharité-Lemieux et al., 2015; Marcos-Pardo et al., 2018; Mehra et al., 2016; Stathi et al., 2004; Stødle et al., 2019) in older adults due to their positive influence on optimism, self-efficacy, self-esteem, affect, intrinsic motivation and social interaction (Bragina & Voelcker-Rehage, 2018). The positive impact of group-based exercise on social support and a sense of relatedness (Biedenweg et al., 2014; Killingback et al., 2017; Robert et al., 2017; Hartley & Yeowell, 2015; Hawley-Hague et al., 2014; Parnell et al., 2015) are important predictors for healthy ageing because they positively impact mental and physical health (Hawley-Hague et al., 2014; Killingback et al., 2017; Taylor et al., 2004; Uchino et al., 2012). For instance, immune response, cardiovascular function and recovery from illness are positively impacted by social support and relatedness alone (Uchino et al., 2012).

Furthermore, social interactions that are evident in the context of community-based group exercise might also influence cognitive function. This is important because ageing is associated with a decline in sensory-motor and cognitive abilities. The severity of the decline is individual-specific and the domains most affected are attention, memory (basic functions) and executive function (i.e., the high-level processes, which allow management and coordination of various elements of cognitive tasks; Kirk-Sanchez & McGough, 2013). Sustained exercise participation is more effective in reducing the risk of cognitive decline than habitual physical activity (Ballesteros et al., 2015; Diamond, 2015; Quigley et al., 2020). This is likely due to exercise affecting the biological mechanisms underlying the cognitive function such as neuroplasticity and vascular function (Quigley et al., 2020) as well as stimulating

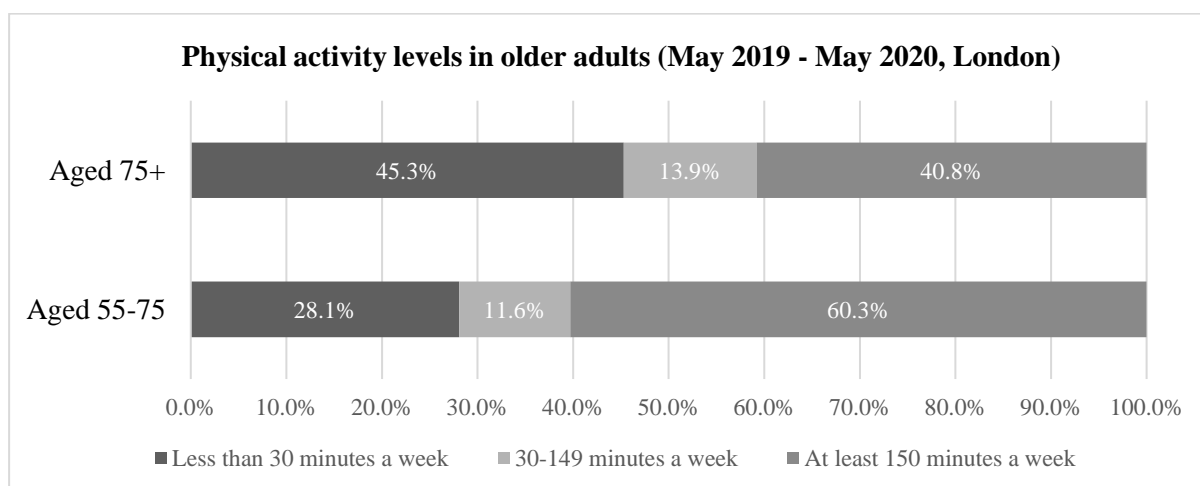


emotional wellbeing and social interactions (Ballesteros et al., 2015; Diamond & Ling, 2016). Current evidence suggests that the type, intensity, duration and frequency of exercise and the programme duration matter in terms of the extent to which exercise improves physical health and cognition, therefore it may have enhanced benefits compared to habitual physical activity (Quigley et al., 2020, see later Chapter 5). Randomized control trials showed that the effectiveness of exercise in maintaining cognitive function is dependent on the characteristics of exercise programmes, such as intensity, frequency and cognitive demands (Ballesteros et al., 2015; Diamond & Ling, 2016; Kirk-Sanchez & McGough, 2013; Quigley et al., 2020).

Many older adults who are inactive may find it difficult to take up and sustain their participation in exercise programmes with higher intensity, complexity or longer duration. The current global physical activity guideline states that “Doing some physical activity is better than doing none. If older adults are not meeting the recommendations, doing some physical activity will bring benefits to health and they should start by doing small amounts of physical activity, and gradually increase the frequency, intensity and duration over time.” (WHO, 2020, p. 5) as well as the national physical activity guidelines agree with the above points (CMO, 2019). Therefore, it is important to identify the most effective programme designs that are attractive for inactive older adults. Maximising the effectiveness of exercise performed with less intensity, frequency or smaller duration could help older adults who are inactive to take up exercise and gain health benefits. However, more evidence is needed to better understand what the most beneficial programme designs and types of community-based exercise programmes are that can enhance emotional wellbeing and cognitive function in older adults.

In all exercise programmes, adherence is paramount to realizing the health benefits of exercise. Group-based exercise programmes for older adults were found to improve motivation to exercise (Etnier et al., 2017; Marcos-Pardo et al., 2018) and they often have high adherence rates (Farrance et al., 2016; Franco et al., 2015). The social interactions and the enjoyment experienced by the participants when attending these programmes have been shown among the reasons for high adherence (Killingback et al., 2017; Kanamori, Takamiya, & Inoue, 2015; Komatsu, Yagasaki, Saito, & Oguma, 2017; see later Chapter 3). In fact, improved emotional wellbeing induced by exercise participation might facilitate long-term adherence. Therefore, it is important to understand how these improvements depend on the programme design and programme delivery, and what are the important aspects of community-based programmes that facilitate engagement in exercise (see later Chapter 4). Addressing the barriers and facilitators of exercise has important public health implications given the high prevalence of physical

inactivity in older adults (Figure 1.2) Further understanding of these factors can inform community-based exercise providers on strategies to improve engagement and in doing so positively influence healthy ageing.



**Figure 1.2** The level of physical activity in adults over the age of 55 between May 2019 and May 2020 (the most recent data were retrieved from Sport England, 2020).

It is important to note that the commonly used Active Life Survey is not aligned with the conventionally used age category of older adults (Table 1.1). One reason might be, that while the chronological age of 65 years old or older has been used as a conventional definition, the evidence-base of this definition is unknown. The classifications of ‘older adult’ and the use of 55, 60 or 65 as the lower range for inclusion criteria are also inconsistent in the literatures of psychology, body image, medical, and sport sciences (Di Lorito et al., 2021; Sabharwal et al., 2015; Tiggemann, 2004). In this thesis we focused on independent-living older adults (Table 1.1), but the age range of the inclusion criteria in two of the chapters (Chapter 3 and 5) were purposefully extended. The reasons for extending the inclusion criteria were that research shows the importance of regular sufficient physical activity from midlife to maintain cognitive function and reduce or delay the risk of late-life cognitive impairment (Evers et al., 2012; Chang et al., 2010; Macpherson et al., 2017) as well as to improve emotional wellbeing in retirement (Morgan et al., 2019). Therefore, it was crucial to capture the barriers and facilitators in those previously inactive older adults who took up exercise at the phase of transition to retirement.

To conclude, the physiological mechanisms through which physical activity impacts physical health have been widely researched and well-evidenced, however the contextual mechanisms underlying the exercise impact on mental health and adherence specifically in older adults are not fully understood (Boulton et al., 2018; Taylor et al., 2004). Furthermore, despite the intensive research on the topic of exercise in older adults, physical inactivity still

remains a problem (National Plan for Sport and Recreation Committee, 2021) and we still do not know how to support a large number of inactive older adults effectively to get more physically active. More evidence is needed to identify which factors and programme characteristics have the strongest influence on exercise uptake to gain further benefits for the emotional wellbeing and cognitive function in older adults. To fill these gaps in knowledge, this thesis aimed to understand how the characteristics of different community-based programmes can facilitate exercise engagement as well as improve the emotional wellbeing and cognitive functioning of older adults.

## 1.2 The research paradigm

We understood and addressed the above gaps through the conceptual lens of critical realism. Critical realism has become a valuable research paradigm used in qualitative and mixed-methods research in Sport and Exercise Science over the last 30 years (Poucher, Tamminen, Caron, & Sweet, 2020; Ronkainen & Wiltshire, 2021; Ryba, Wiltshire, North, & Ronkainen, 2020; Smith & McGannon, 2018). Sitting between positivism and constructivism, it accepts that there is an external world that exists independently of our awareness of it and that a dimension of reality also exists, which is socially constructed (Danermark, 2002). The central point of research in critical realism is understanding “what works for whom and why” (North, 2013; Ryba et al., 2020). The main assumption of critical realism and examples of how these assumptions could be applied in exercise psychology are described in Table 1.2. By integrating ontological realism and epistemological constructivism (Bhaskar, 1978), critical realism states that objects of research exist independently of the researcher’s conception of them and reality is observable only at a given time while other parts of reality are unobservable. At the same time, we rely on our observations and use our minds to construct knowledge about entities and structures that exist independently of us. Our knowledge of the world can never be perfect and therefore it is open to challenge and change (Kempster & Parry, 2011).

**Table 1.2.** Summary of the critical realist assumptions and examples in exercise psychology (adapted from Ryba et al., 2020).

<b>Critical realist assumptions</b>	<b>Description</b>	<b>Example in exercise psychology</b>
Ontological realism	The objects of research exist independently of researchers’ conceptions of them.	What we call “emotional wellbeing” remains a reference to real properties and events, experienced by actual people independently of

		research. Qualitative methods help gain access to its different forms and quantitative methods help measure differences across people and across time points.
Epistemological constructivism	Knowledge is fallible, concept-dependent and constructed; varies across space and time.	Our knowledge of emotional wellbeing or cognitive function is subject to how these are measured. Qualitative and quantitative methods can help refine, revise or refute what we think about the impact of exercise on emotional wellbeing and cognitive function.
Stratified ontology	Reality is stratified. Parts of reality are in-principle observable at a given time. Other parts of reality are in-principle unobservable at a given time.	While exercise-induced changes of cognitive function are perceived or observed, several aspects are unobservable, such as genetic predispositions, neurochemical factors, environmental factors and unconscious responses. We can only infer the existence of some of these factors by detailed assessments including various methods and multi-disciplinary approaches to research.
Causal complexity	Causal explanations are important for advancing knowledge, but the causal properties of phenomena are contingent, complex, open and emergent.	The causes of exercise adherence in older adults are multiple and complex. Quantifiable patterns and factors (e.g., sociodemographic factors, sedentary/walking time) may point towards causal explanations and qualitative research may provide insight into possible underlying factors or inconsistencies in the findings.

In critical realism methodological pluralism is acceptable and research designs should be pragmatic and ‘fit for purpose’ to better understand the complexity of objects and mechanisms (Sayer, 1992; North, 2013). As Sayer suggested, scientists “*produce interpretations of objects, but do not generally produce the objects themselves*” (Sayer, 1992, p. 49). Through the critical realist lens, we accept that participants have multiple properties (e.g., physiological, biological, psychological, social), dispositions and life experiences before becoming research participants and we used both qualitative and quantitative methods to gain rich information about those properties and the multiple-level factors that influence their exercise adherence. The inclusion of multiple perspectives (e.g., active and inactive older adults, and exercise instructors) is also useful in supporting interpretations about a given phenomenon. The research reported in this thesis began by examining relevant empirical and theoretical research with a theory-based approach to build up an initial map of the multiple influences of exercise engagement in older adults (see Chapter 2). Then the focus of each experimental study was to investigate further the

complex nature of engagement and to better understand what works for whom and in what circumstances.

### **1.3 Theoretical underpinnings**

In this thesis, the socio-ecological model and the self-determination theory were used in parallel; the former to explore a broad range of factors at multiple levels and the latter to understand the intrapersonal factors that influence older adults' motivation towards exercise. Socio-ecological models were first developed to understand health behaviours and how they are affected by different levels: intrapersonal, interpersonal, organisational, environmental, and policy. The underlying assumption of the model is that individuals are embedded within a larger multi-layered social, environmental and cultural context (McLeroy et al., 1988) and on each level, several factors may interact and influence individuals' health behaviour (Sallis et al., 2015). Previous research in physical activity and exercise demonstrated the effectiveness of the model to understand the dynamic interrelation between individuals and their context (Biddle et al., 2021; Boulton, Horne, & Todd, 2018; McLeroy et al., 1988). For example, a recent study used the socio-ecological model to analyse their data from focus groups and interviews with older adults regarding their physical activity (Boulton et al., 2018). They found themes on each of the levels but primarily in the levels closer to the individual. Sallis and colleagues (2008) explain that behaviour change towards a physically active lifestyle is maximized when policies and environments support exercise choices, when social support is strong, and when individuals are educated and motivated to make those choices. In this thesis, the socio-ecological model was used to investigate the multi-level factors impacting participation in community-based exercise programmes. Designing the interview guides in the qualitative phases of the research studies based on this model helped us take a comprehensive view of the possible influences of exercise engagement in older adults.

The self-determination theory was used to delve into the motivational process at the intrapersonal level (Ryan & Deci, 2000b). According to its basic assumptions, individuals seek situations in which their three primary psychosocial needs are satisfied: the need for autonomy, the need for relatedness and the need for competence. The theory also explains the mechanisms through which the social environment can facilitate the internalization of behaviour: by fulfilling the basic psychosocial needs, the individual will show more intrinsic motivation for the activity (i.e., doing something for the pleasure derived from the activity) and less extrinsic motivation (i.e., enacting the behaviour to gain something separable from the activity; (Oliver

et al., 2016; Ryan & Deci, 2000b). Using the self-determination theory in the interpretation of the qualitative findings (in Chapters 3, 4, and 6) helped us uncover some underlying mechanisms that could impact the motivation of older adults towards exercise adherence (Mehra et al., 2016; Silva, Marques & Teixeira, 2014; Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Exploring some of these motivational factors and how they inter-relate is important for providing recommendations for interventions.

#### **1.4 The outline of this thesis**

The aim of this thesis was to explore how community-based exercise brings cognitive and emotional benefits to older people and which barriers prevent the participation of inactive older adults. To achieve this aim, the thesis was designed into a series of four experimental studies and contextualised by a comprehensive literature review. Quantitative and qualitative methodology and versatile methods were used and triangulated in this thesis.

The outline of the thesis is presented in Table 1.3.

Chapter 2 synthesized quantitative and qualitative evidence regarding the impact of community-based exercise programmes with different characteristics on cognitive function and emotional wellbeing using the socio-ecological model. Also, the factors influencing adherence were analysed using the same model to investigate what determinants are important in engaging older adults.

Chapters 3 and 4 present two studies, the data from which enabled us to identify and qualitatively analyse the determinants of group-based exercise programmes from two different perspectives. The first study (Chapter 3) explored the perceptions of older adults who attended one of several different types of community-based group exercise programmes available from the same provider. Focus groups were conducted to identify the most important programme characteristics which positively influenced their adherence. The personal and contextual factors of the programmes were analysed within the socio-ecological framework. Chapter 4 presents interviews with the instructors involved in these programmes. This chapter explored their perceptions of community-based group exercise and help understand how instructors influence adherence and contribute to positive outcomes in older adults.

Chapters 5 and 6 focus on inactive older adults and how they can benefit from exercise. Chapter 5 examined the experiences of previously inactive older adults who took part in 12-week exercise programmes. The exercise programmes had different cognitive demands, one of them was Cheerleading while the other programme was Indoor cycling. Both programmes had

all the beneficial contextual features which were found to be important in the previous chapters. This was a quantitative randomized control design study that included measures of adherence as well as pre-and post-intervention measures of cognitive function and emotional wellbeing. Chapter 6 explored what facilitates the engagement of currently inactive older adults. At the time when this last study was conducted, there were major changes happening at the policy, environmental and organisational levels, because of the Covid-19 pandemic. Therefore, the study also explored how previously active older adults responded to the closure of community-based exercise programmes. Mixed methods were used to investigate the facilitators and barriers to physical activity in both inactive and previously active older adults.

Throughout the studies of this thesis, the important characteristics of exercise programmes that suit the intrapersonal factors, health needs and preferences of older adults were identified. Based on the findings a set of recommendations were developed to improve current community-based services.



**Table 1.3** The objectives, main research questions and methods of the research studies included in the thesis

<b>Aim: to explore how community-based exercise brings cognitive and emotional benefits to older people and which barriers prevent the participation of inactive older adults</b>		
<b>Objectives</b>	<b>Research questions</b>	<b>Methods</b>
<b>To determine factors associated with improved cognitive function and emotional wellbeing in different community-based exercise programmes. The secondary research question asks which factors contribute to adherence.</b>	<div style="border: 1px solid blue; border-radius: 10px; padding: 10px; text-align: center;"> <p>Chapter 2</p> <p>What is the current evidence on the determinants and impact of adherence in community-based exercise programmes?</p> </div>	<p>Systematic synthesis review</p> <p>Quantitative and qualitative</p>
<b>To understand how the characteristics of community-based group exercise influence adherence and to investigate the perceived emotional and cognitive function related benefits of different community-based exercise programmes in the lived experiences of older adults.</b>	<div style="text-align: center;">↓</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; text-align: center;"> <p>Chapter 3</p> <p>What are the most important characteristics of group exercise programmes for older adults?</p> </div>	<p>Qualitative</p> <p>Focus groups</p>
<b>To understand the instructors' perspectives of what influences adherence and positive outcomes in older adults in the programmes they lead.</b>	<div style="text-align: center;">↓</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; text-align: center;"> <p>Chapter 4</p> <p>How does the interpersonal context of exercise programmes facilitate adherence?</p> </div>	<p>Qualitative</p> <p>Interviews</p>
<b>To investigate the impact of two types of exercise interventions, with different levels of cognitive demand, on the mental and physical health of previously inactive older adults.</b>	<div style="text-align: center;">↓</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; text-align: center;"> <p>Chapter 5</p> <p>What type of exercise is better to improve mental health?</p> </div>	<p>Feasibility study</p> <p>Randomized-control trial</p>
<b>To investigate the barriers and the motivations to exercise in inactive older adults.</b>	<div style="text-align: center;">↓</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; text-align: center;"> <p>Chapter 6</p> <p>What is the difference between actives and inactives?</p> </div>	<p>Qualitative and quantitative</p> <p>Mixed method</p>

# CHAPTER TWO

## The determinants and effects of community-based exercise: A systematic synthesis of the current evidence

### Abstract

This systematic synthesis aims to understand what exercise programme characteristics contribute to effectiveness in terms of adherence and positive outcomes in cognitive function and emotional wellbeing of older adults. Qualitative and quantitative research studies that reported on community-based exercise programmes in older adults were included. A systematic search was carried out following Farrance, Tsofliou and Clark (2016) in 17 online scientific databases limited to publications 2014 - May 2019. A total of 939 studies were screened against the inclusion/exclusion criteria. Eight qualitative and twelve quantitative study designs were finally included in the review. None were excluded on the basis of quality. Eleven themes emerged as influencing adherence and were organized into three levels of the socio-ecological model (McLeroy et al., 1988): intrapersonal (individual aspects of motivation, benefits of exercise); interpersonal (social factors related to the exercise group, instructor's approach) and environmental/organisational (appealing design of exercise programmes, affordability, location, advertisement). The mean adherence rate of studies was 75% (SD = 1.6). Two studies measured cognitive function and found improvements following exercise interventions. Ten studies measured emotional wellbeing and found improvements in quality of life or reduction of depressive symptoms. The synthesis demonstrated that community-based exercise programmes are effective in improving the level of physical activity in older adults, positively impacts emotional well-being and psychosocial health. The synthesis showed that individual factors of motivation, assessment of convenience and preferences should be assessed in interventions targeting older adults.

## 2.1 Introduction

Ageing is associated with a decline in cognitive function and emotional wellbeing. The domains of cognitive function most affected by ageing are attention and memory (basic functions) and executive function which are the high-level processes that allow management and coordination of various elements of cognitive tasks. The decline in emotional wellbeing is often caused by deterioration in both physical function and social interactions (Steptoe et al., 2015). Effective interventions are needed to prevent cognitive decline and help older adults maintain their physical function and engage in regular social interactions.

Recent reviews summarizing the evidence for the role of exercise in neuroprotection found that some exercise programmes have a positive impact in restoring cognitive function in later life (Ballesteros et al., 2015; Kirk-Sanchez & McGough, 2013). Clinical trials have shown that the effectiveness of exercise in maintaining cognitive function is dependent on the characteristics of the programme, with higher metabolic or cognitive demands having larger beneficial effects (Smith et al., 2010). Randomized control trials have shown that exercise, which is structured, planned and repetitive, is more effective in maintaining cognitive health than general physical activity, which is unstructured and incorporated in daily life (Diamond, 2015). Adherence to aerobic, strength, coordinative exercises and structured multi-component exercise programmes with longer duration positively impact cognitive function (Kirk-Sanchez & McGough, 2013). Long-term exercise participation is neuroprotective through different mechanisms such as improved emotional wellbeing and physical fitness as well as social engagement (Kirk-Sanchez & McGough, 2013). Adherence to exercise is essential to realise and maintain any of its associated beneficial effects on cognitive and physical health. The characteristics of exercise (e.g. type, modality, components, social elements, location, instruction, social factors) have been found to influence adherence (Farrance et al., 2015; Killingback et al., 2017). A previous systematic synthesis found that group-based community exercise programmes have a higher adherence rate than non-exercise-focused interventions (Farrance, Tsofliou and Clark, 2016). However, this review suggested that comprehensive evidence is still missing regarding the most effective designs and types of community-based exercise. Furthermore, this review did not identify specific factors of exercise programmes that effectively promote adherence, in order to enhance cognitive function and emotional wellbeing in older adults. This chapter aims to fill this gap.

We aim to provide an up-to-date overview of the current literature to understand what programme characteristics contribute to programme effectiveness in terms of adherence and positive mental health outcomes, particularly cognitive function and emotional wellbeing.

## **2.2 Methods**

### *2.2.1 Search strategy*

This systematic synthesis reviews the literature following Farrance, Tsofliou and Clark (2016) who reviewed the literature from 1995 to 2014. Here we use a similar search strategy and methods to investigate factors of adherence in community-based exercise programmes for older adults. As with Farrance et al. (2016), we included both qualitative and quantitative studies but unlike them, we were interested only in studies reporting on cognitive function and emotional wellbeing. A systematic search was carried out in 17 online scientific databases (Academic Search Complete, Arts & Humanities Citation Index, CINAHL Complete, Complementary Index, Emerald Insight, LSBU Research Open, Medical Online, MEDLINE, PsycARTICLES, PsycINFO, Science Citation Index, Science Online, ScienceDirect, Scopus, Social Sciences Citation Index, SocINDEX, SPORTDiscus). The search was limited to publications between 2014 and May 2019. Reference lists were also hand-searched and authors were contacted where relevant information was not reported in the article. Using a Boolean search strategy, key concepts (e.g. ‘adherence’, ‘community living’, ‘physical activity’, ‘older people’) and their alternative subject headings were entered into the databases.

The selection was restricted to studies published in peer-reviewed journals and in the English language that explored older people’s perspectives on adherence to community-based exercise programmes. The inclusion criteria were: original research article published in a peer-reviewed journal; exercise intervention lasting at least 8 weeks; the study design was randomized or quasi-experimental or controlled design or longitudinal design with at least 6 months follow-up or was a qualitative study; group-based community activity involving exercise; having the average age of participants over 65 years; participants lived independently in the community; reporting assessment of cognitive function or emotional wellbeing (e.g. life satisfaction, happiness, positive affect, freedom from depression, cognitive, general health or functioning measures). The 8-weeks as a minimum length of exercise programmes was set as a selection criterion because research suggests that the time for establishing a new habit is on average 66 days, with a range of 18–254 days (Lally & Gardner, 2011). Studies investigating

physical activity in a population with a specific health condition other than severe cognitive impairment (e.g., coronary heart disease, diabetes) were considered eligible if the participants were not hospitalized during the intervention but lived independently. Studies reporting interventions other than group-based exercise were excluded from the review as were those with participants having severe cognitive impairment or dementia. The full list of exclusion criteria is presented in Table 2.1.

To select eligible articles, two reviewers (ZS and RO) screened the results of the search independently in three phases: the titles, abstracts, and full texts. The two reviewers discussed any disagreements in screening results until an agreement was reached and the article was either discarded or kept onto the next phase.

**Table 2.1** Inclusion and exclusion criteria for the selection of articles for this review

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>
Peer-reviewed research article published after 2013 in English	Reports published in conferences, books, theses, policy documents, reviews or pilot studies
For quantitative research, exercise intervention lasting at least 8 weeks and for qualitative research, participants attending ongoing exercise programme	Home-based exercise programme
Uses control group or follows cohort for at least 6 months or is qualitative research or is mixed-method research	Exercise intervention is not group-based, structured, planned or repetitive
Intervention is set in the community and includes group-based exercise	Studies with a clinical intervention for hospitalized patients
Participants are on average over 65 years old and live independently	Participants have severe cognitive impairment or dementia
Measures include assessment of cognitive function or emotional wellbeing	

### 2.2.2 Data extraction and synthesis

Following the above process, the full texts of selected studies were read and examined by ZS for data extraction and tabular presentation of several key characteristics: sample size and composition; study design; type and structure of group activity; measures of cognitive function, emotional wellbeing, adherence and other measures; results on cognitive function, emotional wellbeing and adherence.

The framework for this review followed the guidelines identified by Noyes et al (2019) for synthesis methods to combine evidence from quantitative and qualitative research to explore multiple research questions and outcomes of health interventions. The data were

synthesised using parallel-results convergent synthesis design. The data of the selected studies were analysed and presented separately, and the integration of findings occurred in the interpretation of results in the discussion section.

For the qualitative studies, thematic synthesis was performed according to the method of Thomas & Harden, (2008) to identify a range of common themes and any divergent views. The entire result sections from the articles were imported into a qualitative data analysis software MAXQDA 2018 (VERBI Software, 2018). The texts were read to include free line-by-line coding for statements associated with participants' perceptions of adherence and the impact of the intervention. The codes were then developed into descriptive themes. And finally, the descriptive themes were used to create a new thematic synthesis that went beyond the original studies and the synthesis was organized according to the levels of an evidence-based health research model, the socio-ecological model (McLeroy et al., 1988)

For the quantitative studies, the cognitive function, emotional wellbeing and adherence results were analysed descriptively. The aim was to identify outcomes related to cognitive function and emotional wellbeing and if relevant data were available, to understand if these outcomes had an effect on adherence. A matrix was constructed to juxtapose the qualitative and quantitative data and to assess the extent to which the quantitative interventions incorporated the main analytic themes identified in the qualitative synthesis. A second reviewer was involved in the data synthesis to ensure that the data were sufficiently challenged and tested for robustness.

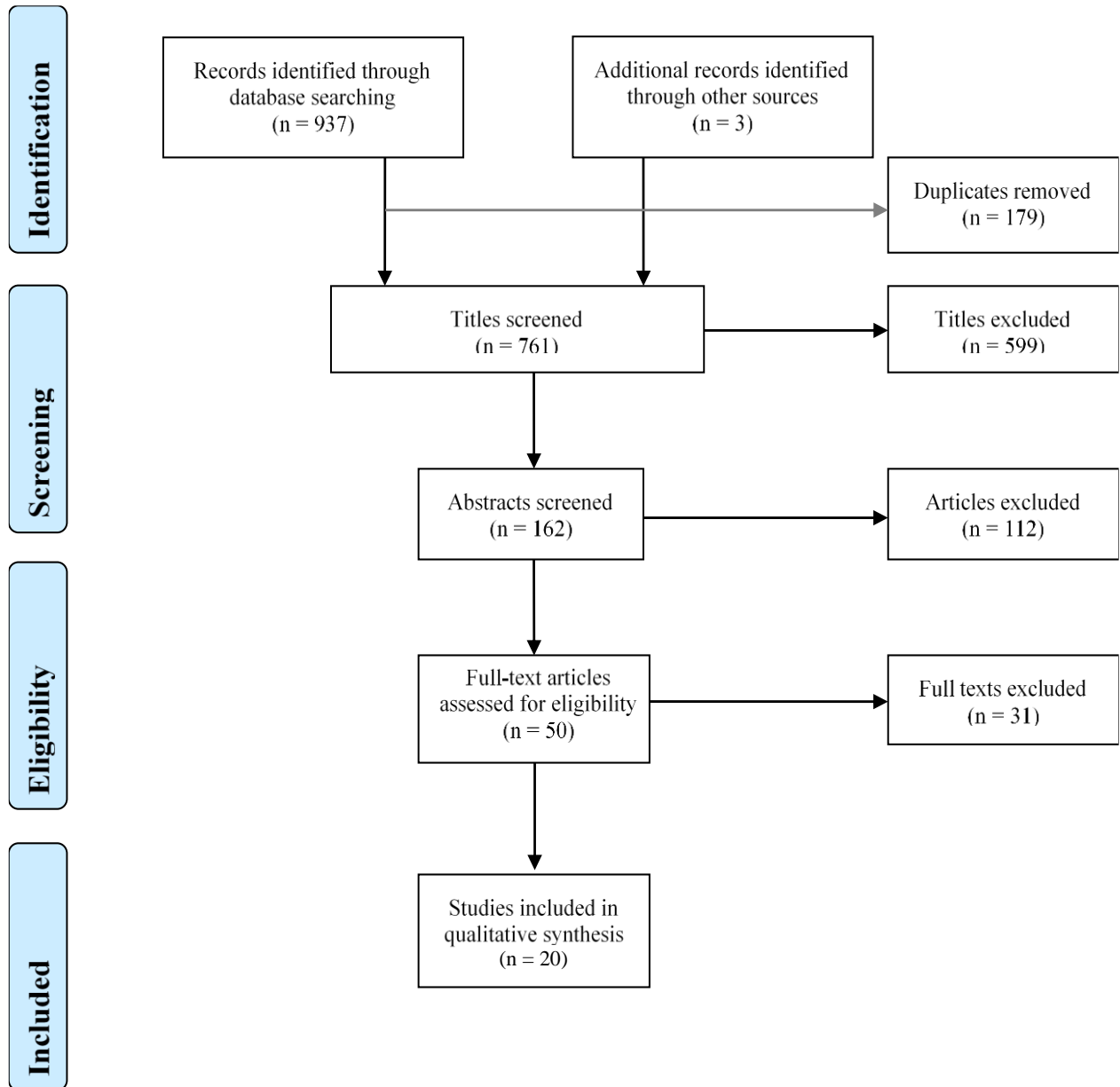
### *2.2.3 Quality assessment*

The comprehensiveness of reporting in each study was assessed using the Critical Appraisal Skill Programme checklist (CASP, 2014). The screening questions were challenged for each study and a score of 0, 1 or 2 was given according to how well the study answered the screening questions (0 = no, 1 = partly, 2 = yes). The maximum score for quantitative studies is 22 and for qualitative studies is 20. The two reviewers evaluated qualitative and quantitative studies they discussed any disagreements in the scoring until an agreement was reached.

## 2.3 Results

### 2.3.1 Included studies

The total number of studies identified and screened against the inclusion/exclusion criteria was 939. The study selection is presented on the PRISMA flow chart in Figure 2.1. Nineteen studies met the inclusion criteria including seven qualitative and twelve quantitative studies.



**Figure 2.1** PRISMA flow chart of the study selection process

### *2.3.2 Quality of included studies*

There was no disagreement in the grading of studies between reviewers. No study was excluded based on quality. The quantitative studies all scored  $\geq 8$  points on the quality appraisal assessment. The main limitations were poor reporting of details whether participants or instructors were blinded to treatment; the participants who dropped out were not accounted for in the conclusions of the study and several studies reported differences in demographics between treatment and control groups pre-intervention. Seven of the qualitative studies scored  $\geq 15$  points. Only one qualitative study (Parnell et al., 2015) scored lower (10 points). The main limitations of the qualitative studies were missing details whether the relationship between the researcher and the participants was considered and three studies were also lacking a clear statement of the findings.

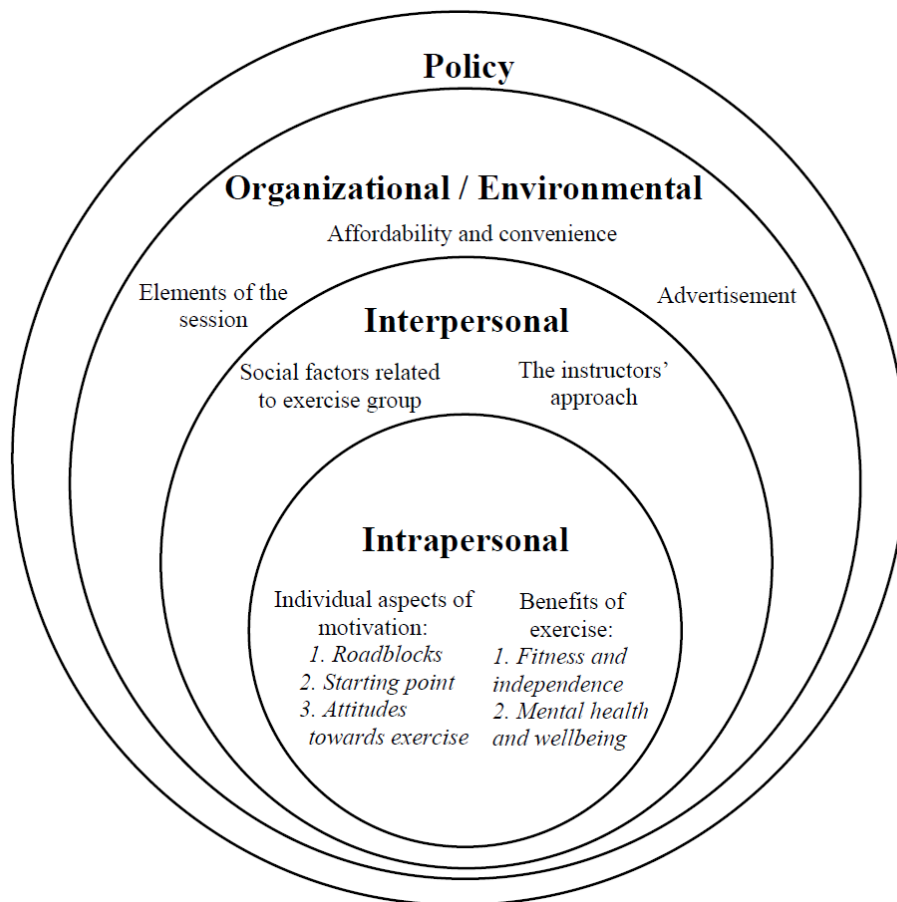
### *2.3.3 Qualitative synthesis*

The eight qualitative studies included a range of approaches for data collection such as semi-structured interviews, focus groups, and case studies. Sample sizes ranged from 7 to 39 and all exercise participants were aged between 50 and 92 years. The exercise cohorts were mixed in gender in most studies (Bennett et al., 2018; Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017; Parnell et al., 2015) but not all in two studies (Roberts et al., 2017) and (Mehra et al., 2016).

Participants were recruited from local exercise programmes (Hartley & Yeowell, 2015; Killingback et al., 2017), national exercise programmes (Biedenweg et al., 2014; Mehra et al., 2016; Parnell et al., 2015) or a fall prevention programme (Stødle et al., 2019). Ethnicity was diverse; White British and Black African (Biedenweg et al., 2014; Roberts et al., 2017), White British and Black Caribbean (Hartley & Yeowell, 2015), White, Chinese, Japanese, Arab and Black (Bennett et al., 2018). One study reported a White British homogenous group (Parnell et al., 2015) and ethnicity was not reported in four other studies (Killingback et al., 2017; Mehra et al., 2016; Stødle et al., 2019). The length of the exercise interventions varied from 13 to 24 months or was not reported. Roberts et al. (2017) reported that the participants had been attending an exercise programme for 15 weeks before the interview. Table 2.2 summarises the characteristics and the main findings of the qualitative studies included.



Eleven organising themes emerged as influencing adherence and appeared to relate to three global themes of intrapersonal, interpersonal and environment/organisation levels of the socio-ecological model. The themes and sub-themes are presented in Figure 2.2.



**Figure 2.2** Illustration of themes and sub-themes at each level of the ecological model that were drawn from the results of this review.

### **Intrapersonal levels**

All studies reported threads relating to one or more aspects of individuals' motivation towards exercise and the benefits gained through participation. These two organizing themes contain several sub-themes which were identified as important factors for exercise adherence in the qualitative studies.

The **individual aspects of motivation** were present in six of the eight studies concerning the *attitudes toward exercise*, the *starting point* of exercise participation and *roadblocks* which restrict individuals from taking up exercise. *Attitude towards exercise* was found to be a key factor in adherence to group-based exercise programmes. Firstly, the role of physical activity in older adults' lives in the past and present influenced their motivation to take part in the group-based exercise. For participants who exercised from an early age and throughout their

lifespan, although the mode of exercise had changed as they aged, it remained an important part of their daily lives (Killingback et al., 2017). Another study also found that such participants easily fitted physical activity into their daily routine; moreover, they appreciated the role of exercise classes in structuring their weekly schedule (Biedenweg et al., 2014). Secondly, self-efficacy was noted as a motivator towards adherence, which is characteristic of those individuals who had previously participated in exercise (Biedenweg et al., 2014). These participants had the “desire to learn something new and the desire to get out of the house” (Biedenweg et al., 2014, p. 5). *Starting point* for taking up exercise was evidenced in three studies. Killingback et al. (2017) found that exercise uptake was facilitated by having an individual motivator towards exercise, such as the desire to stay active or to keep independent and healthy, to socialize (Killingback et al., 2017) or to handle challenges of an existing health condition (Stødle et al., 2019). Encouragement and consultation with a trusted person (GP or physiotherapist) were found to encourage uptake of an exercise, as older adult participants valued approaches which increase their self-efficacy and self-management of their health condition (Biedenweg, 2014). *Roadblocks* were physical, psychological limitations and life circumstances, which limited exercise adherence. While physical health concerns and mobility problems were reported as barriers in most of the studies (Bennett et al., 2018; Biedenweg et al., 2014; Hartley & Yeowell, 2015), other barriers varied depending on the characteristics of the targeted participants. Lack of motivation and readiness toward behaviour change were commonly cited barriers for exercise uptake in older adults who quit or who declined to join a weekly multi-component group exercise (Biedenweg et al., 2014). ‘Feeling left out’ was cited as an obstacle to adhering to group-based exercise by black Caribbean older adults because they felt they stood out from the rest of the group (Hartley & Yeowell, 2015).

**Benefits of participation** were presented in all eight studies as one of the main determinants for uptake and adherence. Improved physical fitness was reported as the outcome of regular exercise attendance, while improved emotional wellbeing was the main perceived benefit facilitated by the social interactions. *The physical improvements*, related to health maintenance and disease prevention, managing chronic health conditions, weight loss, balance, cardiovascular fitness, strength, walking ability, coordination, sleep and more energy, were found to be important motivators for uptake and long-term adherence (Bennett et al., 2018; Biedenweg et al., 2014; Robert et al., 2017; Hartley & Yeowell, 2015; Mehra et al., 2016; Parnell et al., 2015; Robinson et al., 2014b; Stødle et al., 2019). Becoming physically fit and independent were suggested as key motivators to exercise (Mehra et al., 2016) and it also

resulted in improved life-manageability (Stødle et al., 2019). The *improved mental health* benefits were related to energising and empowering effects of the social atmosphere and the way exercise “acted as a mood lifter” (Killingback et al., 2017, p. 8) or the beneficial effect of building relationships with others (Bennett et al., 2018; Robert et al., 2017) and quality of life (Parnell et al., 2015). *Psychosocial benefits* of the social aspect were evident in all eight studies and these benefits were related to social support, enjoyment, improved emotional wellbeing and a reduced feeling of loneliness (Bennett et al., 2018; Roberts et al., 2017; Hartley & Yeowell, 2015; Killingback et al., 2017; Mehra et al., 2016; Stødle et al., 2019). Tai chi participants felt that with others they tended to do the exercise more often, and they valued the support from other people (Du, Roberts, & Xu, 2017). Furthermore, Mehra and colleagues (2016) found that social relations and “having fun” with others were important to satisfy participants’ need for relatedness. “Enjoying being with others while exercising” (Biedenweg et al., 2014, p. 5) was highlighted as the main motivator of adherence to group-based exercise (Biedenweg et al., 2014; Du et al., 2017; Hartley & Yeowell, 2015; Killingback et al., 2017; Parnell et al., 2015).

### **Interpersonal factors**

All studies included threads about the social factors related to the exercise group and the instructor’s professionalism and personality.

**The social factors of the exercise group** were important to help mitigate social isolation (Bennett et al., 2018) and facilitate a sense of belonging (Hartley & Yeowell, 2015; Killingback et al., 2017). For example, meeting with new people, “having a good time” doing exercise together (Biedenweg et al., 2014; Parnell et al., 2015) and the opportunity to relate to others were important facilitators of adherence in different study populations (Bennett et al., 2018). Interacting and sharing common experiences with similar others or members of their own minority group provided opportunities to support each other in handling life difficulties (Hartley & Yeowell, 2015; Parnell et al., 2015). After exercising together for several months or years, participants also formed close friendships (Killingback et al., 2017; Mehra et al., 2016). Encouragement from fellow participants while doing challenging exercises and making improvements in their physical skills was found to be an especially important motivator for participants over 80 years in the Otago Exercise Programme (Stødle et al., 2019). Besides emotional wellbeing, benefits of the social atmosphere, social relations and ‘having fun’ were

identified as major reasons to join the weekly classes and adhere long term (Robert et al., 2017; Hartley & Yeowell, 2015; Mehra et al., 2016; Parnell et al., 2015).

**The instructor's approach** was highlighted in five studies, which included threads about personality and professionalism (Bennett et al., 2018; Biedenweg et al., 2014; Killingback et al., 2017; Mehra et al., 2016; Stødle et al., 2019). The instructor was important in aiding participants' ongoing adherence as they increased participants' enjoyment and feelings of competence during exercise sessions. The *instructor's personality* (as perceived by participants) seemed to be important in the following ways: "demonstrating friendliness, care and being approachable", helping participants to feel welcomed in the group, "bringing a sense of fun" to the group, teaching with enthusiasm and encouragement (Killingback et al., 2017; Mehra et al., 2016). The *professionalism* of the instructor, such as being aware of participants' health conditions, ability/competence to offer advice and adapt exercises to their physical boundaries, was important to make participants feel safe to exercise (Killingback et al., 2017; Mehra et al., 2016). At the same time, by tailoring the exercises to individual abilities, avoiding criticising participants' exercise ability, and providing positive feedback on participants' improvements, the instructors supported feelings of encouragement (Biedenweg et al., 2014; Killingback et al., 2017; Mehra et al., 2016; Stødle et al., 2019). Lack of professionalism was presented as the most frequent criticism from participants of a multi-component exercise programme. Individuals described their dissatisfaction with their peer instructor's lack of adequate fitness-training background and sometimes "pushing them too hard" (Bennett et al., 2018). In contrast, clear and structured teaching and presentation of the rationale for the programme promoted participants' regular attendance and adherence to the programme (Mehra et al., 2016). Participants also appreciated the instructor's enthusiasm and ability to make the sessions fun and enjoyable, which were important motivators to adherence (Bennett et al., 2018).

### **Environmental/Organisational factors**

Six studies included threads relating to environmental or organisational factors, which not only enable participation but make the exercise programmes appealing for older adults.

**Elements of the session** were found important to facilitate an enjoyable, relaxed, safe and interactive atmosphere. These included details about the programme design, the structure and the delivery of the exercise sessions. First of all, *opportunities for socialising* was one of

the most important features of the exercise programmes. The group-based format itself seemed to be appealing for older adults as they “felt that exercising in a group was easier than doing it alone at home“ or in the gym, as it mitigated the distractions of home, helped establish an exercise routine, and most importantly, the group created a positive exercise environment (Killingback et al., 2017; Bennett et al., 2018). The opportunities for socialising before and after the classes facilitated social connections and made exercising worthwhile (Bennett et al., 2018); it was considered an essential component supporting regular attendance for older adults (Parnell et al., 2015). Secondly, *having a variety* of activities on offer was found to be motivating as it fulfilled participants’ different physical needs and preferences (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Parnell et al., 2015). Also, participants appreciated exercises, which trained their whole body, focusing on their cardiovascular fitness, balance and muscle strength (Bennett 2018). Thirdly, the *class features* were important for satisfaction; safe and adaptable exercises catered for different abilities and previous experience (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017; Parnell et al., 2015). Participants appreciated if the exercises were challenging to the right level or if they were given autonomy to go at their own pace (Bennett et al., 2018; Mehra et al., 2016). In cases where the programme included individual elements such as an additional home practice, participants acknowledged the benefit of the exercises being adapted to their own abilities so they could “work at their own level without pressure” (Killingback et al., 2017). For classes run on a musical background, participants highlighted the positive impact of music on the atmosphere during the class and on their emotional wellbeing. For example, the combination of Tai chi class with music “provided a spiritual expression component for participants who found these classes “calming,” “peaceful,” or “soothing” (Robert et al., 2017). For some, a piece of more upbeat music was found entertaining and motivating to exercise (Killingback et al., 2017). Individual preferences regarding indoor/outdoor classes and mixed/same gender classes differed (Bennett et al., 2018).

**Affordability and convenience** were revealed as significant in aiding adherence in five studies (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017; Mehra et al., 2016). This theme included practical aspects of the programmes, which acted as barriers or facilitators depending on the perspectives of participants from different demographic backgrounds. Specifically, *affordability* (Killingback et al., 2017) or free sessions for those with financial barriers (Biedenweg et al., 2014; Hartley & Yeowell, 2015) was considered essential for adherence. Two studies highlighted the *convenience of the schedule* (Biedenweg

et al., 2014; Mehra et al., 2016) and three others – the *convenience of location and accessibility* as important enablers for older adults to participate in group-based exercise (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017). They appreciated the programmes to be local so they did not have to travel far from their home and they could expand their social network in the local area (Killingback et al., 2017). The studies suggested that keeping participation costs down and organising the sessions locally at an easily accessible location are essential to enable participants of old age to make exercise part of their weekly routine and thus facilitate adherence (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017).

**Advertisements** were investigated as a factor for adherence in two studies that reported its relevance in facilitating exercise uptake. The suggested most successful strategies for exercise promotion are: word-of-mouth, advertisement in paper-formats (such as brochures, postcards, local papers) or on websites, posters on a variety of places such as the bus, the doctors' surgeries, libraries, community centres, churches, stores and banks and sent to people who had had a fall (Biedenweg et al., 2014). Furthermore, Parnell (2015) recommended that organisations should promote their activities by developing community networks, organizing outreach activities such as an awareness-raising or trial sessions, where potential participants could be provided with the opportunity for “getting to know the club and from there, to attract them to the programme” (Parnell et al., 2015). It has been also suggested that “doctors should play a role in recommending the programs to their older patient and that messages should focus on enjoyment and feeling better (Biedenweg et al., 2014).

**Table 2.2** Characteristics of qualitative studies included.

Study	Study quality	Design	Population	Intervention	Outcome
<b>Benett (2018)</b>	19	Semi-structured interviews Thematic analysis	<b>Sample selection:</b> Purposive sample of those who completed the trial and were recruited to become peer instructors 31 interviews (N=14 women) <b>Age:</b> M= 70 years <b>Gender:</b> Male and female <b>Setting:</b> Greater Vancouver, Canada <b>Socio-economic status:</b> varied, low-high <b>Ethnicity:</b> White, Chinese, Japanese, Arab, Black	24 week 3 x 50-60 min multi-component exercise with music Same gender classes (SASG) or mixed gender classes (SAMG) led by instructor ≥65 years old (SASG) <b>Content:</b> warm-up component, moderate intensity strength and aerobic exercises, cool-down).	3 global and 12 lower-order themes: Benefits and challenges of exercising with peers, Group as a means of mitigating social isolation, Group exercise and the physically active body. Themes included: social connections, making friends, exercising with others similar, class structure, peer instructors, challenging and autonomous nature of the classes, suggestions for improvement (for example additional training or including more intense exercises). Preferences are varied regarding same vs. mixed gender participation.
<b>Biedenweg et al 2014</b>	19	Semi-structured Interviews Grounded theory	<b>Sample selection:</b> Purposive sample of participants, those who quit or who declined to join 39 semi-structured interview <b>Age:</b> M=79 (SD= 5.06) (exercise participants) <b>Gender:</b> Male and female <b>Setting:</b> USA <b>Socio-economic status:</b> low-medium <b>Ethnicity:</b> homogenous white and Arab, Black	1 x 60 min a week Enhance Fitness evidenced-based multicomponent class. <b>Content:</b> aerobic, strength, flexibility, and balance exercises. 6-month long Physical Activity for a Life time of Success individual, telephone-based physical activity counselling programme offered in a senior centre	3 global themes: Personal and environmental motivators (enjoying exercising with others, having a routine that promoted accountability, marketing materials, encouragement from a trusted person, cost, location); Barrier (already getting enough exercise, not being motivated or ready, and having poor health); recommendation for marketing strategies (focusing on feeling better, tailored exercise low cost, motivational instructor, interesting activities, flexibility of class schedule, advertisement)
<b>Hartley et al (2015)</b>	17	Qualitative design using focus groups Thematic network analysis	<b>Sample selection:</b> Purposive sample of previous programme participants 3 focus groups (N=18 total) <b>Age:</b> M=76.2 years (SD=5.9) <b>Gender:</b> Male and female <b>Setting:</b> North West England <b>Socio-economic status:</b> low <b>Ethnicity:</b> British and Black Caribbean	Several different group including Nordic walking, walking group, Tai chi, 'Active Life', line dancing, cardiac rehab, exercise group in African Caribbean Community, 'Heart' cardiac rehab characteristics are not specified.	3 global x 3 organising themes: Barriers (financial, access, minority); Motivators to long term adherence (socialising with other from minority, variety of exercises, the impact of exercise on physical health and wellbeing) and Enablers (financial, access, variety). 16 basic themes (lack of funding, cost, lack of appropriate accommodation, capacity, disparity with others, sense of belonging, physical, psychological, socialisation, different group activities, varied levels of difficulty).
<b>Killingback et al (2017)</b>	16	Multiple case study design Thematic analysis and descriptive statistics Proposition building	<b>Sample selection:</b> Purposive sample from 3 exercise programmes Median age: 70.5 (SD=10), 70 (5.5), 68.5 (4.5) N=25 (number of focus groups and interviews) <b>Gender:</b> Male and female <b>Setting:</b> South West England <b>Socio-economic status:</b> not mentioned <b>Ethnicity:</b> not mentioned	1 x 1 hour a week Case 1: multicomponent class Case 2: outdoor exercise including walking and multicomponent exercises Case 3: 1 x 1 hour a week multicomponent class	5 "proposition": factors relating to the individual (preferences for a non-gym environment, current circumstances, personal motivators, role of physical activity in participants' lives), the instructors (personality, professionalism, humanised approach), programme design (the location, affordability, the use of music, adaptable exercise content), social features (factors which supported a sense of belongings) and perceived benefits (physical, psycho-social), empowering, energising

Study	Study quality	Design	Population	Intervention	Outcome
<b>Mehra et al (2016)</b>	20	Qualitative design using focus groups Self-Determination Theory was used for analysis with sequential coding strategy	<b>Sample selection:</b> convenience sampling from a group-based exercise programs Participation: M=9 years (ranged from 3 months - 28 years) 8 focus groups (N=30) <b>Age:</b> M= 74 years (SD = 9) <b>Gender:</b> 100% female <b>Setting:</b> Netherlands <b>Socio-economic status:</b> not mentioned <b>Ethnicity:</b> not mentioned	1 x 60 min a week nationwide group-based programme called More Exercise for Seniors supervised by a certified trainer  Several types of sessions (for example gymnastics, swimming, fitness, yoga, game & sports)	Themes: Motives (autonomy: physically fit and being self-reliant , relatedness: social relations and 'having fun', competence: expert guidance from instructor); Attitudes and Expectations exercises at home (autonomy: tailored to individual needs, self-paced, individually tailored exercise in different levels of complexity; competence: concerns about exercising without guidance; relatedness: concerns about motivating themselves); Attitudes and Expectations of Supporting Technology (Autonomy and competence: being receptive about technology, relatedness: mixed opinions about additional online contacts)
<b>Parnell et al (2015)</b>	10	Mixed methods interviews and survey Thematic analysis	<b>Sample selection:</b> convenience sampling from Extra Time programme 18 semi-structured interview N=486 <b>Age:</b> 5.3% - 50-54 years, 59.9% - 55-74 years, 34.8% 75+ years <b>Gender:</b> 59.7 % women <b>Setting:</b> UK, 16 football clubs <b>Socio-economic status:</b> not mentioned <b>Ethnicity:</b> 95.1% White British	ongoing free exercise programmes delivered by Premier and Football League clubs 1 x 120 min a week exercise combined with social activity groups Choice of physical activity: exercise to music, indoor bowls, cricket, new age curling, walking football, table tennis, zumba	6 themes: football club badge had positive influence on participants' interest, facilitate men adherence; building and developing community networks, spreading the word and other strategies to build interest, increasing opportunities to play football, enjoyable activities, enriching opportunities to socialise
<b>Roberts et al (2017)</b>	15	Qualitative Semi structured interviews Thematic analysis	<b>Sample selection:</b> Purposive sample of programme participants in an older adult activity centre 13 semi-structured interview <b>Age:</b> M= 68.6 years (SD=8.7) 50% White and 50% African American	15-week Tai chi programme 1 x 60 min a week in 2 groups: Tai chi-silence (control) or the Tai chi-music (experimental)  <b>Content:</b> modified 24-form Yang Style Music was used during rehearsal of previously learned class material.	4 global themes: Reason to participate (increase physical activity), health benefits (mind-body movements improve control and balance, abilities in daily life, feelings of control and achievement for the music group only), social interaction (support, enjoyment of interacting with others) and experience regarding practise with "music" (mental health improvement, mind-body connection, mindfulness, it is "calming," "peaceful" or "soothing").
<b>Stødle (2019)</b>	19	Qualitative descriptive design Phenomenological approach a systematic text condensation process	<b>Sample selection:</b> Purposive sampling from Otago Exercise with experience of at least 9 months 7 semi-structured interview, N=7 <b>Age:</b> aged 81-92 years <b>Gender:</b> 57% women <b>Setting:</b> Norwegia <b>SES:</b> not mentioned <b>Ethnicity:</b> not mentioned	Otago Exercise program: strength and balance retraining programme designed to prevent falls in older people	All participants had high attendance rate 4 overarching themes regarding the participants' experiences with participation : (1) Experience of health challenges: A meaningful starting point (changes in health, loneliness) ; (2) Adherence motivated by increased lifemanageability; (3) Comprehensibility through skilled instruction; and (4) Social and professional support enhancing motivation.

Note. M – mean; SD – standard deviation; N – sample size; min – minutes; SASG - Same gender classes; SAMG- mixed gender classes



#### 2.3.4 Quantitative synthesis

The twelve quantitative studies included nine randomized control trials, two quasi-experimental design studies, and one observational design (or cohort). The sample size ranged from 23 to 572 with a total of 1533 participants. Participants were 50 years old and over ( $M = 71.1$  years). Eight studies included both male and female participants; four studies were female-only (Best, Nagamatsu, & Liu-Ambrose, 2014; Lacharité-Lemieux, Brunelle, & Dionne, 2015; Marcos-Pardo, Martínez-Rodríguez, & Gil-Arias, 2018; Picorelli et al., 2014). Table 2.3 summarizes the characteristics and the outcomes of the included studies. Study duration varied from 8 to 52 weeks (median = 60 min), with 1 to 3 exercise sessions per week, lasting for 40 to 100 min (median = 12 weeks).

**Adherence** to the programme was a primary outcome in eight of the twelve studies (Cheung et al., 2016; Kendrick et al., 2018; Lacharité-Lemieux et al., 2015; McCaffrey et al., 2017; Osuka et al., 2017; Papadopoulos & Jager, 2016; Picorelli et al., 2014; Progovac et al., 2017). Adherence was higher when there were perceived cognitive benefits (Best et al., 2014), improved self-efficacy (Cheung et al., 2016), the support of a companion (Osuka et al., 2017), the exercise took place in an outdoor location (Lacharité-Lemieux et al., 2015), and where the intervention included an educational element (Papadopoulos & Jager, 2016). Additionally, the amount of total weekly physical activity was a primary outcome in two follow-up studies, which aimed to investigate the impact of an exercise programme after the programme had finished (Best et al., 2014; Kendrick et al., 2018). The remaining studies reported adherence as a secondary outcome, with primary outcomes on self-determined motivation and body composition (Marcos-Pardo et al., 2018), strength, balance, quality of life, fear of falling (Sales et al., 2017), and reaction time (Shellington et al., 2017). Adherence was measured with various methods (see Table 2.3): as a percentage of the total number of sessions attended (mean 75%, SD 1.6 %) (Osuka et al., 2017; Papadopoulos & Jager, 2016; Picorelli et al., 2014; Sales et al., 2017; Shellington et al., 2017) or the proportion of participants reaching a predefined required attendance rate ( $M = 95\%$  achieving at least 75% of class attendance; Cheung et al., 2016; Marcos-Pardo et al., 2018; McCaffrey et al., 2017; Progovac et al., 2017) or recommended physical activity level ( $M = 45\%$  achieving 150min physical activity/week) (Best et al., 2014; Kendrick et al., 2018).

**Table 2.3** Study characteristics of included quantitative studies.

Study	Study quality	Design	Population	Intervention	Comparative intervention	Main findings
<b>Best et al. (2014)</b>	11	Randomized controlled trial	<b>Sample selection:</b> purposive sample of participants in a previous randomized control trial involving exercise N =155 <b>Age:</b> M=69.54 years, SD=2.85 100% women <b>Setting:</b> Vancouver, British Columbia, Canada.	52-week programs (plus 1-year follow-up): 1 or 2 x 60 min/week resistance training (RT) <b>Content:</b> 10-min warm-up, resistance training, 10-min cool-down RT: progressive, high intensity with free weights or no weights	52-week programme (plus 1-year follow-up) 2 x 60 min/week balance and toning (BAT) <b>Content:</b> 10-min warm-up, balance and toning (BAT), 10-min cool-down BAT: Only body-weight, stretching, range-of-motion, core-strength, balance, relaxation	<b>Cognition:</b> Stroop interference from month 0 to 12 significantly improved ( $t(123) = -2.81, p < 0.01$ ). Improvements in executive function during the training period predicted adherence to physical activity in 1-year follow-up but did not predict adherence during the training period. <b>Emotional:</b> N/A <b>Adherence:</b> The exercise compliance over 1 year was 67.9% (in 1xRT group 71.0%, in 2xRT group 70.3% and in BAT group 62.0%) Decrease at post-intervention at a decelerating rate.
<b>Cheung et al. (2016)</b>	15	Randomized controlled trial (2-arm trial in two cohorts)	<b>Sample selection:</b> population based recruitment of older adults via press, flyers and health talks N= 36 <b>Age:</b> M=71.9 years, SD=5.6 Gender: 100% women <b>Setting:</b> community and senior centres in Minesota, US	8-week programme 60 min/week Hatha yoga class plus 4x30 min/week home yoga practice. <b>Content:</b> a warm-up and cool-down; poses in the seated, supine, prone, and standing positions; breathing exercises; and relaxation training. Incentives of \$10 at each data collection point and water bottles, yoga gear such as to those who turned > 6 log sheets.	Wait-list control	<b>Cognition:</b> N/A <b>Emotional:</b> At follow-up: Correlation (+) between frequency of home yoga-practice and SF-12 mental health scores, quality of life (Cantril score). <b>Adherence:</b> 74% of participants attended $\geq 75\%$ of the yoga classes, with 35% participants attending all classes. Average class attendance was 6 classes (SD=1.98, range 1–8). During the intervention period, 88% of participants practiced yoga at home $\geq 3$ days/week, 74% of them $\geq 90$ min per week. <b>Other measure:</b> Correlations (-) between frequency of home-practice and sleep duration, sleep medication use. Attendance had moderate linear relationship with change in the scores of pain, function, balance and sleep latency subscales.

Study	Study quality	Design	Population	Intervention	Comparative intervention	Main findings
<b>Iliffe et al. (2015)</b>	18	Randomised controlled trial (3-arm, parallel-cluster).	<b>Sample selection:</b> population based recruitment of older adults in GP practices via letters and advertisement N=572 <b>Age:</b> M=72.9 years (SD=6.03) 62.4% female <b>Setting:</b> London, Nottingham, and Derby, UK.	24-week programme 1 x 60 min/week Falls Management Exercise (FaME) supervised group-based exercise programme plus 2 x 30 min home exercises unsupervised <b>Content:</b> leg muscle strengthening and balance retraining with resistance bands, ankle cuff weights, mats and flexibility training, functional floor skills and adapted Tai chi with progressive difficulty.	24-week programme 3 x 30 min/week Otago Exercise Program (OEP) unsupervised exercise programme, home-based plus 2 x week walking <b>Content:</b> Otago exercises using ankle weights and hand hold weights 2. Usual care - no intervention: participants were not offered either programme.	<b>Cognition:</b> N/A <b>Emotional:</b> No significant differences in quality of life, social network and perceived social support. Expectations of exercise improved significantly in both groups; participants with positive expectations at baseline improved more so only in FaME group. <b>Adherence:</b> Physical activity at post-intervention and follow-up significantly improved in FaME group compared to usual care, but no significant difference between FaME and OEP. <b>Other measures:</b> Significant reduction in rate of falls in FaME compared with usual care at 12-month. Balance confidence significantly improved in FaME and OEP.
<b>Lacharité-Lemieux et al. (2015)</b>	18	Randomised controlled trial (2-arm, parallel).	<b>Sample selection:</b> population based recruitment of white, postmenopausal women via mass mail and newspaper N = 23 <b>Age:</b> M=60.7 years (SD=4.8) 100% women <b>Setting:</b> Centre on Aging, Sherbrooke, Quebec, Canada.	12-week programme 1 x 60 min/week outdoor multicomponent , supervised group-based exercise (OutTr); Intensity: HR in 65%-95% of max HR <b>Content:</b> 10-min aerobic exercises, 20-min aerobic static exercises in a circuit, 15-min resistance exercises, 15-min cool-down. Location: natural park beside a body of water, rich biodiversity.	12-week programme. 1 x 60 min indoor multicomponent, group-based exercise (InTr), the same as OutTr; Intensity: HR in 65%-95% of max HR. <b>Content:</b> 10-min aerobic exercises, 20-min aerobic static exercises at stations of a circuit, 15-min resistance. 15-min cool-down. Location: a meeting room with carpeted floor and windows	<b>Cognition:</b> N/A <b>Emotional:</b> Exercise-induced improvement in affective valence were higher in OutTr. Significant group-by-time interaction for post-exercise tranquility (increase in OutTr and decrease in InTr group. Between baseline and week 12, depression decreased only in OutTr. <b>Adherence:</b> Adherence significantly higher in OutTr group (97% vs 91%). Between baseline and week 12 physical activity level increased only in OutTr group (F1,11 = 5.19, p = .044, $\eta^2 = 0.321$ ).
<b>Marcos-Pardo et al. (2018)</b>	10	Quasi experimental, randomized controlled trial	<b>Sample selection:</b> recruitment of inactive older adults who are beginners in resistance training N = 47 <b>Age:</b> M=68.7 years (SD=3.04) 62 % women <b>Setting:</b> older adults' social club, Murcia, Spain	12-week programme 3 x 60 min/week resistance-training on non-consecutive days with motivational strategies. <b>Content:</b> resistance exercises in a circuit format. Load was increased from week 1 to week 12.	Non-exercising control (n = 20).	<b>Cognition:</b> N/A <b>Emotional:</b> Significant effect of intervention on SDT construct at post-intervention. In experimental group significant increase in autonomy; competence and relatedness. <b>Adherence:</b> 100% adherence rate <b>Other measures:</b> in experimental group fat mass and BMI significantly decreased at post-intervention.

Study	Study quality	Design	Population	Intervention	Comparative intervention	Main findings
<b>McCaffrey et al. (2017)</b>	8	Randomized controlled trial (2-arm)	<b>Sample selection:</b> volunteers with joint pain were recruited from Senior Centres and housing community via posters and newspaper N = 112 (n = 63 intervention gr) <b>Age:</b> M=75.3 years (SD=7.51) 76 % women <b>Setting:</b> Florida, USA	8-week 2 x 45 min/week Sit 'N' Fit Yoga plus 2 x 45 min/week home practise after week 8 (following a manual and pictures) <b>Content:</b> breathing techniques, yoga asanas with stretching and joint mobility, 6 basic yoga poses in sitting and Mind-Body connection	8-week 2 x 45 min/week Health Education Program (HEP) <b>Content:</b> social interaction using games, lecture, and discussion with a qualified health educator.	<b>Cognition:</b> N/A <b>Emotional:</b> In both groups combined, depression decreased, social activities increased, life satisfaction increased in week 8 and no significant difference between groups. <b>Adherence:</b> 95% of participants attended 75% or more of the intervention , no significant between-group difference <b>Other measures:</b> In chair yoga group pain interference significantly decreased in week 8 and week 21. there was significant decrease in pain and gait speed in week 21.
<b>Osuka et al. (2017)</b>	11	Non-randomized controlled intervention	<b>Sample selection:</b> volunteers were recruited via newspaper adverts N = 59 in Non Couple Group (NCG), 68 in Couple Group (CG) <b>Age:</b> M=71.9 (SD=5.2) in NCG and M=69.5 (SD=3.8) in CG 85% women in NCG <b>Setting:</b> Ibaraki, Japan	8-week 1 x 70-100 min/week walking and strength class + at home: at least 1 x 20min/week walking and 20min/week strength exercise with spouse <b>Content:</b> 10–20 min warm-up, 50–60 min walking and strength exercise and 10–20 min cool-down. Location: walking outside and exercises in a fitness studio	8-week 1 x 70-100 min/week walking and strength class + at home: at least 1 x 20min/week walking and 20min/week strength exercise without spouse <b>Content:</b> the same as for CG	<b>Cognition:</b> N/A <b>Emotional:</b> no significant change in exercise self-efficacy when comparing the groups, exercise social support improved only in CG <b>Adherence:</b> attendance in walking significantly higher in CG compared to NCG at week 8 (CG: 23.7%, NCG: 52.9%). No difference between groups in attendance in strength training. Other measures: Non-significant interactions for support from friends and instructors.
<b>Papadopoulos et al. (2016)</b>	9	Quasi-experimental study (group placement based on locations)	<b>Sample selection:</b> volunteers were recruited via flyers from two living facilities N = 28 <b>Age:</b> M= 83.8 years (SD=8.0) 79% women <b>Setting:</b> Washington, US	8-week 2 x 60 min/week strength training + 5 weekly 20-min education (EST group) <b>Content:</b> 5 min warm-up, 50 min resistance with elastic tubing and 5 min cool down. Educational programme about resistance-training.	8-week 2 x 60 min/week strength training (ST Group) <b>Content:</b> 5 min warm-up, 50 min muscle-strengthening using elastic tubing and 5min cool down.  Group 3: reference group (R)	<b>Cognition:</b> N/A <b>Emotional:</b> quality of Life significantly improved for ST and EST groups, not for the R group. Fatigue and depression scores decreased but not significantly. <b>Adherence:</b> attendance was significantly higher in EST (87.5%) than ST (69.2%).
<b>Picorelli et al. (2014)</b>	11	Exploratory observational study using regression model	<b>Sample selection:</b> population-based recruitment of women N = 382 (n=231 and n=151) <b>Age:</b> 70.5; 100 % women <b>Setting:</b> Brazil	10 weeks, 3 x 50 min/week aerobic training <b>Content:</b> 5 min warm-up, 40 min aerobic exercises with arms and legs while walking, orthostatic exercises and 5-min cool down.	10 weeks, 3 x 50 min/week strength training <b>Content:</b> leg exercises with a resistance tailored to the individual and progressively increased	<b>Cognition:</b> no significant findings <b>Emotional:</b> no significant findings <b>Adherence:</b> adherence rate in aerobic group 49.70%, in strength training 56.20%. Significant barriers to exercise only for the muscle training group: “The bad weather disrupts the accomplishment of the exercises”.

Study	Study quality	Design	Population	Intervention	Comparative intervention	Main findings
<b>Sales et al. (2017)</b>	11	Randomized controlled trial (2 arms)	<b>Sample selection:</b> population based recruitment via advert and health talks from community and senior centres N = 62 <b>Age:</b> 71.4 (SD=6.7) years 71% women (77% in control group (CG); 64% in exercise park intervention group (EPIG)) <b>Setting:</b> Melbourne	18-week, 2 x 60-90 min/week exercise park intervention <b>Content:</b> 5-10 min warm-up, 45-75 min circuit format of exercises for upper and lower body mobility and fine motor skills, balance, coordination strength and 5-10 min cool-down and stretching	No intervention control group In every 2 weeks 1 x 120 min/week meeting including social activities (9 in total)	<b>Cognition:</b> N/A <b>Emotional:</b> no significant difference in quality of life between groups over time. <b>Adherence:</b> attendance 79.6% in EPIG. Other: No significant differences in fear of falling and number of falls; single leg stance, knee strength, handgrip strength, performance in 2-min walk and timed sit to stand tests significantly improved
<b>Salmoirago-Blotcher et al.(2015)</b>	14	Randomized controlled trial	<b>Sample selection:</b> recruitment of inactive older adults with history of coronary heart disease via online, radio, newspaper adverts N = 29 <b>Age:</b> 67.9 (SD=10.30) 26.9% women <b>Setting:</b> Providence, US	12-week; 3 x 60 min/week Tai chi ("PLUS") + maintenance classes for 12 additional weeks <b>Content:</b> sequences of Tai chi exercises	12 weeks 2 x 60 min/ week Tai chi ("LITE") <b>Content:</b> sequences of Tai chi exercises	<b>Cognition:</b> N/A <b>Emotional:</b> quality of life improved but only as a trend toward significance <b>Adherence:</b> 90% in LITE, 88% PLUS retention rate Other: Physical activity level significantly improved in PLUS group compared to LITE group, no difference in aerobic fitness between groups over time.
<b>Shellington et al.(2017)</b>	12	Randomized control trail	<b>Sample selection:</b> population-based recruitment of older adults who reported complain in memory or thinking skills N = 58 <b>Age:</b> 68.7 74% women <b>Setting:</b> Woodstock, Canada.	24-week (+28-week follow-up) 3 x 60 min/week multiple modality exercise plus mind-motor exercise (M4). <b>Content:</b> 5 min warm-up, 20 min aerobic exercise, 5 min cool-down, 10 min light resistance, 15 min balance and square-stepping exercise, 5 min stretching.	24-week programme (28-week follow-up) 3 x 60 min/week multiple modality exercise (M2). <b>Content:</b> 5 min warm-up, 20 min aerobic exercise, 5 min cool-down, 10 min light resistance training, 15 min balance and range of motion and 5 min of stretching.	<b>Cognition:</b> Executive-related antisaccades reaction time significantly improved post-intervention and persisted at 52 weeks in both groups. No significant difference between groups. Attendance: M2 group 58% (SD=9.7); M4 group 53.7% (SD=12.2). Other: The phone recreational physical activity score increased at 24 and 52 weeks,

Note. M – mean; SD – standard deviation; N – sample size; min – minutes; HR – heart rate; RT – resistance training; BAT – balance and toning; FaME – Falls Management Exercise; OEP – Otago Exercise Programme; OutTr – Outdoor multicomponent, supervised group-based exercise; InTR – Indoor multicomponent, supervised group-based exercise; CG – control group; EPIG – exercise park intervention group; EST – strength training with education; ST – strength training; R – reference group; NCG – Non Couple Group; CG – Couple Group

**Cognitive function** was a primary outcome measure in only one study (Shellington et al., 2017) and it was a secondary outcome in the study of Best and colleagues (2014) with a primary measure of self-reported physical activity. Both studies found improvements in cognitive function following exercise interventions. Shellington and colleagues (2017) found that the oculomotor control (antisaccade control as a measure of executive function) in older adults with self-reported cognitive complaints improved post-24-week mind-motor exercise intervention and persisted at the 28-week follow-up both the experimental and the groups. Best and colleagues (2014) applied the Stroop test as the measure of executive function and used the Montreal Cognitive Assessment as a covariate along with age, education, weight and measurement of depression and physical function. The Stroop test was a secondary outcome measure and it was taken at baseline and post-training (at month 12) to determine whether baseline or improved performance on the Stroop test, acquired as a result of training, predicted the maintenance of regular physical activity at follow-up. The results showed that cognitive performance significantly improved following a 12-month resistance training in groups exercising once or twice per week. Nevertheless, the baseline performance or its change did not predict class attendance or additional physical activity level. On the other hand, follow-up results demonstrated that those who made greater improvements to executive function during the training period showed better physical activity adherence at 1-year follow-up and this association could not be accounted for by changes in global cognition, physical activity during the 12-month intervention period, functional comorbidity or depression. Four other studies evaluated cognitive function only as a screening tool or descriptive measure at baseline, using the Mini Mental State Examination (Picorelli et al., 2014; Shellington et al., 2017) or the Montreal Cognitive Assessment (Best et al., 2014; Shellington et al., 2017).

**Emotional wellbeing** was assessed as a primary outcome measure in two studies (Lacharité-Lemieux et al., 2015; Marcos-Pardo et al., 2018). Most other studies reported on it as a secondary outcome measure with adherence being the primary outcome (Cheung et al., 2016; Kendrick et al., 2018; Lacharité-Lemieux et al., 2015; McCaffrey et al., 2017; Osuka et al., 2017; Papadopoulos & Jager, 2016; Picorelli et al., 2014; Progovac et al., 2017). The most used measures of emotional wellbeing were changes in depression (Best et al., 2014; Lacharité-Lemieux et al., 2015; McCaffrey et al., 2017; Papadopoulos & Jager, 2016; Picorelli et al., 2014) and quality of life or life satisfaction (Cheung et al., 2016; Iliffe et al., 2015; McCaffrey et al., 2017; Papadopoulos & Jager, 2016; Sales et al., 2017; Salmoirago-Blotcher et al., 2017).

Furthermore, self-efficacy (Cheung et al., 2016; Osuka et al., 2017) and affective responses and feelings towards exercise (Lacharité-Lemieux et al., 2015) were also measured.

In terms of quality of life, the most often used measure was the Health Survey Version 2 Short Form (12) (Sales et al., 2017; Salmoirago-Blotcher et al., 2015; Cheung et al., 2016). The other methods were the Cantril Self-Anchoring Ladder (Cheung et al., 2016), Older people's Quality of Life Questionnaire (Iliffe et al., 2015) and the Quality of Life Profile-Seniors Version Survey (Papadopoulos & Jager, 2016). Improved quality of life was found following 8-week interventions consisting of Hatha-yoga combined with home practices (Cheung et al., 2016) or strength training twice a week, but not after weekly participation in traditional strength and balance programme (Papadopoulos & Jager, 2016). A more pronounced improvement of quality of life was found in a group that attended a 12-week Tai chi programme three times per week versus twice a week (Salmoirago-Blotcher et al., 2017). Quality of life did not change significantly following a 24-week fall management exercise programme at post-intervention or 12-month follow-up (Iliffe et al., 2014) and also did not improve following an 18-week Exercise Park Intervention, which primarily focused on fall-prevention (Sales et al., 2017).

In terms of depression, the measures used were Geriatric Depression Scale-Short Form (Papadopoulos & Jager, 2016; Best et al., 2014; Picorelli et al., 2014), the Beck Depression Inventory (Lacharité-Lemieux et al., 2015), or the PROMIS Emotional Distress and Depression (McCaffrey et al., 2017). In four studies there were (significant) reductions in depression scores. Lacharité-Lemieux et al. (2015) reported that the mean depression score significantly reduced following a 12-week outdoor multi-component exercise intervention compared to indoor training, despite similar exercise-induced feelings. McCaffrey et al. (2017) also found that mean depression scores reduced, and life satisfaction and perceived social interaction improved for all participants in either an 8-week seated yoga class or an 8-week health education class; there was no significant difference between groups regarding this positive outcome. Picorelli et al. (2014) found that baseline depression scores did not predict differences in adherence to aerobic or to strength training. Finally, Marcos-Pardo, Martínez-Rodríguez, and Gil-Arias (2018) found that after completing a 12-week strength training programme with instructors who had previously been trained in self-determination theory, the participants experienced increased feelings of autonomy, relatedness and competence, although their motivation did not differ significantly from the control group.

### 2.3.5 Synthesis of qualitative and quantitative studies

For this analysis, we created a matrix with the analytic themes identified from the qualitative studies (following Farrance et al., 2016) and assessed if those factors were evident in the quantitative interventions to demonstrate which qualitative themes were present in the quantitative interventions. The matrix is presented in Table 2.4. The studies differ from each other in terms of programme length, intensity, and targeted population. Due to the diversity of the programmes, no statistical analysis was carried out on the matrix scores but descriptive analyses were used to summarize patterns, which may relate to adherence.

The studies included in this review were published between 2014 and 2019 and reported a 53-100% attendance rate (mean = 75%). This score is somewhat higher than previously found by Farrance and colleagues (2016; mean of 69.1 %, range 53-93%). Overall there did not seem to be a relationship between attendance rate or retention and the matrix scores. However, studies that reported a mean attendance score lower than 60% did not include the following aspects: the individual behaviour of participants was not taken into account, self-efficacy was not targeted/measured, there were no incentives/rewards, and participants reported no perceived benefits of exercise. In contrast, most of these factors were embedded in the studies reporting an attendance rate of 90% and above.

*Improvement in physical health and emotional wellbeing* was targeted and/or measured in all twelve studies and four of them measured perceived benefits of exercise. Those studies which found positive effects on emotional wellbeing or perceived benefits of exercise also reported high adherence or retention rates (Cheung et al., 2016; Lacharité-Lemieux et al., 2015; Marcos-Pardo et al., 2018; McCaffrey et al., 2017; Papadopoulos & Jager, 2016; Salmoirago-Blotcher et al., 2017). However, none of the studies examined whether emotional wellbeing was a mediator of adherence.

None of the studies reported *individual motivators* for participants joining the exercise programmes; only two studies reported that health professionals recommended participants took up exercise for fall prevention (Iliffe et al., 2015) or cardiac rehabilitation (Salmoirago-Blotcher et al., 2017). Most studies reported homogenous groups of participants because in most studies participants were white females (Cheung et al., 2016; Kendrick et al., 2018; Lacharité-Lemieux et al., 2015; Salmoirago-Blotcher et al., 2015), but this was not because there was an intention to evaluate the impact of group homogeneity.



**Table 2.4** Synthesis matrix of the qualitative themes and the quantitative studies. The criteria are based on the themes and sub-themes identified from participant views in the qualitative studies.

Criteria	Marcos-Pardo (2018)	McCaffrey, (2017)	Lacharité-Lemieux (2015)	Sales (2017)	Papadopoulos (2016)	Cheung (2016)	Osuka (2017)	Best (2014)	Salmoirago-Blotcher (2015)	Iliffe (2015)	Shellington (2017)	Picorelli (2014)
<b>Intrapersonal factors</b>												
1. Did the intervention consider the role of individual behaviour?	✓	no	✓	✓	no	✓	✓	no	✓	no	no	✓
2. Did the participants exercise before in group-based exercise?	no	n/a	n/a	n/a	n/a	no	no	not clear	n/a	n/a	n/a	n/a
3. What was the <u>activity level</u> of the participants recruited?	inactive	n/a	minimally active	active	n/a	n/a	inactive	inactive	inactive	active	inactive	n/a
4. Is there evidence that the intervention facilitated or measured <u>self-efficacy</u> ?	✓	no	no	no	no	✓	✓	no	no	no	no	no
5. Roadblocks (psychological, physical, circumstances) Did the study assess barriers to exercise or take it into account?	✓	✓	✓	no	no	✓	no	no	no	✓	no	✓
6. Did the intervention include ethnically homogenous group? (which <u>ethnicity</u> )	n/a	varied	✓	n/a	n/a	✓	n/a	n/a	✓	✓	n/a	n/a
7. Were the participants similar to each other (gender, <u>demographic</u> )? (SD in age)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8. Inclusion criteria for <u>healthy older adults</u> ? No if frail or vulnerable participants recruited (health, history of fall, advanced age)?	✓	not specified	✓	no	not healthy	not specified	not healthy	✓	not healthy	not specified	✓	not healthy
9. Did the recruitment include any motivating methods, <u>incentives</u> ?	no	no	no	no	no	✓	no	no	✓	no	no	no
10. Did the participants have personal motivator to start (health challenge)?	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Criteria	Marcos-Pardo (2018)	McCaffrey, (2017)	Lacharité-Lemieux (2015)	Sales (2017)	Papadopoulos (2016)	Cheung (2016)	Osuka (2017)	Best (2014)	Salmoirago-Blotcher (2015)	Iliffe (2015)	Shellington (2017)	Picorelli (2014)
11. Were the participants referred from (recommended to exercise)?	n/a	n/a	n/a	n/a	n/a	n/a	n/a	no	✓	through GP database	n/a	n/a
12. Were participants' (perceived) benefits measured?	no	no	✓	no	no	✓	no	no	✓	✓	no	no
13. Fitness and independence Outcome in physical health improvements?	✓	✓	no	✓	✓	✓	no	✓	✓	✓	✓	✓
14. Mental health and wellbeing Outcome in cognitive function or emotional wellbeing improvements?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15. Is there evidence of the interventions empowering and energising effects? Positive outcome?	✓	✓	✓	no	✓	✓	no	no	✓	no	no	no
<b>Synthesis scores of intrapersonal factors</b>	8	5	8	4	4	10	4	4	9	6	4	5
<b>Interpersonal factors</b>												
1. Did they found improvement in social interactions?	✓	✓	no	no	no	no	✓	no	no	no	no	no
2. Special training on teaching style	✓	n/a	no	no	no	no	no	no	n/a	n/a	n/a	no
3. Professionalism of instructor (being qualified, physiotherapist or exercise professional, years of experience)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Synthesis scores of interpersonal factors</b>	3	2	1	1	1	1	2	1	1	1	1	1
<b>Organizational/Environmental factors</b>												
1. Class structure (reported wam-up & cool-down)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. Variety	no	no	no	no	no	no	no	no	no	no	no	no
3. Opportunities for socialising (sponsored by organizations)	✓	✓	no	✓	no	no	✓	✓	no	no	✓	no
4. Individual/adaptable content	✓	✓	✓	n/a	✓	✓	✓	✓	✓	✓	n/a	✓
5. Affordability	n/a	n/a	n/a	✓	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<b>Synthesis scores of organizational/environmental factors</b>	3	3	2	3	2	2	3	3	2	2	2	2
<b>Total scores (max 23)</b>	14	10	11	8	7	13	9	8	12	9	7	8
<b>Adherence rate (%)</b>	100%	94%	94%	79.60%	78.40%	75%	74.50%	68%	66%	61%	56%	53%

In terms of *social factors*, the group nature of the programmes implied that opportunities for participants to connect socially were available in all quantitative studies. On the other hand, only five of them evaluated aspects which facilitate social support, such as exercising with a spouse (Osuka et al., 2017), or in small groups or pairs (McCaffrey et al., 2017; Sales et al., 2017; Shellington et al., 2017), or stimulating participant interaction (Marcos-Pardo et al., 2018). Three of these studies found improvement in perceived social support (Marcos-Pardo et al., 2018; McCaffrey et al., 2017; Osuka et al., 2017) and two did not measure the impact of social factors. Qualified fitness instructors led all exercise programmes but only one study included special training on teaching style using the Self Determination Theory and found 100% attendance in resistance training (Marcos-Pardo et al., 2018).

*Affordability* was seldom addressed as a factor for adherence in quantitative studies. Sales and colleagues (2017) reported no attendance fee while Cheung and colleagues (2016) reported that travel costs were not covered. Three studies reported offering the intervention at accessible locations (Cheung et al., 2016; McCaffrey et al., 2017; Papadopoulos & Jager, 2016). Incentives or rewards (such as yoga equipment) were used in two studies to recruit and retain participants (Cheung et al., 2016; Salmoirago-Blotcher et al., 2017) and these two studies also reported a high adherence rate of 75% and above.

## **2.4 Discussion**

This state-of-the-art review synthesised the quantitative and qualitative findings of studies on group-based exercise programmes to update the review of Farrance and colleagues from 2016. The synthesis aimed to identify the factors which contributed to adherence, and how this relates to the improvement of emotional wellbeing and cognitive function in midlife and older adults who live independently in the community. The analysis of the twelve quantitative studies showed a 6% improvement of the mean adherence rate compared to the mean adherence rate reported previously (Farrance et al. 2016). This rate was also higher than the adherence reported in another review of group-based and individual exercise programmes (Picorelli et al., 2014). The number of qualitative and quantitative research studies has also doubled since 2014, which is likely to provide stronger evidence concerning the determinants of exercise adherence. Importantly, this study provides unique insights into the field of group-based exercise in three areas. First of all, the qualitative analysis extends the findings of previous reviews by identifying new key themes from the perspectives of older people which are important in

supporting their adherence to group-based exercise. Secondly, our synthesis demonstrates that group-based exercise interventions are not only effective in improving adherence but also effective in positively impacting emotional well-being, psychosocial health and there was some evidence that multi-component and resistance exercise programmes have a positive impact on cognitive function. Thirdly, the aligned synthesis of qualitative and quantitative studies showed that the individual factors of motivation, assessment of convenience and preferences of participants are worth investigating or taking into account in future quantitative studies.

Regarding the first area, the key themes relating to exercise adherence (individual factors of motivation, perceived benefits of exercise, exercise history and motivation, social support, programme design, affordability and convenience) were important factors described in the qualitative studies reviewed. Most of the facilitators of adherence were also supported by Farrance and colleagues (2016) and other qualitative evidence (Boulton et al., 2018; Killingback et al., 2017). By categorizing the themes into intrapersonal, interpersonal and environmental/organisational levels of the socio-economic model we could more effectively explore the exercise behaviour of older adults (Boulton et al., 2018) and highlight the most important levels when analysing the characteristics of an exercise intervention.

We identified that the majority of qualitative studies reported facilitators to exercise adherence in participants who already attended exercise programmes. However, the uptake of exercise and barriers to adherence in inactive populations were rarely considered. The only study which included participants who dropped out or who declined to join an exercise suggested that lack of motivation and competence to start exercising are strong barriers to joining exercise programmes (Biedenweg et al., 2014). Therefore, exploring the motivational factors involved in exercise uptake is essential to allow us to recommend strategies to motivate inactive older adults to participate in exercise.

Furthermore, we established that the *starting point* of the exercise was dependent on having a recommendation from a trusted person and individual motivators related to health and socialising. Literature suggests that there is an age-related shift in exercise motivation towards present-oriented emotionally meaningful goals from future-oriented goals (Steltenpohl et al., 2019). Younger adults tend to exercise to achieve personal goals or compete with themselves and prefer to exercise alone (Crust, Swan, Allen-Collison, Breckon, 2014). In contrast, older adults often rely on support from a significant person to exercise and appreciate having enjoyment and opportunities to socialize with others while exercising (Steltenpohl et al., 2019).

To them, the perception of being part of a marginal group and lack of opportunity to socialize with similar others were meaningful reasons for exercise dropout (Hartley & Yeowell, 2015). Understanding the influences of exercise uptake and adherence at multiple levels is crucial for designing effective health interventions. Overall exercise promotion should be tailored to older adults by focusing on the perceived benefits of socialising, enjoyment and improved physical health, and emotional wellbeing (Steltenpohl, 2018; Biedenweg, 2014). It appears that future studies targeting older individuals should investigate the reasons for amotivation and preferences of inactive individuals to develop effective strategies for behaviour change.

Regarding the second area, the positive effects of exercise participation on emotional wellbeing and psychosocial health were strongly supported by both qualitative and quantitative studies. In agreement with Farrance and colleagues (2016) our qualitative results also showed that the main perceived benefit of group-based exercise is the social interaction and the improvement of emotional wellbeing is also influenced by social aspects of the group. Therefore, future experimental studies should investigate further whether the physical or social aspects of the exercise programme have a stronger impact on emotional wellbeing and cognitive function.

Farrance and colleagues (2016) also found that the perceived benefits of exercise, such as social support, emotional wellbeing, physical health gain and the energizing and empowering effect of the programme, were the main determinants for adherence (Farrance et al., 2016). On the other hand, the quantitative studies we reviewed rarely measured the perceived benefits of exercise but instead used direct outcome measures of emotional wellbeing and social support. Adherence to yoga (McCaffrey et al., 2017), strength and balance exercise (Papadopoulos & Jager, 2016), multimodality outdoor training (Lacharité-Lemieux et al., 2015) and Tai chi (Salmoirago-Blotcher et al., 2017) at least twice a week significantly improved emotional wellbeing. In terms of social support, it was found to be associated with higher adherence in one of the quantitative studies (Osuka et al., 2017), which supported previous evidence (Farrance et al., 2016; Picorelli, Pereira, Pereira, Felício, & Sherrington, 2014; Steltenpohl, 2018; Biedenweg, 2014). Although the relationship between social interactions and improvement in emotional wellbeing was not measured in any of the quantitative studies, there was some indication that these factors were associated with each other (McCaffrey et al., 2017). Compared with individual strategies, social motivation strategies were found to be more effective for older adults (van Het Reve et al., 2014). As demonstrated in the quantitative synthesis, adherence to exercise was positively influenced by

improvement in self-efficacy (Cheung et al., 2016), and additional educational information about the exercises (Papadopoulos & Jager, 2016). The above evidence suggests that older adults are more likely to adhere to an exercise programme where they exercise with others because the social presence motivates the participants to join the training sessions. Furthermore, higher levels of competence also determine better adherence in older adults.

Our review extends the results of the previous synthesis (Farrance et al., 2016) as it found that adherence to group-based exercise also has a positive impact on cognitive function. The quantitative synthesis supported this finding by showing improvement in attention following resistance training and multimodality exercise programmes (Best et al., 2014; Shellington et al., 2017). This improvement existed both in control and experimental groups regardless of the number of weekly exercises (Best et al., 2014) or incorporating an additional mind-motor task (Shellington et al., 2017) and it was also related to adherence in 1-year follow up (Best et al., 2014). On the other hand, none of the qualitative studies reported that cognitive benefits were perceived by participants following exercise. The reason might be, that the scope of the questions in the qualitative studies did not focus on cognitive function. However, it is worth investigating this area further to improve understanding of the impact of exercise on other aspects of cognitive function, for instance on memory or executive function.

Regarding the third area, the synthesis of qualitative and quantitative studies showed that the intrapersonal factors of motivation and participants' preferences are worth investigating or taking into account in future quantitative studies. On the one hand, qualitative studies also found that certain interpersonal and organizational/environmental factors influenced adherence (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017; Mehra et al., 2016) but on the other hand none of the quantitative studies reported those factors. For instance, quantitative studies did not use participants' preferences in designing the details of an intervention or assess convenience (time, frequency, location). At the same time, the synthesis of qualitative and quantitative findings resulted in no relationship between adherence and characteristics of the programme such as its length, frequency and duration of the sessions, or type of exercise. As the synthesis matrix demonstrates, adherence may have been impacted by the individual behaviour and the methods used for motivation. It is also important to highlight that adherence was higher in those quantitative studies which reported improvements in emotional wellbeing and/or social interaction (Cheung et al., 2016; Kendrick et al., 2018a; Lacharité-Lemieux et al., 2015; Marcos-Pardo et al., 2018; McCaffrey et al., 2017; Osuka et al., 2017; Papadopoulos & Jager, 2016; Picorelli et al., 2014; Progovac et al., 2017; Sales et

al., 2017) although the relationship was not tested. Furthermore, studies with poorer attendance (< 60%) were lacking in the following: the individual behaviour of participants was not taken into account, self-efficacy was not measured or targeted, incentives/rewards were not used, perceived benefits were not measured, no evidence was found for energizing/empowering effect of exercise or improved social interactions. In contrast, most of these factors were found in the studies with an attendance rate of 90% or above, therefore they seemed to have the greatest impact on the differences in the attendance rates on the matrix.

To sum, this study confirmed that adherence is impacted by multiple factors that should be considered in designing effective exercise interventions for older adults. While the socio-ecological model is useful in designing comprehensive health-related interventions, individual factors remain critical in changing emotional responses, beliefs and attitudes towards exercise and motivation towards exercise. This study also confirmed that community-based group exercise programmes are effective in improving emotional wellbeing, cognitive and physical function in older adults so it is important to investigate strategies that might motivate older adults to engage in an exercise. Incorporating the perceptions and concerns of older participants in the design of future interventions may be a small step in increasing adherence in this population but it is a step forward.

In future, research trials and exercise programmes in the community practice should consider the following recommendations.

- 1) In terms of intrapersonal factors: record participants' motivators to gain insights into subsequent adherence;
- 2) In terms of interpersonal factors: record group homogeneity to gain insight into ethnicity-specific drop-out rates;
- 3) In terms of programme design the main factors to be considered are:
  - embedding social support facilitators within the intervention programme
  - training instructors in effective and supportive communication
  - giving incentives such as rewards (especially for 'new starters')
  - holding the sessions at accessible locations and at affordable prices.

#### *2.4.1 Relevance for the following chapters*

Chapter 2 showed that community-based exercise programmes have high adherence rates, however, there were two areas where only limited evidence was found. Firstly, the qualitative

and quantitative studies rarely report the factors that prevented drop-out or influenced exercise uptake in inactive older adults. In Chapter 3 and 4 we will investigate factors that could influence drop-out from the perspectives of active older adults and their exercise instructors, while in Chapter 6 we will aim to better understand the motivational factors that could impact exercise uptake in inactive older adults. Secondly, the positive effects of exercise on emotional well-being were strongly supported both by qualitative and quantitative studies, however only a limited amount of studies reported on the impact of exercise on cognitive function. Next, Chapter 3 will address the first area and explore the determinants of exercise uptake and dropout in several different types of community-based exercise programmes.



# CHAPTER THREE

## Determinants and perceived impact of community-based exercise programmes on adherence

### Abstract

Community-based group exercise programmes for older adults improve emotional wellbeing and maintain adherence in the short term (Farrance et al., 2016, Franco et al., 2015). However, little is known about the facilitators for exercise engagement or whether older adults and their instructors have similar views. Using a socio-ecological model of health behaviour (McLeroy, this study aimed to understand what factors influence uptake and long-term adherence to community group-based exercise in older adults. Participants were 52 older adults and six of their instructors (reported in the next Chapter) from group-based exercise programmes. The older adults took part in focus groups and the instructors took part in interviews. The questions focused on: barriers, facilitators and benefits of engagement in exercise. Thematic template analysis was conducted to identify the determinants of adherence concerning the levels of the socio-ecological model. The analysis indicated that intrapersonal factors, perceived benefits of exercise, relationships within the group and with the instructor, the sessions' location and set-up had a strong impact on exercise adherence in older adults. Participants reported that social interaction and a welcoming atmosphere are important from the first session. Participants appreciated instructors' individualised approach because it improved their skills and made them feel safe, but also because it gave them a sense of competence. Perhaps the most important factor for long-term adherence is the enjoyment felt by participants who attend. This enjoyment can derive from participants' perceived skill improvement, especially if they had a history of exercise and were driven to exercise. Enjoyment can also derive from socialising and building friendships among the group especially for those who were not driven to exercise. The results highlight the importance of the exercise programme meeting participants' basic psychological needs of competence, autonomy and relatedness (Ryan & Deci, 2000b). The recommendations derived from the findings are useful for instructors and exercise providers working with older adults.

### **3.1 Introduction**

The main focus of the latest healthcare and social care guidance was to identify efficient strategies to prevent loneliness (Age UK, 2019), physical inactivity (Sport England, 2021), and the increasing occurrence of depression and dementia in later life (NICE, 2018). Interventions such as psychological therapies, walking schemes, and referral to social activities are typically delivered to address the issues around mental, physical and social health. Crucially, group exercise interventions have the potential to affect these different key areas of concern simultaneously due to their positive impact on physical and mental health, wellbeing, quality of life, development of personal resources, social contacts and maintenance of independent living (Hamer et al., 2014; McPhee et al., 2016; Taylor et al., 2004). Group activities tend to have better outcomes than one-to-one interventions due to the added benefits of social support and emotional wellbeing on adherence (Farrance et al., 2016; Hayashi et al., 2018; Kanamori, Takamiya, & Inoue, 2015; Komatsu, Yagasaki, Saito, & Oguma, 2017; Chapter 2). An intervention study comparing the impact of individual and group-based fall prevention exercise, found that those who participated in a combination of home-based and group-based programmes had higher enjoyment, achievement, satisfaction and self-recognition scores than those who only participated in the home-based individual exercise programme (Hayashi et al., 2018). Furthermore, evidence suggests that group-based exercise has the potential to positively impact cognitive function not only because of the metabolic benefits of exercise per se, but also due to the social interactions involved (Brown et al., 2009; Mandolesi et al., 2018). Group exercise may also increase feelings of safety, sense of meaning, purpose and achievement, and positive feelings towards identity, as demonstrated in reviews of qualitative evidence (Chapter 2; Farrance et al., 2016; Mason & Holt, 2012). Therefore, participation in group-based exercise programmes not only promotes physical health but provides opportunities for socializing, which reduce isolation and loneliness in the community (Kanamori et al., 2015; Millard, 2017).

Adherence is essential to maintain the beneficial effects of exercise, and group-based exercise programmes have been shown to increase adherence after midlife. Adherence rates in group-based exercise have been reported around 69-75% (Chapter 2; Farrance et al., 2016; Franco et al., 2015). The main predictors of adherence are enjoyment and social interaction (Biedenweg et al., 2014; Garmendia, 2013; Helen Hawley-Hague et al., 2014; Mason & Holt, 2012; Parnell et al., 2015; Stanton et al., 2014). Also, older adults are motivated to adhere if

they perceive the programme as stimulating and if they feel improvements in their emotional wellbeing (Farrance et al., 2016; Killingback et al., 2017). Qualitative research has found that enjoyment, social interaction, cost, choice, and exercise options (Bennett et al., 2018; Killingback et al., 2017) were more important for adherence than the perceived physical health benefits of which seems incongruent with the fact that in older adults the perceived functional independence, self-care, and social involvement were identified as contributors to exercise motivation (Miller & Iris, 2002). Several studies explored the barriers to exercise uptake and adherence. For example, people often feel anxious about exercise uptake and/or remember participation as unpleasant (Bethancourt et al., 2014; Farrance et al., 2016).

The socio-ecological model of health behaviour has been successfully used to understand the dynamic interrelation between individuals and their context (McLeroy et al., 1988). It organises the factors influencing health behaviour into five different levels: intrapersonal, interpersonal, organisational/environmental, and policy (McLeroy et al., 1988). Sallis and colleagues (2008) argue that behaviour change towards a physically active lifestyle is maximized when policies and environments support exercise choices, when social support is strong, and when individuals are educated and motivated to make those choices. The socio-ecological model has been used to analyse data from focus groups and interviews involving older adults regarding their physical activity (Boulton et al., 2018). This analysis identified themes about each of the levels but most of them belonged to the levels closer to the individual. At the personal level, the motivational process of individuals regarding exercise is often explained by the self-determination theory (Ryan & Deci, 2000b). According to its basic assumptions, individuals seek those situations in which their three primary psychosocial needs are satisfied: the need for autonomy, the need for relatedness and the need for competence. The theory also explains the mechanisms through which the social environment can facilitate the internalization of behaviour. By fulfilling the basic psychosocial needs, the individual will show more intrinsic motivation for the activity (i.e., doing something for the pleasure derived from the activity) and less extrinsic motivation (i.e., enacting the behaviour to gain something separable from the activity) (Oliver et al., 2016; Ryan & Deci, 2000a). For example, one study showed that older adults adhered to a fall-prevention exercise programme (Otago Exercise programme) more readily when they felt that their three basic needs were met (Stødle et al., 2019). However, it is unclear how contextual factors at the other levels of the ecological model impact these intrapersonal motivations. Understanding their interdependencies is important

because interventions for long-term adherence should be designed to support the development of individual motivation by considering the contextual constraints and opportunities.

In sum, there is evidence for the effectiveness of group-based exercise in maintaining adherence in the short-term (Picorelli et al., 2014) and for emotional wellbeing (including social interaction and enjoyment) being the main factor for exercise adherence (Chapter 2; Farrance et al., 2016). However, little is known about the factors for exercise uptake or for the prevention of long-term drop-out which remains a challenge (Best et al., 2014; Iliffe et al., 2015). Given the cognitive declines which are known to occur with older age, the perceived cognitive benefits of exercise might be an important factor for long-term adherence but no studies so far have investigated that topic. Therefore, this study aimed to understand what factors facilitate or limit uptake and long-term adherence to group-based exercise in older adults. To achieve its aim this qualitative study explored the influences of adherence at multiple levels of the socio-ecological model and investigated the perceived benefits of different types of group-based exercise on cognitive function, emotional wellbeing and physical function.

## **3.2 Methods**

### *3.2.1 The epistemological underpinning*

A contextualist approach aided the data collection process. This approach accepts that behavioural patterns are socially produced and depend on countless different factors, relations and activities. Older adults' realities, which refer to their behaviours and perceptions about exercise, are also affected on multiple levels (Boulton, Horne, & Todd, 2018; Sallis, Owen, & Fisher, 2008). Through social constructions such as language, consciousness and shared meaning, which the focus group technique exploits, some of this reality can be effectively accessed. Focus groups were used to discursively construct, represent, and illustrate the social and interpersonal aspects of the groups. The environment of focus groups facilitates quick and rich exploration of a range of views, therefore it supports the exploration of older adults' facilitators and barriers to community-based exercise programmes and encourages them to identify and clarify their ideas for service improvement. Due to synergy and spontaneity, which is created by group dynamics, participants build on the answers of others, through their comments and explanation, and they can generate new ideas (Hennink, 2007; Krueger & Casey, 2014). Previous research suggests that three to six focus groups are sufficient for an extensive identification of themes in qualitative studies (Guest et al., 2017). The analysis and

interpretation of the findings from the focus groups were influenced by the subtle realism approach (Madill et al., 2000). This approach recognises that research is never independent of the perspective of the researcher(s) involved. It advocates the existence of a reality outside the researcher, which is knowable to the researcher, and accepts that the reality cannot be fully understood (realist ontology). This approach is considered valuable to applied qualitative research (Murphy et al., 2017). At the same time, the socio-ecological model was used as a guide during data analysis to ensure an appropriate level of depth and breadth in understanding older adults' perception of their own and their peers' exercise behaviour.

### *3.2.2 Participants*

The 52 participants who took part in the study were on average 66.9 years old (SD = 5.36, range 60 - 82) and 60% of them were females. They had experience with attending one or more of the 8 group-based exercise classes organised by the same provider (Silverfit Charity). Most participants were still attending classes at the time of data collection: Cheerleading (n = 10), Bollywood (n = 6), Pilates (n = 5), Tai chi (n = 6), Nordic walking (n = 11), Indoor cycling (n = 2), Walking football (n = 5) and group-based Gym session (n = 3), and 3 additional participants had dropped out from Cheerleading classes. Participants had different levels of adherence to these exercise groups and some took part in several exercise groups. Participants were either of white (76%) or of Arab, Black (24%) ethnic background. All participants fluently spoke and understood English and all resided in urban areas of London. Data on socioeconomic class and national origin was not collected. All participants were retired and most reported during the focus groups that they were on low pensions. All participants reported at the point of recruitment that they did not have cognitive impairment and did not have a current health problem, preventing them from exercising. The study protocol was approved by the Ethics Committee of the School of Applied Sciences at London South Bank University (SAS1809). Permission was sought and granted from the providers of all the exercise groups involved before recruitment started.

### *3.2.3 Study design*

Eight focus groups were conducted to explore the perceptions and experiences of participants regarding exercise uptake and adherence. Each of the six focus groups included 3-10 participants from the same exercise class; one focus group was attended by participants from

the Pilates and the Nordic walking classes, and another – from the Indoor cycling and the Walking football classes. Focus groups were all mix-gender except for Bollywood and the non-exercisers which were all-female. A focus group discussion guide was developed using the outcome of the literature review (Chapter 2) and best-practice guidelines, and a pilot study was conducted with separate Nordic walking exercisers to refine the focus group guide. To aid engagement, promote group cohesiveness and encourage participation, warm-up questions were included (Morgan et al., 2012). The focus group discussion guide included questions about experiences, attitudes, beliefs and barriers to exercise, the perceived effects of the exercise, and areas for improvement. Participants were instructed to respond mostly from their point of view on themselves. The only exception was when participants were asked to respond by referring to their inactive peers. The interview guide is presented in Appendix 3.1.

#### *3.2.4 Procedure*

An e-mail with information about the study and the goal of the focus group was sent to several exercise instructors from the same provider asking permission to visit and recruit participants. During the visit, the study was verbally explained to class attendees and flyers with additional information were given. The exercise provider also included the study flyer in the weekly email and newsletters sent to participants. To recruit participants who had dropped out of group-based exercise, the flyers were also placed in community centres and libraries. Despite these efforts, we only recruited 3 participants who had dropped out of group-based exercise. The recruitment started in January 2019 and all focus groups were conducted between February 2019 and May 2019. The focus groups were run at the location of the exercise sessions or at the university and took 60-90 min to complete.

#### *3.2.5 Data analysis*

Template analysis was used to thematically analyse the data (King, 1998). Data were analysed from a subtle realist perspective, thereby enabling a deductive approach to coding using the levels of the socio-ecological model of health behaviour for categorising the themes. When analysing the first focus group data, an initial coding template was developed incorporating themes in line with the research questions and themes identified in previous literature. Adapting King's (2004) guidelines, coding was undertaken hierarchically, using the meaningful themes to encompass successively narrower and more specific second and third-level codes. The

coding template was revised throughout the analysis. The final template was then used to recode all the transcripts and this served as an organising framework for the interpretation of results. Two researchers were involved in data analysis by transcribing, coding and discussing the template and themes together. This provided useful points of critical reflection. To help organise the coding, computer-assisted qualitative analysis software (MAXQDA) was used as it facilitates the various iterations of the coding process.

### **3.3 Results**

In most groups, responses were quick and the majority of participants engaged in detailed discussion. As the open-ended questions focused on the determinants of adherence from the participants' point of view and on how the exercise setting might influence adherence, responses also tended to focus on intrapersonal factors, perceived benefits or barriers to exercise, relationships within the group and with the instructor, the location and the set-up of the sessions. The themes which emerged were organised into the five dimensions of the socio-ecological model. The themes and sub-themes are presented in Table 3.1 below. The themes that contributed to each level are described below where more in-depth information is included as to how these themes impacted the older adults' exercise behaviour.

#### **Intrapersonal level**

##### **Preferences in leisure activities past and present**

*Exercise history* was identified as a factor, which often influenced current preferences and exercise habits. Although participants had negative memories of Physical Education (P.E.) lessons, being a member of a sports club in the past was something of which they were proud. Most of the participants did a range of sports in their childhood and youth, such as cycling, tennis, aerobics, hiking and cricket. Interestingly, most participants in the dance-based classes had done dancing as children and the Walking football participants also indicated their previous enthusiasm towards football:

*And we are all obsessed by football in all our lives starting from kids. We are just pleased to playing it. (Walking football participant at Crystal palace, Man, 60 years)*

Participants remembered how physical activity had been incorporated into day-to-day life at an age where there were few buses, no television, and no internet. Being active during leisure time was important for the majority of participants who regularly attended several different sessions per week. For example, a woman participant proudly reported that she does “Tai chi on Fridays, yoga on Wednesdays and walking group on Tuesdays”. On the same note, giving up regular exercise during adulthood was justified with work and family commitments but participants also said that restarting it after retirement was an important part of their leisure time, along with gardening, cultural outings, singing or meeting friends. Caring for a family member or friend was highlighted by some participants as a barrier that could break their regular attendance to the weekly exercise sessions but also as a drive to exercise:

*My leisure time is a bit limited because I am the main carer for my mother which is quite stressful. So I needed to get out of the house and need to socialise more.  
(Bollywood participant in Whitton, Woman, 63 years)*

This theme showed some similarity with a part of the *Attitudes to exercise* sub-theme identified in Chapter 2 because participants reported that their past experiences in relation to sport and exercise throughout their lifespan have an impact on their perception, motivation and the importance they assign to exercise.

### **Starting point**

*Having a drive* for exercise was agreed to be a crucial factor for joining an exercise. They reported that the initial reasons for joining the exercise group after they had retired were the need to get out and to meet new people or to maintain their health as they get older. For instance, they wanted to manage their long-term conditions, to keep fit and strong to maintain independence, to improve their balance and physical function, or to lose weight. As a recently retired participant who had arthritis explained:

*Keep me active I think, keep active so I can still do things. If I wouldn't do the exercise I would just be sitting all day at home and watch television. So **to get the 'old limbs going'** so you don't end up pushing a Zimmer frame along or anything like that. (Nordic walking participant in Burgess Park, Male, 65 years)*

Some participants reported that they already “felt the need to do more physical activity and were looking for” opportunities in the area. One of the participant who now also volunteer to help with the registration and welcoming of new participant said:



*I felt that during the winter I wasn't getting enough exercise, because you know gardening and the allotment stops and so that's why I was looking for it. (Bollywood participants in Whitton, Woman, 70 years)*

*Having support* was found to help participants attend for the first time. Some participants indicated that they were recommended by a friend or started the exercise together with their friends or partners, such as one of a Black African woman participant who joined Silverfit over 3 years ago:

*Yes, I was walking at the park and they were (Silverfit) just there and I said, as soon as I retire I will join this, and... because I didn't want to go there by myself I was talking to my friend, she came and we went for the first time. (Nordic walking participant in Burgess Park, Woman, 67 years)*

'Giving it a try' was often highlighted as a crucial step to getting started. While some participants found it comfortable and enjoyable to "give it a go and just jump in", they often discussed that for some of their peers it was an effort to step out of their comfort zone and that a friend might help with that. While men often started the exercise by just 'giving it a try', women often found important to have a friend to go with.

*P1: I think some people are also just afraid to go to a large group, to an established group, to come to them on their own.*

*P2: You need a friend to go with if there is a large group. (Nordic walking participants in Burgess Park, P1 - Man, 68 years, P2 – Woman, 71 years)*

Having a drive as a starting point for taking up exercise mirrors the sub-themes of individual motivators (Chapter 2, Killingback et al., 2017) and drive to improve physical health (Stødle et al., 2019). In relation to social support, *having support* from a friend was more dominant as a starting point than having encouragement from a medical professional in Chapter 2, however 'giving it a try' does not have similarity to any of the starting points of Chapter 2.

## **Roadblocks**

*Changing circumstances*, like a different schedule during school holidays, moving to another area, or health problems were discussed as potential barriers to attendance as these things

change participants' exercise routine. By losing the routine, participants found it challenging to return and some participants also felt embarrassed and concerned after missing a couple of sessions. For example, two keen Nordic walkers with several years of experience (and one of them (P2) has been also trained as a walk leader) discussed:

*P1: You get such a mindset of it when you are doing a course and you think "oh I missed that session, I was absent, I should have been there in that group to support them", and you get that feeling "I am embarrassed I missed it", but actually it doesn't matter because no one would say anything.*

*P2 added: Yes, it is quite an important thing, what goes through in a lot of people's minds. They are worried about what other people will ask or say. (Nordic walking participants in Burgess Park both Man, P1 – 69 years, P2 – 70 years)*

*Lacking interest* in a programme was another barrier to participation that was mentioned. Participants spoke of disliking an exercise they tried, or dropping out because they missed the social bond with other participants of the group, or "getting bored" with group-based gym sessions.

*The difficulty in getting out of their comfort zone* was found to be an important obstacle to joining an exercise group. Participants believed that their inactive peers might be unable "to get out of their shells", or find the level of the sessions too intense, or be afraid of joining when they are unfit, or have health problems that stop them from doing exercise. For example, one participant who joined the group recently with her friend stated:

*And I think one of the reasons why we don't get many more people is because they might think that we are going to be all "snooty" and they might feel "awkward" because we all know the way how to do it and they don't. Or we are all going to charge off for hundreds of miles and they will be struggling behind, which is obviously not the case. (Nordic walking participant in Burgess Park, Woman, 66 year)*

Or in another example in a Walking football group where participants seemed to closely bond to each other:

*P3: I think they might be afraid of making a fool of themselves. They might not be fit and think that everybody around them will be fit and look silly.*

*P4 laughing in reply: Just send them along to us and they would never leave again.  
(Walking football participants, Crystal Palace, both Man, P3 – 70 years, P4 – 68 years)*

Most of the previously *roadblocks* identified in Chapter 2 appeared again in our sample, such as the physical, psychological limitations, life circumstances and lack of motivation sub-themes.

### **Mindsets, thought processes and strategies**

*Overcoming negative thoughts* was not considered easy but participants mentioned their strategy for maintaining regular attendance even if the weather was not appropriate for going out or if they had concerns about going to the session. They often remind themselves about the benefits of attending the sessions:

*You know when you get up in the morning and you feel “oh I am not sure I can do this if I have the energy to go to Bollywood today”. But then you say, “yeah I will because I will feel better”. And once the music starts you just start jiggling about and you do feel better. (Bollywood participant in Whitton, Woman, 76 years)*

*Being able to adapt* to situations in which something would stop participants from being physically active was also found to be effective. For example, some participants reported that they “plan the day and organize” their day while others changed the type of exercise programme or their exercise routine if they did not like the programme or if their circumstances changes. For instance, those participants who dropped out of the Cheerleading classes reported that they started to use a mobile application and did walking sessions together with their friends to maintain the right level of physical activity:

*You are not restricted and if you miss it for a day you can find ways to replace it and get back on track. So, for example, today the weather is nice and yesterday I haven't done my target so I can do more today. So I just stopped the car and walked to the office. (Participant who dropped out of Cheerleading exercise and regularly does walking with friends, Woman, 65 years)*

*Looking forward to the exercise sessions or having positive thoughts about it were reported by the majority of the participants and some of them said that “it becomes a need” or they are already coming to the session “happy and go away even happier”.*

### **Benefits of participation**

*“Gave me something back” after retirement was often stated regarding participants’ social life or fitness level. Typical remarks that illustrate the perceived benefits of the sessions were: “mind, body, stamina, friends, the whole thing is a positive in your life and it energizes us.”; “gives me back something I thought I finished with”. Moreover, they acknowledge the importance of these benefits in maintaining their independence while becoming older: “it is a better way of living, more happy”.*

Some participants reported that it gives them a structure to their day and week that they found to be an important thing in their retirement, or the exercise gives them a “kick start to the day”. Especially for those participants who do volunteering for their exercise organization, the exercise programmes also provided a sense of personal development, as one of the Silverfit Ambassador mentioned:

*I feel much more engaged with the whole organization once I had responsibilities to it and I gave some support. And I actually feel proud about volunteering. (Nordic walking participant at Crystal Palace, Woman, 73 years)*

*Perceived health and wellbeing benefits were highlighted in the three areas of physical, cognitive and emotional wellbeing. First of all, participants recognised the positive impact of exercise on their physical function and health regarding their flexibility, balance, stamina, coordination, strength and posture. They also reported that they “have the blood pressure of a teenager”, “recover better” if they are ill, are “more aware of their body” and “feel more energized and alive” in general. In sum, the exercise improves their health condition, such as a participant with arthritis explained*

*I am getting older and I am fitter than I ever was. It [exercise] does what I want. I have got knee problems and it is one of the best ways to... my knees are miles way better than they were when I started, I don't want to grow old, I want to be able to walk fast, climb... It helps me breathe through my nose, it works, it's great. (Indoor cycling participant at Elephant and Castle, Man, 74 years)*

The majority of participants agreed that different exercises have a different effect on their health. Most of the Tai chi participants stated that “it works differently on the body, muscles, a lot of stretching and balancing, which Nordic walking doesn’t, or Cheerleading doesn’t.” Participants also discussed the beneficial effect of Pilates on the posture, and interestingly, one of them described her perception that “...after Pilates I feel taller. Yes, I definitely feel more upright.” The improvement of stamina and lower body strength was specified as the main benefit of the session, while regular Nordic walkers agreed that it works on the upper body and lower body at the same time” and they felt that they “walk faster to the bus and catch it easier”. Finally, Cheerleading and Bollywood participants pointed out that coordination as the “big advantage” of the classes.

Second, the perceived benefits of exercise on cognitive function were mostly related to memory, concentration, and reaction time. Participants often realized the impact of aerobic exercise and after the session, they feel “alert” and their “mind works very quickly, clean-headed, sharp”, “get the brain wired”. While the majority of participants in the danced-based exercise classes described the challenge “to use their brain to remember the steps” as “while you are moving you have to think”, Tai chi participants often reported how meditative the sessions are, such as:

*I feel uplifted with the Tai chi, it is very relaxing and grounding. Grounding means it brings you down to earth. I feel much more relaxed, centred, and calmer. You just feel more relaxed with yourself. (Tai chi participant in Whitton, Woman, 73 years)*

Interestingly a few participants also noted that exercise influenced their memory not only has an immediate effect but more generally:

*Increase memory power. Simply, I used to forget names and nowadays I seem to get them out of the brain box....and when I do crosswords I can pick the words up faster as well. (Walking football participant at Crystal Palace, Man, 70 years)*

Third, the impact of exercise on emotional wellbeing was highlighted by most of the participants. They described a sense of accomplishment after the classes, such as “you think good about yourself, you have done that” and improved confidence when “setting targets” and see “I am getting better, feeling better for it”.

Feeling de-stressed after the sessions were acknowledged especially by those participants who had a caring role in their family. It seems to be impacted by the social interaction that the classes offer, for example a participant who recently joined:

*Dementia is not only taking a large piece out of the life of my wife, it takes out of my life as well as I always got to be there. Twice a week I come to the session and it is like a breath of fresh air. Someone sits with my wife, I come and I have the chance to mix with a range of people and I feel it changes my whole attitude to my week. (Walking football participant at Crystal Palace, Man, 68 years)*

All participants reported feeling happy after the exercise sessions, not only because of the physical training but also because of the social atmosphere. This has a crucial impact on their motivation, as stated by one of the participants:

*It helps to start again, I had so much fun in this group. You know it does lift you! Each time I come I go away very happy. And the social content is just great, really. (Nordic walking participant at Crystal Palace, Woman, 71 years)*

The enjoyment and energizing effect of the sessions are likely to be the first and most important factor for both newcomers and regular exercise participants. As one participant who attend Indoor cycling and Walking football on alternating weeks said:

*We have so much fun in that class, there are a few characters in there who are keeping the chatter going on all the time, sometimes you can't sit because you are laughing so much.....It is uplifting because you know you are going there, you meet people and laugh. I think it gives you something to look forward to. (Indoor cycling participant at Elephant and Castle, Man, 70 years)*

This theme captured similar benefits to physical and mental health as found in Chapter 2. Furthermore, the benefits of the social interactions and relatedness as well as the energizing effect of the exercises were dominant in each exercise group and repeated the findings of Chapter 2.

## **Interpersonal level**

### **Sense of community**

*Welcoming* was pointed out during most of the focus groups as an important aid provided by the regular participants to the newcomers. The friendliness and “encouragement” from others made new participants overcome the initial “worries of going somewhere new” and to “feel part of the group” from the beginning. As stated by one of the experienced Nordic walkers:

*You can be the most unfit person and we still welcome you with open arms and nurture you until you feel the benefit of [organisation]. (Nordic walking participant at Crystal Palace, Woman, 74 years)*

Social support and a non-judgemental atmosphere made people feel comfortable, safe and competent, even if they were not at an advanced fitness level, as described by a participant who had recently joined Tai chi:

*I don't feel any pressure or being looked at if I am doing a movement wrong. Really, I just need to build my confidence up about my movements and I will be doing them correctly. But I don't feel I am letting anybody down or anybody is looking at me. I am just very happy I am there, just taking my time to learn the movements. (Tai chi participant in Whitton, Woman, 70 years)*

Similar others in the groups created an atmosphere that some participants reported being a valuable part of the group sessions. One participant who joined Silverfit over 4 years ago and recently started to volunteer as an Ambassador also recalled some opposite experiences related to an exercise he gave up:

*Here we are at a similar age as well. When you go to a gym you probably are the oldest person and you've got all the younger or middle-aged businessmen... I gave up the gym because when I started to do some exercises I had some person standing with an annoyed face thinking "It's my turn now!" (Indoor cycling participant at Elephant and Castle, Man, 69 years)*

Benefits of the social aspect were powerful factors that seemed to facilitate adherence. The opportunity for developing their social network by making a new friend was a meaningful aspect of the exercise programme. One participant who used to work in a large organization in central London explained:

*When you retire your social structure changes. So for example when you work you have your friends at work and when you retire this gives you an opportunity to again have friends in a completely new environment, which is part of the process really. (Walking football participant at Crystal Palace, Man, 68 years)*

They also reported relatedness to each other and a kind of social identity that the group provides, as a volunteer walk leader participant said:

*It's because you come along to the group and you feel part of it. And you feel everyone is supporting you and you need to do your best to support them. And that's when you get this kind of loyalty or bond between people. (Nordic walking participant in Burges Park, Man, 72 years)*

The above sub-themes are closely aligned with the content included in *the social factors of the exercise group* theme in Chapter 2. The social support facilitated a sense of belonging as found in previous research (Hartley & Yeowell, 2015; Killingback et al., 2017) and the opportunity to relate to others (Bennett et al., 2018). Similar others in the group was found to be an important facilitator of adherence similarly to previous studies (Hartley & Yeowell, 2015; Parnell et al., 2015). Alike in previous findings, the social atmosphere provides powerful benefits to older adults that makes theme adhere long term (Stødle et al., 2019; Robert et al., 2017; Hartley & Yeowell, 2015; Mehra et al., 2016; Parnell et al., 2015). In all focus groups, welcoming was found to be an important facilitator to adherence and interestingly it was not captured as a sub-theme in other studies in Chapter 2.

### **The instructor's approach**

*The relationship to the instructor* appeared to be an important aspect of most participants' perception of the social context in group-based exercises. Participants not only felt safe when they were under the supervision of a qualified instructor but they also reported attachment to their instructor. They stated their preference to have the same instructor who they could trust:

*I think there is a relationship, whereas changing [the instructor] every week you will lose that... I think we would lose that and people would not come the same. (Cheerleading participant at Elephant and Castle, Woman, 75 years)*

On the other hand, some participants seem to place less importance on the impact of the instructor. Both the gym-group participants and those who dropped out of the Cheerleading class stated that they like to set the intensity and targets for themselves, "pushing themselves" or changing the exercise routine as they wish.

*Encouragement and supporting enjoyment* were important characteristics of the instructor according to all of the participants. Participants emphasized that they value instructors being



confident, non-judgmental, patient and encouraging. They agreed on how the instructor's approach could facilitate enjoyment during the sessions by not taking it too seriously, making the exercise fun and making the participants laugh and smile. For example, one participant who attends both Cheerleading and Nordic walking sessions weekly summarized:

*And there is also a huge amount of enthusiasm from someone like [instructor's name] and the Cheerleading instructors are really kind and amazing with the amount of energy, enthusiasm and encouragement. So for example, we usually go all sorts of directions with our steps and arms but she always makes us feel that we are doing an amazingly fantastic job and it does help a lot. If you don't feel that you have been criticized but you had been praised it makes you want to go back. (Nordic walking participant at Burgess Park, Man, 70 years)*

*Setting the right level* relating to the intensity and complexity of the movements was the most important characteristic of the instructor's teaching method. The participants pointed out that they like that the instructor gets to know the group's ability and accommodates everyone. For example, the instructor can give alternatives to the movement for participants who are more and less advanced. Participants appreciated that during the class there was "no pressure" and "no compulsion" but they were guided to an achievable pace by the instructor. They disliked the intensity being too fast when they felt "rushed" or if they "don't have a chance to breathe." They also explained the importance of a careful, methodological approach to teaching:

*She speaks in a very simple one-step-at-a-time way. She says one thing in one week and another one in the other week. So after my first session, I knew already a bit about it and then the next time a bit more. It gradually improved my confidence. Because it does take a bit of confidence to learn. And once you learnt and you know the technique you enjoy it. (Nordic walking participant at Burgess Park, Woman, 69 years)*

*Teaching style* was found to be a characteristic of the instructor which sometimes did not match with participants' preferences. For example, a few participants complained about the communication style of the instructor. Some participants found it interesting when instructors tell stories and talk about research findings, while others prefer to focus solely on the movements.

*I find that it is a part of the class to listen to him. I am not getting irritated by him, I know some others are. When you are trying to learn and concentrate it could annoy you. So in two levels I am concentrating but also listening, I pick what I want to hear. (Tai chi participant in Whitton, Woman, 72 year)*

Some of the dance-based participants found the repetition of music and routine becoming “boring” after a certain period, while others would need more time to learn the routine. They also explained that they prefer a structured way of teaching and a well-prepared instructor more than a random, improvising teaching style. These statements were more suggestions than real complaints and for most participants, kindness, patience and encouragement were the most important characteristic of the instructor.

The instructor’s approach theme mirrored our findings in Chapter 2 and the above sub-themes emphasized the most important elements of the instructor’s behaviour and teaching techniques that can make their *personality* and *professionalism* be perceived appealing by the participants.

### **Organizational and environmental level**

The third level of the ecological framework included characteristics of the organization and the environment of the exercise programmes, such as the setting, surrounding, location, and time which we found could be empowering characteristics of the exercise.

### **Supportive surrounding**

*Induction* of new participants was marked by the friendliness of the staff at the reception and the ambassadors’ introduction which made them feel at ease and comfortable in the group when they joined for the first time. The ambassadors at the organisation were regular long-term participants who volunteered to take the registration before the sessions and to organize the tea and coffee for the social gathering afterwards. Additionally, correct and visible signs could also help reduce the initial anxiety. Interestingly, some participants mentioned that awareness about the emergency procedure (such as fire escape routes or first aid) also helped them to feel safe. Safety was discussed concerning the qualified instructor as participants appreciated to “have someone in the front who doesn’t push them” but shows them “how to warm up and cool down properly”, “keeps the correct pace”, and corrects their movements to avoid injuries.

*Features of the sessions* such as exercise type, setting, supervised teaching and structure were important factors, which promoted the interactions within the group and with the instructor. Most of the participants highly appreciated the social gathering after the exercises as good opportunity for “a cup of tea and a chat together”, to “share recipes”, to “make friends in our neighbourhood” or to “organize trips together sometimes”. Some of the participants also found the mixed-gender sessions “nice and more fun”. Some specific features of the various exercise types were also mentioned. For example, nordic walkers often reported that “there was something about exercising outdoors”, which was relaxing and beneficial for their health. Some of them also highlighted how the walking sticks helped them to “improve my knees as the poles take the weight off my leg and improve my posture at the same.” One of experienced participants gave an example of why she found the Nordic walking session enjoyable:

*We were just listening to the birds, looking at the blossoms, it was so nice. Some people think they would get bored of walking in the same park. But actually no, because it is so different as the season change. These parks are so beautiful. (Nordic walking participant in Burgess Park, Woman, 70 years)*

Tai chi participants explained that by paying careful attention to the breathing and the flow of their movement they felt that the classes were “meditative and relaxing” for them. At the same time, others discussed how their brain and coordination were challenged while they were learning the different movements:

*When I started I found it was a lot, and stressful to learn the different forms. But now as I know what I am doing I have this feeling of going into another dimension, it is like, everything disappears, puts things in perspective. (Tai chi participant in Whitton, Woman, 71 years)*

Walking football participants described how much they enjoyed playing and also “thinking about the tactic we use”. They also agreed that having the “right team together” with a similar level of players was important for a good game. Danced-based exercises were found to be “uplifting” and “good for wellness” due to a combination of the tune and the movements of the body. Participants reported that learning the different steps and the choreography was challenging but rewarding at the same time, although a participant who gave up Cheerleading because of lack of enjoyment and time had a different opinion:

*I had to understand that exercising to music is not for me. I am a purist, I like music and I like to exercise but not exercise with music, but it didn't put me off exercise.*

*(Participants who dropped out of Cheerleading and regularly do a walking session with a friend, Woman, 64 years)*

Indoor cycling participants pointed out that the use of the specialized bicycle and the speed measure was useful for them to monitor their performance and to see “little by little it is creeping up...from where I started”. On the other hand, they discussed that this class was more attractive to people who like “gadgets” and “machinery” than to others who might feel “intimidated” and “scared” by modern equipment.

*Affordability and convenience* were mentioned as significant determinants of adherence, “because if the session is expensive people won’t go” and increasing the session price “put people off”. Participants reported that for their session “the fee was very low” which appealed to them as they could do several classes per week without “paying a fortune”. Convenience related to the location and the time of the class. Most participants shared that they did exercises in their local area while some long-term members also visited other places further from their residence. Especially for them, an easy way of transportation on buses or trains was important. On the other hand, preferences regarding the time of the session were diverse, as they said:

*P1: I think that is one of the problems we get with the afternoon sessions if the weather is not really nice, but grey and windy...we don't want to get out. But I think it is also nice to have it in the afternoon as well because most of the programmes offered locally are in the morning. So it is quite nice to have an afternoon class.*

*P2: Interesting, I would say the opposite. I prefer to do it in the morning. But it is all about preference, isn't it? (Tai chi participant in Whitton, P1 – Man, 74 years, P2 – Woman, 72 years)*

Participants also reported that bad weather, winter months or darkness might “put them off” from attending the sessions and they preferred places that were not too crowded.

The elements of supporting surrounding that was captured here repeated the important elements of the sessions in Chapter 2 that can facilitate an enjoyable, relaxed, safe and interactive atmosphere and help newcomers come back and adhere to the programmes.

## **Advertisement**

*Using a wide range of methods* and resources to advertise the activities was suggested to engage inactive older adults. From the methods already used, such as flyers, social media, website,

taster sessions and word of mouth, the latter two were suggested to be the most effective for this population. Many participants had heard about the sessions from their friends before they joined and they believed that personal recommendation might be the most powerful tool to increase interest. At the same time, some of the participants suggested that “the taster sessions are really good, so people can have a go” and “it would encourage them”. One group discussed how the number of members increased after their short Bollywood performance in a community event. Some participants suggested advertisement could be improved by including more details about the sessions on the flyers and website. For example, for Nordic walking, the information should include that there are different levels from moderate to vigorous. Participants also thought that advertisements should emphasise that the programmes are about “fun, fitness, friendship!”. For new ways of promotion, one participant suggested a “community challenge” for engaging inactive people:

*So for example, health is a big theme here in Southwark and so, to get older people to join this Health Challenge [so] that everyone is getting fit and healthy so they want to be part of this group. (Participants who dropped out of Cheerleading and regularly does walking sessions with a friend, Woman, 62 years)*

*Liaising with GPs*, practise nurses and patient participation groups were discussed in all of the focus groups. Only a few participants reported that their doctor had recommended physical activity to improve their health and physical function or to manage their conditions. Participants believed that GPs should inform their older patients about the details of different exercise programmes and how to join them. For example, two experienced participants and a Silverfit Ampassador discussed:

*P1: It would be important for GPs to know about it. Like social prescribing, because for people who would benefit, GPs should know more about it and what is available locally.*

*P2: Yes, because it is all very well said that people just need to go and do some more exercise and they just think, that oh they would just do it, just go to the gym. And people often go to the gym and then don't enjoy it. Whereas if they know something about [the organization] and came along to our sessions they would like it because of the social side.*

*P3: Yes we tried that but they didn't let us put the leaflets out. They are picky about what they accept, if it is not approved by NHS they don't put it out. (Nordic walking participants in Burgess Park, P1 – Woman, 67 years, P2 – Man 69 years, P3 – Woman, 71 years)*

The methods of advertisement were the same as reported by Biedenweg and colleagues (2014) in Chapter 2, and liaising with GPs was also suggested as a potential method that could motivate inactive older adults to join exercise programmes.

## **Policy level**

### **Funding**

The guide for the focus group discussion did not intend to conduct the exploration at this level, however, some discussion arose in relation to finances. Funding for the organisation was mentioned as important because it impacts the sustainability and price of the sessions. Participants expressed their frustration about the limited funding offered by the local government. They believed that low prices would encourage older adults in poor areas of London to be active and engage in their community. Some participants were demotivated when membership price increased or “some tutors left because there were no funds for them, or some classes finished” as the budget of the project ran out. As discussed earlier the majority of participants were retired with low pensions. Their decisions about how to spend their limited income were important and any financial change seemed to impact their attitude towards the programme and the organization.

## **3.4 Discussion**

This qualitative study investigated the experiences and perceptions of older adults about group-based exercise programmes. The results provided insight into factors that influence older adults' uptake and adherence to exercise programmes at the different levels of the ecological model. Next, we explore the findings at the intrapersonal, interpersonal, environmental/organisational and policy levels in more detail and in relation to previous research. The themes and sub-themes are presented in Table 3.1 below. The recommendations derived from the findings of this study might be useful for instructors and exercise providers working with older adults. These recommendations are presented in Table 3.1.

## **Intrapersonal level**

At the intrapersonal level, the attitude of older adults towards exercise was mainly explained by the individual's previous and existing choices of leisure activities. These have been reported as important motivators to engage in group-based exercise (Boulton et al., 2018; Killingback et al., 2017). Most likely, this is because the routine of choosing active and/or social leisure activities has already been established as part of their identity. Our findings are in line with the theory of self-determination, whereby the affective, cognitive and behavioural responses to exercise, which emerged from participants' comments, are lined up in a continuum from 1) amotivation to 2) extrinsic and 3) intrinsic motivation (see Chapter 1; Ryan & Deci, 2000a).

First, according to our participants, their inactive peers lacked the motivation to engage in exercise and they find nothing attractive or important about exercise. Therefore, participants believed it is challenging to motivate them. Others may want to do exercise but feel unable or incompetent to take it up because of health problems or because they feel uncomfortable with unfamiliar situations.

Second, the motivation of some participants in this study was related to extrinsic factors, such as meeting with friends, losing weight, or having recommendations from a trusted person. These extrinsically motivated individuals reported that changing circumstances can limit their attendance and that losing their routine may make them feel anxious about re-joining. This is a novel finding as previous literature identified life circumstances themselves as barriers together with attitudes, low perceived competence and poor health (Biedenweg et al., 2014; Robinson et al., 2014b). On the other hand, we also found that adherence was aided by the thought processes and by strategies adopted by participants, especially under negative circumstances. These are important findings since motives and barriers to exercise have been extensively explored in previous qualitative research (Killingback et al., 2017), but the thought processes of older adults have rarely been explored.

Third, intrinsically motivated participants reported a drive towards exercise, and feelings of enjoyment, pleasure and personal development. Plus, they wanted to experiment with new types of exercise, were conscious of its benefits, and experienced a state of flow when exercising. Flow is an optimal human experience of being fully engaged in an intrinsically motivating task (Nakamura & Csikszentmihalyi, 2009). In older adults, experiences of flow were found to be positively associated with activities, which were in some ways cognitively

stimulating (Lee & Payne, 2016) and were also found to improve subjective wellbeing (Heo et al., 2010). Combined, these results allow for recommendations to be drawn specifically for older adults with different types of motivation (see Table 3.1).

Perceiving the benefits of exercise was crucial for continued adherence. The majority of participants reported that by attending the exercise programme they regained their social network, a more-structured daily routine and improved their energy level. These perceived benefits contributed to satisfying the basic psychological needs of relatedness, competence and autonomy (Stødle et al., 2019; Ryan & Deci, 2000b). In line with previous findings, the friendly social atmosphere and the social bonds between group members supported the feeling of relatedness (Biedenweg et al., 2014; Hartley & Yeowell, 2015). Some of our participants described that getting out of their homes and socialising were the most important reasons to participate and the benefits of the social aspect contributed to their long-term adherence. Furthermore, several health benefits of exercise were stated relating to their physical fitness, cognitive function and emotional wellbeing, for instance, enjoyment, improved physical skills, balance, coordination, and personal accomplishment, which were considered as factors that positively influence autonomy and competence (Mehra et al., 2016). Combined, these findings indicate that group-based classes in the community are an appropriate format to satisfy the need for relatedness, autonomy and competence as strong motivational drives to take up and continue exercising and therefore improve vitality and wellbeing in older adults.



**Table 3.1** Recommendations for practice derived from the themes and sub-themes of the focus groups

Levels	Themes and sub-themes	Recommendations
<b>Intrapersonal</b>	<ul style="list-style-type: none"> <li>1. Preferences in leisure activities past and present (autonomy)</li> <li>1.1 Exercise history</li> <li>1.2 Being active at leisure time</li> <li>2. Starting point</li> <li>2.1 Having a drive for exercise (autonomy)</li> <li>2.2 Need for support (relatedness)</li> <li>2.3 ‘Giving it a try’ (competence)</li> <li>3. Roadblocks (or Limits or obstacles)</li> <li>3.1 Changing circumstances (autonomy)</li> <li>3.2 Lacking interest (autonomy)</li> <li>3.3 Difficulty in getting out of comfort zone (competence)</li> <li>4. Mindsets - Thought processes and strategies</li> <li>4.1 Overcoming negative thoughts</li> <li>4.2 Being able to adapt</li> <li>4.3 Looking forward to it (autonomy)</li> <li>5. Benefits of participation</li> <li>5.1 “Gave me something back” (relatedness and competence)</li> <li>5.2 Perceived health and well-being (autonomy)</li> </ul>	<p>Advice for active lifestyle and exercise should be emphasized often during a consultation with health professionals and if possible, opportunities for group-based exercise should be recommended (2.2, 10)</p> <p>To tailor exercise to older individuals, the following should be taken into consideration: individuals’ exercise experience (1.1); attitude towards exercise at present and intention to exercise uptake (2.1); specific needs (2.2, 3); perceived challenges (3); limitations in physical function (3.3); and skills to overcome those challenges (4)</p> <p>The programme should have a system for participants to report life circumstances affecting their attendance such that the instructor can follow up with non-attendees and facilitate their re-joining (3.1)</p> <p>In inactive older adults who have no history of organized social or active leisure activities: first, introduce them to social activities and later to group-based exercise activities to ensure a level of comfort in the transition from inactivity to group exercise (3.3). Those who consider joining a programme could be linked with a volunteer long-term participant as a “buddy” who could personally recommend the exercise and introduce them to the exercise group (2.2)</p> <p>Help participants establish goals related to health and physical function that they value (5), and provide regular feedback on their development and performance (7.2) this will build self-esteem and contribute to establishing consciously valued goals and facilitate more internalized and integrated motivation.</p>

<p style="text-align: center;"><b>Interpersonal</b></p>	<p>6. Sense of community (relatedness)</p> <p>6.1 Welcoming</p> <p>6.2 Social support</p> <p>6.3 Similar others</p> <p>6.4 Benefits of the social aspect</p> <p>7. The instructor's approach (<i>competence</i>)</p> <p>7.1 Encouragement and supporting enjoyment</p> <p>7.2 Setting the right level</p> <p>7.3 Teaching style</p>	<p>Carefully design the exercise setting and session to provide a positive welcome (6.1), social support (6.2) and regular reassurance (7.1)</p> <p>Purposefully build a sense of community, for instance by having group t-shirt, badges or group challenges (6.3)</p> <p>For instructors to communicate in an encouraging and non-judgmental style (7.3)</p> <p>For instructors to tailor exercises to individuals (7.2) and support autonomy, competence and relatedness. For example, by offering exercise choices or by allowing participants to set the right level of intensity for themselves (7.2 autonomy), by using an encouraging teaching style (7.1 competence), and by offering opportunities for social interactions during exercise (7.3 relatedness)</p>
<p style="text-align: center;"><b>Environmental Organizational</b></p>	<p>8. Supportive surrounding (all needs)</p> <p>8.1 Orientation</p> <p>8.2 Elements of the session</p> <p>9. Affordability and convenience</p> <p>10. Advertisement</p>	<p>To create a relaxed setting for the classes where participants can feel welcome, safe, oriented and relaxed so that they enjoy the early experience of exercise (8)</p> <p>To design the sessions to allow for interactions within the group and with the instructor and build a sense of community (6.4, 8.2)</p> <p>To promote uptake by offering various group-based exercise classes in multiple locations at affordable prices and sustain the offer over prolonged periods (9)</p> <p>To use an effective advertisement, such as word-by mouth, and recommendation from GP or a trusted person (10)</p>
<p style="text-align: center;"><b>Policy</b></p>	<p>11. Funding</p>	<p>To provide more and longer-lasting funding from the government for organizations and programs targeting older adults (11)</p>

## **Interpersonal level**

At the interpersonal level, the current results point to the perceived benefits of a sense of community and the benefits of supervised exercise. The majority of participants reported that the social aspect of the exercise was the most enjoyable feature which encouraged their long-term commitment. These results support the previous finding from a mixed-method study, which examined the outcome of a nationwide programme including various group-based exercises in the UK (Parnell et al., 2015). Welcoming, social support, enjoyment in exercising with others and social connectedness were all documented as powerful determinants for adherence in various group-based exercise contexts (Boulton et al., 2018; Devereux-Fitzgerald, Powell, Dewhurst, & French, 2016; Hartley & Yeowell, 2015; Komatsu et al., 2017; Roberts et al., 2017). Our participants agreed that feeling welcomed by a designated person and by the group, combined with an enjoyment of social interactions, made their first attendance positive and encouraged newcomers to continue participating. As confirmed by previous qualitative findings the feeling of relatedness to others within the group could shape the attitude of older adults towards group-based versus home-based exercises (Mehra et al., 2016). In addition, we established that for longer-term participants the sense of community can be further enhanced by providing opportunities to volunteer in different tasks within the organisation and act as ambassadors. This is an important opportunity to increase the commitment to the group, but it has been rarely mentioned in the literature.

The participants in our study valued the instructor's approach in relation to their teaching style and methods. Participants felt comfortable when the instructors' communication was encouraging and kind, and appreciated their "one-step-at-a-time" instructions, which helped develop their skills, and created a fun and enjoyable atmosphere. Previous research reported that instructors' professionalism, personality, and humanised approach were important determinants of adherence (Killingback et al., 2017). By being patient, positive and encouraging, the instructors can increase participants' self-efficacy and create an enjoyable atmosphere, which facilitates adherence (Roberts et al., 2017; Robinson et al., 2014b). A recent randomized control trial reported that after completing a 12-week resistance training with instructors who were trained in self-determination-theory-led teaching style, participants' feelings of autonomy, relatedness and competence towards exercise increased more than for those participants who were trained by regular instructors (Marcos-Pardo et al., 2018). Therefore, at the interpersonal level, social interactions between participants and encouragement from the instructor may facilitate the relatedness and competence of the participants when they exercise, which improve their motivation for exercise. Table 3.1

provides practical recommendations for improving the participants' sense of community as well as the instructor's approach in order to improve adherence to group-based exercise.

### **Environmental and organisational level**

At the environmental and organizational level, methods of advertisement, exercise choices, the affordability of the classes, the convenience of the venues, and most importantly the supportive environment were identified as essential determinants facilitating adherence and supporting participants to reap the benefits of exercise. In this study, one organisation called the Silverfit Charity, provided the exercise classes at different locations across London. Participants had opportunities to volunteer for this charity and therefore they have some insight into the challenges of the organization regarding service development, promotion of services and funding. They suggested that having exercise organisations liaise with GPs and establishing links with health organisations could be a promising way to engage inactive participants. This method of health promotion has also been suggested elsewhere (Farrance et al., 2016), however some volunteer participants in our study reported their failed attempts at gaining permission to place flyers at GP surgeries. Furthermore, word-by-mouth was considered to be one of the most effective ways of exercise promotion. Older adults might feel more encouraged when they receive recommendations from one of their peers and for new joiners, it might reduce the initial anxiety if they already know someone in the class. Social support received from a trusted person is a well-documented motivator for starting group-based exercise in older adults (Biedenweg et al., 2014; Stødle et al., 2019). Therefore, this way of advertisement could be considered as social support for exercise uptake and new methods should be explored to utilise it as a way of engaging inactive older adults (as suggested in Table 3.1). At the same time, having a variety of exercises on offer might facilitate autonomy and it was also reported as an important motivator for older adults who joined community-based exercise groups (Biedenweg et al., 2014). Many participants in our study tried several exercise types before finding a class they enjoyed, which fitted their preferences and physical needs. In this connection, affordability and convenience were also identified as key themes. The reason might be that the majority of participants were retired with small pensions and mobility problems, which are well-documented barriers in older adults. Previous studies have also shown that low cost, accessible locations and schedule flexibility were actual enablers for group exercise (Biedenweg et al., 2014; Hartley & Yeowell, 2015; Killingback et al., 2017). Finally, our results illustrate how the features of the programme can reduce feelings of vulnerability when first joining an exercise group. Although vulnerability and low self-efficacy were often reported barriers in previous

qualitative studies (Hartley & Yeowell, 2015; Robinson et al., 2014b), strategies to reduce these barriers are rarely put forward. Our findings showed that social gatherings in an allocated area at the start and end of the sessions helped participants to feel welcomed, relaxed and connected. The sense of community supports or satisfies the need for relatedness (Marcos-Pardo et al., 2018) and in fact, for most of the participants in this study, it was the most important motivating factor of exercise adherence.

### **Policy level**

The participants highlighted a need for more and longer-lasting funding from the government for organisations and programmes targeting older adults. A common drawback of community-based programmes is the continuous search for external funders, which often other providers within commercial leisure sector do not need to face. A longer-lasting funding would allow the exercise provider(s) to improve uptake by advertising the programmes better offering various group-based exercise classes in multiple locations at affordable prices and sustaining their offer over prolonged periods. This research had some practical implications and helped the provider understand the factors that improve adherence and uptake, as well as the benefits to wellbeing in order to show the value of the exercise programmes and to help secure further funding.

#### *3.4.1 Conclusion*

It is crucial to find effective methods to prevent physical and mental health decline and social isolation in older adults (Royal College of Psychiatrists, 2018). This study addressed the applied health research topic of exercise behaviour to understand which factors influence older adults in their engagement to community-based exercise programmes. To achieve our aim, the experiences and perceptions of exercise participants were investigated. Previous research supports the effectiveness of the socio-ecological model (van Stralen et al., 2009) and self-determination theory (Mehra et al., 2016; Silva, Marques & Teixeira, 2014; Teixeira et al., 2012) so both were used for the in-depth exploration of factors influencing the motivation of older adults towards exercise at different ecological levels. The findings showed that participants perceive multiple benefits from group-based exercise which were related to their emotional wellbeing, social inclusion, cognitive function and physical fitness. Our results also highlighted the importance of the exercise programme meeting participants' basic psychological needs and providing the basis for the practical recommendations. Considering the challenges of the ageing process, community-based exercise programmes have the potential

to offer effective methods for the health prevention of older adults living independently in an urban setting. Effective methods should be investigated to assess the individual needs and preferences of inactive older adults to design new strategies, which could increase their motivation to uptake exercise. As our participants identified, there is a need for more and longer-lasting funding to allow the exercise providers to develop, advertise and offer various group-based exercise classes in multiple locations at affordable prices to make the programmes appealing to both previously active and inactive older adults.

#### *3.4.2 Relevance for the following chapter*

This chapter mapped out several factors that influence exercise adherence in community-based exercise on the levels of the socio-ecological model. It is worth exploring whether the instructors have similar views about what are the most important factors that could improve uptake and prevent drop-out. Furthermore, the instructor's approach and teaching style were found to be important, therefore understanding the methods instructors use to motivate older adults could be triangulated with the finding of Chapter 3 to further improve the practical recommendations. In Chapter 4, we conducted a qualitative study to investigate the teaching methods of instructors and their perception about factors limiting and facilitating adherence to group-based exercise in older adults.

**Appendix 3.1** Focus group discussion guide A (90 mins)| Exercise participants

Focus	Questions	Materials	Time
<p>Introductions and warm up</p>	<p><i>Moderator to introduce themselves, LSBU and subject matter</i></p> <ul style="list-style-type: none"> <li>• <i>Explain ground rules (no phones, listen to each other, its ok to agree or disagree, might ask specific people, might ask more talkative participants to give others a chance)</i></li> <li>• <i>Introduce any observers</i></li> <li>• <i>Reassure participants of confidentiality</i></li> <li>• <i>Secure permission to record</i></li> </ul> <p>I'd like to begin by asking each of you to introduce yourself. Please share:</p> <ul style="list-style-type: none"> <li>• Your first name</li> <li>• A little bit about you: why/how did you come to exercise today/what your thoughts were</li> <li>• What is your favorite exercise and how long have you being doing that?</li> <li>• Why is that exercise is your favourite?</li> <li>• What do you expect from an exercise class?</li> </ul>	<p>Recording devices</p>	<p>10</p>
<p>Exercise history</p>	<p>Group discussion</p> <p><i>When did you join to the current programme?</i></p> <p><i>Why did you join for the first time?</i></p> <p><i>What did help you to join?</i></p> <p><i>What else do you do? Other hobbies?</i></p> <p><i>Why did you choose this particular type?</i></p>	<p>Recording devices</p>	<p>10</p>
<p>Perceived effect of exercise and reason for exercising</p>	<p>Task 1</p> <p><i>Moderator to hand out worksheets. Worksheets to ask participants to write first 3 words or phrases that come into their head when they think of the reason why they exercise / 3 words about the effect of the exercise on their day/life. Moderator to ask participants to complete worksheets. Participants to share their answers with the room</i></p> <ul style="list-style-type: none"> <li>• What three words did you put down? <ul style="list-style-type: none"> <li>○ Why?</li> </ul> </li> </ul>	<p>three words worksheets</p>	<p>15</p>

Current activity and its impact on quality of life, emotional health, cognitive health	Group discussion <i>Do you think different exercises have different effects?</i> <i>On physical health?</i> <i>On mood/how do you feel in general?</i> <i>On cognitive health?</i>	Recording devices	15
Characteristics of programme	Task 2 <i>We would like to know more about factors that might make you to come back every week or helps you to start again if you miss any session.</i> <i>Please write down the followings:</i> <i>Over the last month how often do you miss a session What does help you to come back?</i> <i>What are the most important characteristics/factors of the programme for you?</i> <i>If you speak about it or suggest the programme to someone what do you say?</i>	Paper Recording devices	10
Areas for improvement Factors to help inactive people to get started	Task 3 <i>We would like to identify things what we can improve about the sessions and make it easier for non-exercisers to join.</i> <i>1. Please list 3 things what we can improve about the programme to make it more convenient and enjoyable for you.</i> <i>2. Please list 3 things what we can improve about the programme to make it easier to join for someone who has never done it before and inactive.</i>	Papers, flip chart	15
Promotion of activity	Group discussion <i>How could we promote the session?</i> <i>What we can do to increase attendance?</i> <i>Circumstances and situations that make the participant feel safe and competent to exercise?</i> <i>How we can help people to adhere to the programme more?</i>	Recording devices	10
Final group task	Task 4 <i>Moderator to ask participants to say 1 sentence how they would promote their exercise class. Write together a summary similar to an advert to promote the activity with those sentences.</i>	Flip Chart	5



Appendix 3.2 Ethical approval (Chapter 3 and 4 are two phases of the same research)

**London South Bank  
University**

Direct line: 0207 815 5422  
E-mail: dawkinl3@lsbu.ac.uk  
Ref: SAS1809

Tuesday 13<sup>th</sup> March 2018

Dear Zsofia,

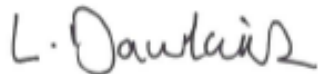
**RE: Talk, move, have fun and repeat / Engage, exercise, enjoy and repeat,  
Determinants and impact of community-based exercise programmes on  
adherence**

Thank you for submitting your amendments.

I am pleased to inform you that full Chair's Approval has been given by Dr.  
Lynne Dawkins, on behalf of the School of Applied Sciences.

I wish you every success with your research.

Yours sincerely,



Dr. Lynne Dawkins  
Chair, Research Ethics Coordinator  
School of Applied Sciences

## Appendix 3.3 Participant Information sheet



### Information Sheet

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#### **Engage, exercise, enjoy and repeat:**

Determinants and impact of community-based exercise programmes on adherence

You are invited to participate in an investigation which has been approved by the London South Bank University (LSBU) Research Ethics Committee. Before formally agreeing to participate, please read the following information, making sure you fully understand what the study involves. If you have any questions regarding the investigation please feel free to ask, and we will do our best to explain and provide any further information you may require.

**The aim of this study** is to understand what makes it easy or difficult for older adults to participate in different types of exercise programmes available in the community. This study will evaluate several types of local exercise programmes by focusing on the participants' experiences and views related to the impact of the programme on health and mood, on the likes/dislikes of programme characteristics, and enjoyment during exercise.

#### **Why have I been invited to participate?**

You are invited to participate because you have joined to an exercise programmes in London Borough of Lambeth or Southwark for at least 1 week ago and you're aged over 50. We would like to know more about how this programme effect your health and wellbeing. Your views and experiences about the programme will help us to improve the current services and it might help to engage inactive people to get involved in exercise.

#### **What will happen if I take part and what are the possible benefits of taking part?**

This study involves taking part in a group discussion or interview and you will be also asked to fill in a short questionnaire. The group discussion will involve no more than 8 participants at one time, and will last between 60 and 90 minutes. It will take place at the location of the exercise program before or after one of your exercise session. In case it is not possible, you will be invited to come to the London Southbank University where a meeting room will be arranged. In case you prefer to participate in an interview instead of the group discussion, the researcher will contact you to conduct a telephone interview. The benefits to you of participating include an improved knowledge of your own reasons to participate in physical activities.

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

Participation in this research study is voluntary. If you choose to participate you will be given this information sheet to keep and be asked to sign a consent form. You are free to withdraw from the study at any time during data collection without giving a reason and without any consequences. You can withdraw from the study up to 1 week after participating in the focus group by contacting the Researcher on telephone/email, however only your filled questionnaires can be removed from the data analysis. Your verbal comments during the Focus group/Interview are not possible to be identified and removed.

### What are the possible risks of taking part?

This study has been reviewed by the London South Bank Research Ethics Committee to ensure that potential risks are limited. You are free to leave discussions at any time and are advised to seek help from physical activity providers or GP's in the case of any discomfort.

### Will the data collected in this study be kept confidential?

Your confidentiality will be protected at all times. All information will be securely stored in a locked cabinet and the anonymous data will be stored in a password protected computer accessible only by the research team.

### What should I do if I want to take part?

If you wish to participate you will be asked to sign and return a consent form and then take part in the group discussion/interview.

### What will happen to the results of the research study?

The study will provide understanding of how characteristics of the programme influence participant's motivation to adhere. The study will also highlight areas for improvement in the current exercise programmes and services. The results will inform practitioners who evaluate or recommend physical activity for older adults about the available programmes and about how they can motivate people to start an exercise. All information gathered will be anonymised, and the group's views will then be used in publications including reports and scientific articles and will be disseminated to key public, scientific and professional stakeholders via presentations and leaflets.

### Who is organising the research and who has reviewed the study?

This research is conducted by the University's Sport and Exercise Science Research Group in partnership with several physical activity organisations in the London Borough of Southwark and Lambeth. The research has been approved by the University Research Ethics Committee of London South Bank University.

### Contact for Further Information

If you have any questions regarding this project, please contact the physical activity provider, or the research team. If you have any concerns about the way in which the study has been conducted, please contact the Ethics Committee of London South Bank University.

<b>Research team:</b> Dr Rita de Oliveira Email: <a href="mailto:r.oliveira@lsbu.ac.uk">r.oliveira@lsbu.ac.uk</a> Phone: 020 7815 7959 Dr Lisa Zaidell Email: <a href="mailto:zaidell2@lsbu.ac.uk">zaidell2@lsbu.ac.uk</a>	Dr Katya Mileva Email: <a href="mailto:milevakn@lsbu.ac.uk">milevakn@lsbu.ac.uk</a> Miss Zsofia Szekeres Email: <a href="mailto:szekerez@lsbu.ac.uk">szekerez@lsbu.ac.uk</a>	<b>University Research Ethics Committee:</b> Email: <a href="mailto:ethics@lsbu.ac.uk">ethics@lsbu.ac.uk</a>
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**Thank you very much for taking the time to read this information sheet!**

## Appendix 3.4 Informed Consent form



### Consent Form

Ethics approval registration Number: SAS1809

**Engage, exercise, enjoy and repeat:**

Determinants and impact of community-based exercise programmes on adherence

Taking part (please tick the box that applies)	Yes	No
I confirm that I have read and understand the information sheet and the project brief and/or the investigator has explained the above study. I have had the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw as it has been explained on the Information sheet.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>	<input type="checkbox"/>

Use of my information (please tick the box that applies)	Yes	No
I understand my personal details such as phone number and address will not be revealed to people outside the project.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my data/words may be quoted in publications, reports, posters, web pages, and other research outputs.	<input type="checkbox"/>	<input type="checkbox"/>
I would like my real name to be used in the above.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data I provide to be stored (after it has been anonymised) in a specialist data centre and I understand it may be used for future research.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data to be audio-recorded, stored anonymised and be transcribed to use for research purposes.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications.	<input type="checkbox"/>	<input type="checkbox"/>
I confirm that I have completed the screening form and questionnaire.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of my contact details by the researcher in order to invite me to participate in other research project in the future.	<input type="checkbox"/>	<input type="checkbox"/>

Taking part in the study is voluntary and you are free to withdraw at any time without any penalty, without providing a reason. If you experience any emotional or physical discomfort/harm from taking part in the study please seek medical advice from your GP and we advise you to inform the researcher or her supervisor.

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Researcher	Date	Signature

Project contact details for further information: Zsafia Szekeres Email address: [szekerez@lsbu.ac.uk](mailto:szekerez@lsbu.ac.uk)

# CHAPTER FOUR

## Keeping older adults engaged in group exercise: the perspective of instructors

### Abstract

Community-based group exercise programmes improve emotional wellbeing and maintain adherence in older adults at six months. However, little is known about the interpersonal factors for exercise engagement in the longer term or whether older adults and their instructors have similar views. This study aimed to contribute to the findings in Chapter 3 by understanding the instructor's perceptions on factors that influence uptake and long-term adherence to group-based exercise. Participants were six instructors in community-based group exercise programmes that were included in Chapter 3. The instructors took part in interviews where the questions focused on: the barriers, facilitators and benefits of engagement in exercise in older adults and the teaching methods used to facilitate adherence. Template analysis was used following an inductive approach to coding. The instructors thought that an exercise setting that promotes social interaction and a welcoming atmosphere is important from the first session. This can be achieved for example by including a built-in social gathering before and after the session. The instructors thought that participant enjoyment might be the most important factor for long-term adherence. They used a non-judgemental, person-centred and supportive teaching approach to foster individual motivations. The study revealed that instructors have an accurate view of what motivates older adults to engage with exercise (as per Chapter 3). For community-based programmes, a compassionate teaching style and well-designed exercise programme which attend to both socialising and skill development have the potential to sustain the long-term engagement of older adults in exercise.

## 4.1 Introduction

Community-based exercise programmes are often relied upon to target various populations and reduce their risk of physical inactivity. Delivering effective exercise programmes that keep older adults engaged in physical activity is a challenge that exercise instructors face every day. Group-based exercise programmes were found to make a positive change in physical health, emotional wellbeing and adherence in older adults (Chapter 2 and 3; Farrance et al. 2016; Franco et al. 2015). Although community-based group exercise programmes have high adherence rates in the short term (within 6 months) (Franco et al., 2015; Killingback et al., 2017), they also have high drop-out rates in the long term (Jancey et al., 2009; Robison & Rogers, 1994; van der Bij et al., 2002). One reason might be that the initial uptake of exercise may be driven by extrinsic motivational factors (e.g., losing weight, completing a challenge) and as a result, participants struggle to sustain engagement in the long term (Quested et al. 2018; Teixeira et al. 2012). This raises the question of how older adults can be supported to continue adhering to regular exercise in the long term which is necessary to support their health.

Several studies, which focused on the perspective of older adult exercise participants, found that the social context of exercise, including the role of the instructor, is crucial for enjoyment in exercise and for improving adherence (Harvey & Griffin 2020; Franco et al. 2015; Farrance et al. 2016; Mehra et al. 2016; Stødle et al. 2019; Chapter 2 and 3). Older adults considered that the communication, experience and teaching style of instructors were important characteristics of the instructor (Harvey & Griffin 2020; Bea et al. 2017; Franco et al. 2015; Marcos-Pardo et al. 2018; Hawley-Hague et al. 2014; Chapter 2 and 3). In another study, experience, sensitivity and consciousness of the instructor as well as a teaching style that facilitates group cohesion, were positively associated with adherence while other characteristics of the instructor, such as extraversion, being agreeable, and coming across as too intelligent, were associated with poor adherence (Hawley-Hague et al. 2014). Furthermore, a pleasant and supportive atmosphere, which can be facilitated by the instructor, was found to be an important determinant of sustained exercise participation (Quested et al. 2018; Marcos-Pardo et al. 2018; Teixeira et al. 2012). In studies that have used the Self-Determination Theory to explore motivation in older adults, adherence was found to be significantly impacted by the instructor's teaching style (Robinson et al. 2014a; Teixeira et al. 2012; Silva, Marques, & Teixeira 2014; Chapter 2). Exercise settings that support choice, sense of competence, and connectedness with the instructor and between group members, were effective in improving physical activity level, motivation and emotional wellbeing in older adults (Marcos-Pardo et al. 2018; Mehra et al. 2016). Instructors, with their teaching approach, have the potential to develop a motivational

environment in the context of exercise and to support the development of intrinsic motivation in older adults (Vallerand & Lalande 2011; Marcos-Pardo et al. 2018; Silva, Marques & Teixeira 2014). One of the few studies exploring the instructor perspective (Hawley-Hague et al., 2016) demonstrated that they believe they can influence adherence and older adults' attitudes towards engaging in the exercise programmes. Instructors found that uptake and adherence were strongly influenced by external barriers and positive social influences, for example, social support from health professionals, family members and from within the group (Hawley-Hague et al., 2016). The type of class the instructors taught influenced the barriers they perceived in engaging older adults as well as the teaching methods they applied (Hawley-Hague et al., 2016).

There is little current knowledge of how instructors intend to influence the effectiveness of exercise when they deliver exercise programmes for older adults (Harvey & Griffin, 2020). Instructors may have particular cognitive and affective resources that enable them to act and interact in a certain way in the context of group-based exercise to facilitate the engagement of older adults. Knowing more about the perspectives of exercise instructors is important because they have a direct influence on engagement in group-based exercise programmes. In particular, little is known about the influence they have on the social context of exercise programmes or how they foster enjoyment and motivation in older adults. Harvey and Griffin's (2020) scoping review suggests that more research is needed into the communication style and teaching methods that instructors use to foster an inclusive and motivating atmosphere for older adults. Understanding more about instructors may help identify effective strategies for developing the motivational climate of exercise programmes to meet the needs and priorities of older adults thereby improving long-term adherence.

Therefore, this study explores the instructors' perspectives on how they tailor their teaching methods to influence the exercise adherence of older adults. It takes into consideration various types of community-based exercise classes, which are different from the frequently researched fall prevention or clinical rehabilitation exercise programmes. Community-based programmes often do not have a pre-written protocol for delivery and the organizational structure where they are delivered also differs from those in clinical or public health organizations. Given the success of teaching strategies based on the Self-Determination Theory (Vallerand & Lalande 2011; Marcos-Pardo et al. 2018; Silva, Marques & Teixeira 2014), the present study also explores whether and how instructors intend to influence basic psychological needs in the context of their programmes. While in the previous chapter we explored the perspectives of older adults, this study aimed to understand, from the instructors' perspectives,

which aspects of group-based exercise motivates older adults to adhere, and what methods instructors use to foster the motivation of their older adult exercise participants. The research questions are:

1. What is the perception of instructors on the determinants of adherence to group-based exercise programmes in older adults?
2. How do the instructors perceive their teaching methods influence the engagement of older adults in various types of group-based exercise programmes?

## **4.2 Methods**

### *4.2.1 The epistemological underpinning*

The methodology and interpretation of the findings were influenced by the critical realist approach (Bhaskar, 1978) to understand the social factors and systems influencing exercise adherence in older adults. This approach was used as we accept that exercise programmes are implemented in a dynamically changing social world where programme effectiveness may be hindered or facilitated through unanticipated influences of the contexts and other complex mechanisms (Clark et al., 2007). It is important to explore the components and the social context of health interventions and exercise programmes to better understand which components are most effective to improve engagement or how they influence health outcomes (Clark et al., 2007; McGannon et al., 2014). This approach encouraged us to explore the perspectives of instructors across different settings on how they think their actions influence outcomes. This qualitative study focuses on the instructors and explores one part of the social system in which the exercise programmes were embedded; specifically, how they were delivered. We aim to understand what works to improve adherence with consideration of other contextual factors that form instructors' lived experiences of working with older adults. Data collection and analysis was undertaken through the lens of the lead researcher who has a background in exercise psychology and believes in the value of physical activity in older adults. The lead researcher also has experience as an exercise advisor and instructor for adults.

### *4.2.2 Participants*

Participants were 6 instructors of the group-based exercise programmes, from which older adults were recruited for the study presented in Chapter 3, therefore this was a purposive sample. They were all women, aged 46.5 (SD = 14.6). They had 7.3 years (SD = 6.2) of experience as instructors and taught one or more group-based exercise classes weekly (Table 4.1). The exercise programmes were organized by the same provider, which is the main



organization dedicated to providing community-based exercise programmes to older adults in urban areas of London. This provider applies an uncommon “sandwich” formula of socialising/exercise/socialising for older people to increase activity levels and help people make new friends, feel more confident and enjoy life as they age. Two instructors led sessions on Nordic walking, and the others led sessions on either Cheerleading, Pilates, Tai chi or Indoor cycling. All participants were qualified in an accredited programme of the type of exercise they taught but had different amounts of experience working with older adults. Participants’ ethnic backgrounds were Black African (n = 1), Chinese (n = 1), White British (n= 2) and White European (n = 2). All participants spoke and understood English fluently and all resided in London. All participants worked as self-employed exercise instructors full-time or part-time and one had a second job. Permission was sought and granted from the provider of all the exercise groups involved before recruitment started. An e-mail with information about the study was sent to eighteen exercise instructors and six agreed to participate. The study was approved by the Ethics Committee of the School of Applied Sciences at London South Bank University (SAS1809).

**Table 4.1** Instructors’ prior experience and professional background

<b>Type of exercise (years of experience, current profession)</b>	<b>Prior experience and summary of career path as described by the instructors themselves during the interview</b>
<i>Cheerleading (5 yrs, qualified dancer)</i>	<ul style="list-style-type: none"> <li>• experience in ballet and contemporary dance</li> <li>• taking up professional Cheerleading and teaching exercise as a career</li> <li>• completed instructor training to teach older adults</li> <li>• main focus: stretching and core exercise both in her training and when teaching older adults</li> </ul>
<i>Indoor cycling (15 yrs, personal trainer and group exercise instructor)</i>	<ul style="list-style-type: none"> <li>• experience of competing in weight lifting</li> <li>• taking up exercise profession in mid-adulthood from having exercise as a hobby</li> <li>• working as an exercise instructor both in younger and older adults</li> <li>• the current exercise is running</li> <li>• main focus: monitoring progress in her training and enjoyment both in her training and when teaching older adults</li> </ul>
<i>Nordic walking (12 yrs, Nordic walking instructor)</i>	<ul style="list-style-type: none"> <li>• disliking exercise at school and younger age</li> <li>• finding enjoyment and pleasure in kayaking in her 30’s and becoming a sea kayak instructor</li> <li>• choosing Nordic walking as a complementary sport and completing instructor training</li> </ul>

	<ul style="list-style-type: none"> <li>• teaching Nordic walking to older adults and people with Parkinson’s disease for over 10 yrs</li> <li>• main focus: outdoor sports and when teaches older adults: group management, providing attention to all participants</li> </ul>
<i>Nordic walking (2 yrs, retired)</i>	<ul style="list-style-type: none"> <li>• taking up Nordic walking as a hobby after the age of 60</li> <li>• completing Nordic walking instructor training at the age of 68</li> <li>• favourite sport is Indoor cycling</li> <li>• main focus: trying to meet the diverse needs of participants and to progress their skills</li> </ul>
<i>Pilates (6 yrs, Pilates instructor)</i>	<ul style="list-style-type: none"> <li>• athletic background and some coaching experience in running and cycling (as a hobby)</li> <li>• changing career from finance to become an instructor after completing relevant training in Pilates</li> <li>• teaching Pilates to individuals and groups of different ages for over six years.</li> <li>• main focus: improving quality of life of older adults by progressing physical function and placing importance on the social element of exercise</li> </ul>
<i>Tai chi (6 yrs, Translator)</i>	<ul style="list-style-type: none"> <li>• learning Tai chi during pregnancy (from a book and her father) and experiencing a remarkable improvement in her health</li> <li>• practising Tai chi for over twenty years and becoming an instructor</li> <li>• main focus: exercise mind and body at the same time and help participants look after their body; philosophy of Tai chi is happiness; emptying the mind and thinking about something that makes people happy while doing the Tai chi as it helps them “get rid of the toxic in the body and be positive”</li> </ul>

#### 4.2.3 Data collection

Four instructors were interviewed individually and the two Nordic walking instructors were interviewed together. Interview techniques (one-to-one and one group interviews) were chosen because of the individual positions of instructors when leading an exercise group. All interviews were conducted between March 2019 and May 2019. The interviews were run at the location of the exercise sessions or the University and took 45-60 minutes to complete. We used a semi-structured interview guide with open-ended questions, which was developed based on best-practice guidelines for interviews (Manzano, 2016), and the themes derived from Chapters 2 and 3 on each of the levels of the socio-ecological model. The themes included exercise history and experience as an instructor, motivational aspect (of older adults), benefits of exercise, the social aspect of exercise, teaching approach, surrounding and elements of the sessions, affordability and advertisement. The interview guide was also designed to collect information on the instructors' exercise background and previous knowledge of delivering exercise programmes for older adults, their perspective on the barriers and facilitators to exercise in older adults, their perception of programme effectiveness and areas for service development

(see Appendix 4.1).

#### 4.2.4 Data analysis

Interviews were audio-recorded, transcribed and analysed. Thematic template analysis was used with codes being generated through an inductive and iterative analysis remaining close to participants' words. Two researchers were involved in coding the first three interviews independently using an inductive approach. To enrich the information being discovered in the interview data from an independent perspective, one of the researchers was blinded to the specific research questions. The lead researcher had recently analysed focus groups data from the participants who attended the exercise programmes led by the instructor participating in this study (Chapter 3). The two researchers acted as critical friends (Smith & McGannon, 2018), and met to discuss the patterns in the data and develop the sub-themes. The coding template was revised throughout the subsequent analysis. The final template was then used to recode all the transcripts, and this served as an organising framework for the interpretation of results. Once all interviews were coded, the two researchers discussed the patterns of the data with the third researcher. At this stage, they reorganized the sub-themes to develop the overarching themes to answer the research questions. Although an inductive approach was taken during coding, the last stage was also shaped by the researchers' prior experience and knowledge. To facilitate the iterative nature of the coding process, a computer-assisted qualitative analysis software was used (NVivo 12 Pro).

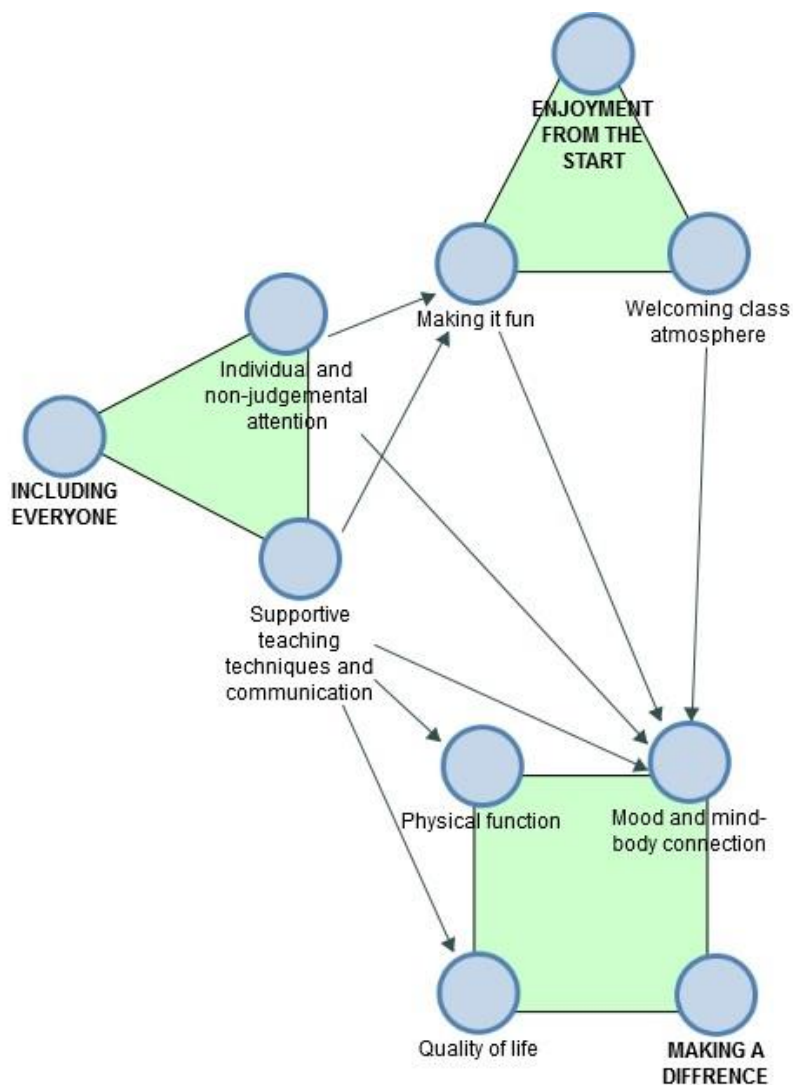
### 4.3 Results

We identified three key themes related to the teaching methods of instructors and their perception about the factors influencing adherence to group-based exercise in older adults: Enjoyment from the start, Making a difference, and Including everyone (see Figure 4.1 and Table 4.2). In parallel with sharing their perception on facilitators and barriers to exercise engagement/adherence they also shared practices they found useful in delivering exercise programmes for older adults.

**Table 4.2** Themes, sub-themes and an example of quotes identified under sub-themes

Themes	Sub-themes	Example quote
<b>Enjoyment from the start</b>	<i>Making it fun</i>	<i>"It is not only the fitness, but it is also the social element of it. I think this sandwich structure works really well."</i>

	<i>Welcoming class atmosphere</i>	<i>“They are just very warm and welcoming with each other.”</i>
<b>Making a difference</b>	<i>Quality of life</i>	<i>“It is a combination, for mental health, as well as for fitness as well as for social.”</i>
	<i>Physical function</i>	<i>“Some of them walk better, they improved their posture, they become stronger, it helps them with their joints, with day-to-day moves.”</i>
	<i>Mood and mind-body connection</i>	<i>“Tai chi is about recognizing your functions with the body...to breathe properly...to generate the blood flow in your body.”</i>
	<i>Individual and non-judgemental attention</i>	<i>“I just take them for who they are.”</i>
<b>Including everyone</b>	<i>Supportive teaching techniques and communication</i>	<i>“The exercises have to be suitable and adaptable for everyone”</i> <i>“clear language and not too technical, and demonstrate it”</i>



**Figure 4.1** Schematic map of the themes (capital letters), sub-themes (small letters) and thematic clusters (green shapes). The arrows represent the influence of factors included in a certain sub-theme on factors included in another sub-theme.

## **Enjoyment from the start**

All instructors shared their thoughts about how important the perceived “enjoyment from the first class” is for the participants to adhere, and that positive feelings induced by exercise are also “good for their health”. Instructors thought the welcoming atmosphere plays a pivotal role in providing a positive experience to the participants from the point of joining the programme. The instructors found that this can be achieved by welcoming new participants and by the positive and open attitude of the other participants.

### *Making it fun*

The instructors perceived that the key to their role was “to make it fun for everyone”. The instructors described their compassion and creativity that make the exercise class a positive experience for their participants. For instance, organizing and leading the warm-up part of the session in a big circle in the park both for the Nordic walking and Pilates participants where “everyone is marching around” together provided “enjoyment for them”. Supporting the participants with poor coordination at the beginning to feel “they are getting better at it” pleased both the participants and the instructor. In some cases the exercise itself evidenced the fun element; one instructor said that “Cheerleading is for the cheer and fun. So you cannot go Cheerleading and be grumpy, it is the whole concept of the sport”. In Indoor cycling the class was made fun by providing variety, adapting the class to the participants, telling jokes, allowing “banter” between the “open-minded” participants and surprising participants by saying “I feel the need for speed” made the class fun. In Tai chi and Pilates, happiness was induced by the form of meditative movements, learning new skills and most importantly to meet with others or “to come and get away from something else; from distress and problems in daily life”.

*They made friends within themselves. Usually, the exercises are almost not the top priority anymore. It is to start with because that is what makes people come but after they just enjoy the social element. It is all part of the package. Having fun is actually more important, so then they come back (Pilates Instructor)*

The instructors also mentioned noting that participants tended to enjoy an exercise or sport similar to the one they had done before or something in which they felt safe and competent. Facilitating a feeling of competence was considered by the instructors crucial to provide a satisfying first experience for older adults in exercise. In fact, the instructors were aware that the negative experience of pain, frustration about not being able to follow the exercise tasks, or having a setback due to a health problem could be the main causes of drop-out.

### *Welcoming class atmosphere*

The instructors explained the other source of enjoyment is the “friendship” that often developed between group members. Instructors found that the socially stimulating aspects of the class were the other source of enjoyment. “Friendship” was often developed between group members and the instructors found that it helped participants gain motivation and adhere to the exercise programme in the long term. The instructors found that the “sandwich set-up of the sessions” facilitated the development of friendship. This programme design means that participants have a short social gathering before the class and a longer social gathering after the class with coffee and tea. The instructors found that it could provide a unique opportunity, especially for men to socialise with others from the same generation. Most importantly, it led to connectedness in the group as participants realized that together with others they would “get laughs and go home feeling better and a little bit happier”.

*But it is not only fitness, but it is also the social element of it. I think this sandwich structure works well; before and after the class there is a social gathering, that is what we really promoted. And now once a month quite a few of them go and have lunch or go to the cinema together. Some local people do aqua aerobics together or balance class somewhere else. (Nordic walking instructor)*

From the instructors’ points of view, the positive experience was heavily influenced by the other group members’ welcoming and friendly attitude towards each other. The instructors found that the members of the class were supporting newcomers as “everyone in the group knows how scary it is to come and join for the first time and so they are just very warm and welcoming with each other”. The dynamics of the group was found to be positively influenced by having a “diverse group with people from all over the world, in any one class from all corners of the world” who “take a friend and then they take another friend and they make friends within the exercise group”. The Nordic walking instructors found Nordic walking unique in the sense that participants can talk and connect while they are walking, which most of the time might “cause their legs not working hard enough”, but for the instructors, the important thing was to “see people laughing”.

All instructors placed importance on the social element and suggested that the group-based exercise is “fantastic whether it's Indoor cycling, or whether it's Nordic walking or whether it's dancing, the idea is to keep them moving”. We found that the sense of competence, facilitated by the instructors, was one source of enjoyment while welcoming atmosphere,

facilitated by the programme design, friendly and inclusive group members was the other source of enjoyment.

### **Making a difference**

The instructors believed that the exercise programmes make a difference to the participants' physical and mental health which motivates them to adhere to the exercise programmes for the long term.

### *Quality of life*

The instructors stated that they intend to positively influence the participants' physical and mental health-related quality of life. They strongly believed that the exercise programmes were opportunities for older adults to "get out of the house and to keep fit and healthy". Improvements in sleep and physical fitness, reduction of pain and the sense of achievement were often reported by the exercise participants to the instructors after the sessions without prompting. Participants also shared with their instructors that even their family members noticed improvements. Instructors felt that the improvements could also "benefit the wider society" as "it [exercise] makes people go to the doctor less, they are getting fitter and they are less ill than before", "they are getting older, but they maintain their fitness or become fitter". According to the instructors' experience, the exercise could "break boundaries" for people when they realize that something they were not able to do before or they were not good at becomes achievable.

*We actually saw some major changes with people; there were some who couldn't actually walk because of pain. They had pain in their back and due to this their upper body and spine did actually not do the twisting movement that we normally do when we walk. And we took them out and with the Nordic walking poles they managed to use their upper body and they started to do the movement again and it got them back into work. We also had people who had stroke in the past and initially, they were walking very slowly and they had difficulty, but now they can walk on any surface, they can do the balance exercises. We had to pay more attention to these people, and it took time but actually, now they can keep up with the rest whereas at the beginning they could hardly do the class. So we saw a few kinds of miraculous changes with people. (Nordic walking instructor B)*

### *Physical function*

The instructors reported several improvements that they observed on the mobility of exercise participants or they heard of from the participants themselves. The instructors believed that the perceived benefits of the exercise on physical function helped the participants realize the importance of exercise to maintain independence and it increased their motivation. Some of the benefits were specific depending on the exercise tasks and the intensity level of the class. All instructors tried to target the mobility of the whole body with the exercises and therefore improved the ability to perform everyday physical tasks.

*So the Tai chi teaches them to manipulate the body without being in pain, handling day to day work like when they take the heavy tray of the roast, Sunday roast out of the oven, so they have pain, so the Tai chi posture teach them how to handle like gardening, carrying/handling heavy box from the floor. (Tai chi instructor)*

The Cheerleading instructor found her sessions to be beneficial for strength, posture, the flexibility of the joints, balance and coordination which overall improves how participants “do day-to-day physical tasks” and “they feel more balanced when they walk”. The Indoor cycling instructor found it particularly beneficial for cardiovascular fitness. She said that not only “the muscles are getting stronger” but also the “heart and lungs are getting stronger”, so they “get to the top of the stairs or walk up the escalator without feeling out of breath”. The instructors described how beneficial the Pilates and Tai chi movements are for the “balance, the joints, due to the slow and conscious flow of movements”, and specifically the Tai chi is for the “internal organs, so the thyroid, the glands internally and even the heart, if they (older adults) are strong inside, then they strong outside”.

### Mood and mind-body connection

Instructors often observed positive mood changes after the exercise sessions and thought the sessions “[helped] them forget about their worries for an hour or so”, and gave participants a sense of achievement, happiness and calm. The instructors believed that the long-term effects on their participants were being more energetic, open-minded and conscious about the importance of physical activity in daily life. The Tai chi instructor felt that “the art of movement” had a unique impact on positive thinking as well and was “empowering” for the participants because of their spiritual experience during practice.

*Tai chi is about recognizing your functions with the body. It's very much about how to breathe properly, how to get the air, the oxygen to generate the blood flow in*



*your body. It's connected to the five elements. So when you stand on the earth you connect to the earth, you connect to the air, you connect to the sky and those enhance the elements in your body, like fire. Your body is the energy so like universal, like the air, the water that plays a major role in Tai chi. It's not only about waving hands and movements. It's good to connect with your mind, your body and the universe and the elements that surround your body. (Tai chi instructor)*

Instructors thought that to stimulate the mind, or to “get the brain to exercise is crucial” for older adults. In Tai chi, learning new moves, combining them in a sequence and paying conscious attention to the sensation during movements were found to be highly beneficial and motivating for the participants. The instructors explained, that Tai chi “is a form of meditation, it helps you to focus on what you are doing”, “in China the children start school with Tai chi because it helps them to focus, to analyze what they are doing”. The instructors believe that learning new movements or a routine has a positive impact on body awareness and the memory of the participants in Tai chi, Pilates and Cheerleading. The Cheerleading instructor mentioned, “their body knowledge and posture has changed” and “they became more comfortable with their body”. Similarly, improved memory was observed by these instructors. In Cheerleading, one of the main focuses of the classes is to learn a dance routine and to memorize that from session to session. As a result, participants who have been attending for a long time, “remember more and more the routine, they know the movements more and more, because of their body memory”. The aforementioned factors were identified as the outcome of exercise which was considered by the instructors as motivators to adhere to the sessions in the long term.

### **Including everyone**

The instructors explained their teaching methods which included an emotional part helping participants to feel more confident by providing individual and non-judgemental attention to them and a technical part helping participants to develop their physical skills by using supportive teaching techniques and communication.

#### *Individual and non-judgemental attention*

The instructors considered individual attention as the key element of their approach when working with older adults, which helped participants feel included and “being looked after”. They achieved this through several verbal and non-verbal communication methods. For example, instructors placed importance on patience, listening and asking participants’ feedback

about their experiences at the beginning and end of the class and equally providing gentle feedback about participants' progress, whether it is positive or negative feedback followed by tailored advice.

*Some people would be quite anxious, some would be worried about other things that happened during the week; you have to listen to them. You have to be quite accommodating. And care about them, some people are a bit lonely, they want to feel you care about them. And the exercise itself is actually a vehicle to communicate with people. So people want to be in contact with other people and they want to work out. And usually, it doesn't matter what the actual exercise is, it just matters that they are being cared for and doing something good for themselves and they feel a bit special maybe. It is the attention. (Pilates instructor)*

Another aspect was welcoming all participants and assisting them in “finding a friend they can talk to”, supporting new and less confident participants “not to feel alone”, and striving to provide them with a memorable first experience.

*It is a funny thing when they actually get attached to one instructor because they started the exercise with her and that was the instructor who made them not too scared. And they just didn't try the exercise with someone else. (Nordic walking instructor 2).*

Acknowledging everyone, for example, knowing the participants' names, was found to be an important part of the instructors' attitude which positively influenced the motivation and mood of the participants. To help participants feel at ease when they return after a break, instructors made a point of recognising they had missed a session, gently letting them know that “they were missed” and accommodating them back to the class. Some instructors were even more connected to the participants; they were notified via email or text message by the participant who could not attend the class because the participants “take this seriously”, “they give the reason why”.

*I think the motivation of the members depends on my style of teaching. So I, I'm a neutral teacher, I understand and focus on their abilities, what they want, what suits them and, you know, to connect with them as well, not to connect like I'm not a friend, I don't go to the party with my student, I never go out with my student but I connect and ask, 'how are you feeling today?', and then we chat about how we are feeling, issues about the health and then we chat about what the good thing is about practising Tai chi. (Tai chi instructor)*

Instructors felt that the level of confidence when participating in a group exercise was variable therefore inclusivity is a crucial factor in helping participants to feel “cared for” and “feel that they want to come back next week”.

*“The biggest challenge is that we have to deal with people who are a bit scared and who are maybe socially not that open and then we have the “go and getters” as well...and the key is that we have to make it fun for everyone.” (Nordic walking instructor 1)*

### *Supportive teaching techniques and communication*

The instructors recognised the diversity of participants concerning their fitness level and found it was important to accommodate everyone (beginners and advanced participants) and set the right level of intensity and complexity to suit their skills. The instructors also placed importance on supporting new members to build their “strength slowly” so they might be able to follow the full class in the future. They tailored exercise instructions to provide safety, facilitate progress and most importantly, to help participants “feel included” and competent so they enjoy exercise from the start. As a result, “everyone feels [after the class] that they have done something, rather than they feel that they haven’t done it because everybody else is fitter than they are”.

The instructors described good practices to overcome the challenge of fitting the exercises to the various skill levels of the participants. Some of the methods were sport-specific but all of the instructors placed importance on adapting their teaching style specifically to the older adults. They emphasise the importance of making “the exercises suitable and adaptable” and encouraging participants to “listen to their own body for a start, and to the teaching tips” given throughout the class. Having a co-teacher for example helps divide the group into advanced and beginner sections after the introduction and warm-up. It enables newcomers to learn the basic moves at a slower pace and for advanced participants to develop new skills.

Actively monitoring all participants throughout the class was found to be crucial to respond to situations where participants might struggle with following the complexity or intensity of the exercises. Instructors mentioned that they gave alternative tasks, “extra teaching points”, physical aids (like a chair) or “just tell them to sit down” for a short break. Instructors also found that giving participants choice about the exercises or the intensity level they want to follow was important. The instructors also described that the level of intensity chosen by the participants can change from one class to another depending on their fitness and needs in a

certain class. To accommodate individuals who “want to push themselves more”, the instructors thought that those individuals could be signposted to try out more challenging programmes available in their neighbourhood. Instructors acknowledged that setting the right level of exercise is particularly important in terms of health and safety; therefore they always ask new participants whether they have any health or mobility problems. They also look through the completed health questionnaires of every new participant before they start the session. Most of the instructors acknowledged that there is a need for developing a Health and Safety Policy in addition to the already existing routine risk assessment at the organization. The instructors explained that the skeleton of the class always included a longer and comprehensive warm-up as it is recommended for older adults, the main part and cool down with stretching exercises. As the instructors explained, these are important elements to reduce injuries and deliver exercise safely to older adults. The warm-up in Tai chi was not only about warming up the body but also about preparing the mind and “warming up the internal organs” as well.

*We start with introducing happiness, so we have to empty and get rid of the tension. If we don't, if we can't do that, we're going to be stiff, it's not going to flow, so people empty their minds, so they are loosening up themselves so they think about the happiness, they think about something positive. And the good energy will happen, and then, as usual, we will do some qigong, which is a very gentle exercise. That is the first part, then we exercise internal organs, and we stretch from the sole, from the feet to the top, to the crown of the head. And then, the whole body stretch vertically and we stretch sideways for the side of the body, for the kidneys and then front stretching, which is very important as well for the heart and the lungs. (Tai chi instructor)*

All instructors shared their “teaching tips” which they have used to progress the confidence and the fitness level of their participants. Balance, core strength and flexibility were highlighted by all of them as the main target areas of exercise for older adults. They might have also given participants between-sessions tasks to practise at home, for instance, “washing teeth on one leg or doing the cooking on tiptoes” or guided them to focus on particular skills while they are exercising.

*Falling is a big risk and that is what I want to avoid having it happen to them. So to avoid it balance is important, having strong legs and strong core and not looking down but up and keep looking up while you are doing the exercises and engaging*

*your core and that is what I tend to teach people. Some of them do not like it but all of them need these exercises. (Nordic walking instructor)*

Instructors used both *verbal clues and demonstration* to teach the new movements and some also asked participants to assist in the demonstration.

*I try to be clear with the language and not too technical, and demonstrate it to someone so they can see it. And it helps and it keeps them motivated as well. Everybody feels that they are under attention when they are demonstrating, and they like it as well. And if I get the vibe that they don't like it then I won't do it, because not everybody does like it. (Pilates instructor)*

The Cheerleading instructor shared her creative “*storytelling*” *technique* which aided participants to memorize the movements.

*Each movement has a story, and it helps them to remember them. So for example we do the "washing machine" movement and when I say washing machine they know what is there. Then we do clean the table, and we do the sunrise, sunset and then I make a story of the routine and it becomes easier for them to remember. (Cheerleading instructor)*

Setting the appropriate intensity and complexity level of the exercise, encouraging, caring and clear verbal instructions were essential parts of the instructors’ toolbox to ensure inclusivity and to increase the confidence of the participants. They used their individual communication and teaching style to make the sessions fun as well as to progress the skills of participants.

#### **4.4 Discussion**

This study explored the perspectives of instructors about factors that limit or support older adults lasting engagement in community-based group exercise programmes. From a critical realist viewpoint, we acknowledge that the context of the research is important in the interpretation of the findings. Therefore it is important to note that the findings relate to older adults living independently in an urban setting and are framed by the instructors’ professional background and experience (Table 4.1). The first research question asked what the perception of instructors was on the determinants of adherence to group-based exercise programmes in older adults. The instructors felt strongly that enjoyment from the start was a crucial element of short-term and long-term adherence. Enjoyment was naturally built from an inclusive atmosphere and the social interactions facilitated by the providers’ “sandwich approach” of

socialising/ exercising/ socialising. But the enjoyment was also linked with skill development during group-based exercise. In fact, the instructors believed that the other determinants of engagement, especially in the long-term, were improvements in quality of life, related to emotional wellbeing, physical function, the connection between mind and body. The second research question asked how instructors perceive their methods can influence the engagement of older adults in various types of group-based exercise programmes. The instructors talked about the older adults with deep sympathy and that compassion showed in their use of individual and non-judgemental attention as well as in the supportive teaching techniques and communication they used. The instructors endeavoured to deliver enjoyable and safe exercise programmes to older adults to improve their engagement in exercise.

Finding that enjoyment is crucial for adherence supports previous literature (Farrance et al. 2016; Franco et al. 2015; Brown & Fry 2011), but the instructors placed an important emphasis on the impact of the *first* exercise session attended by older adults. They thought that the social conditions established by the provider (“sandwich” approach) created a welcoming social atmosphere even before the exercise session started, and that already created positive feelings towards the exercise class. Another important component of enjoyment was linked with the instructors’ individualised attention to participants who were new to the class. Together these components may have created a strong first impression of the ‘exercise class package’, which made participants continue to attend. First impressions of the exercise setting have been found to influence adherence. For instance, having an exercise class with people of similar ages (Beauchamp et al., 2018) or ethnicities (Hartley & Yeowell, 2015) may create positive first impressions which increase the likelihood of participants adhering. Interestingly, we found that in the instructors’ view diversity was a positive aspect and it aided the stimulating atmosphere of the exercise group. This finding is likely to be related to the highly diverse urban environment where the exercise programmes were conducted. Seeing diversity in the first session might make newcomers feel that their individuality is represented and they are welcomed into this inclusive environment. From the instructors’ perspective, similarity in age and socioeconomic status were more important. The exercise programmes were visited by older adults who had similar socioeconomic status and lived in the surrounded neighbourhood, which might help recognise deep-level similarities between participants. Deep-level similarity, which refers to the perceptions of similar social values and the development of social identity (Stevens et al., 2017), had also been found to influence sustained activity (Estabrooks & Carron, 1999).

According to the instructors, participants might have identified deep-level similarities from the start, alongside surface-level similarities.

Another aspect that contributed to enjoyment from the start was the sense of competence in learning new movements. To this effect, it was important for instructors to provide tailored exercises for individual participants to ensure that each one felt adequate and able to do the exercise. After these positive first impressions, continued adherence in the longer term is facilitated by the development of social ties within the group and the perceived benefits of exercise on mental and physical health. Importantly, instructors also linked enjoyment to better health outcomes. They thought not only that the physiological changes could cause health improvements but enjoyment during exercise might also influence both the emotional and the social aspects of wellbeing. The instructors saw group-based exercise programmes as a unique setting where older adults could develop friendships with their peers and have fun together while they are physically active. Enjoyment and need for social interaction were identified in several previous studies as the primary motivations in older adults who adhered to an exercise programme (Etnier et al. 2017; Farrance et al. 2016; Chapter 2 and 3) and who do exercise or sport as their main recreational leisure-time activity (Rahman et al., 2019). Enjoyment is closely linked with intrinsic motivation which can be developed in an environment where individuals' need for relatedness, competence and autonomy are satisfied (Ryan & Deci, 2000b). Older adults' motivation to exercise has commonly been assessed in research studies as an outcome measure to evaluate interventions (Marcos-Pardo et al. 2018; Etnier et al. 2017) or to identify reasons for physical inactivity/activity. Those studies agree that older adults who adhere to exercise experience its benefits mainly to their emotional wellbeing. Our study adds to previous findings by showing instructors' perspectives on effective strategies which create enjoyment from the first moment when older adults join the programme.

Long-term adherence, from the instructors' point of view, is dependent on whether the exercise programme made a difference to participants' lives by providing benefits to their emotional wellbeing and physical function. The participants volunteered feedback to the instructors about several improvements in their quality of life related to emotional wellbeing and physical function which could have been facilitated by environmental and interpersonal factors. Concerning the environment, the exercise providers put programme elements in place to facilitate inclusiveness and social interactions. For example, exercise ambassadors who are class attendants welcome the participants (both new and long-term attendees) at the beginning of the sessions and there is a social gathering with tea and biscuits at the end of the exercise.

Concerning the interpersonal factors, the social ties and the instructors' inclusive approach facilitates improved emotional wellbeing, and the instructors' teaching methods facilitate improved physical function. An exercise setting where the participants feel that their basic psychological needs are satisfied improves motivation, emotional wellbeing and the effectiveness of the exercise intervention on physical health (Marcos-Pardo et al. 2018). Much evidence was found in our study which confirmed the aspects of a teaching approach that supports competence, autonomy and relatedness (Marcos-Pardo et al. 2018), such as supporting the participants to feel competent by giving achievable and individually tailored exercise tasks, providing positive feedback and paying individual attention to each participant. This approach is likely to represent the instructors' values and experience because none of them reported learning these techniques as part of a course or self-directed reading. Instead, they were naturally adapting their teaching style throughout their teaching experience.

The instructors intended to facilitate adherence by using a compassionate, person-centred teaching approach to interact with older adults. We found that their compassionate teaching approach included emotional and physical aspects. The emotional aspect refers to the instructors' inclusive, caring attitude and friendly communication style that they used to provide a positive experience for the participants, both at the early and later stages of engagement. Inclusiveness could create a positive and welcoming atmosphere where the participants felt they were comfortable, safe and listened to. Furthermore, the instructors provided encouraging feedback and aimed to share their passion for being physically active with their participants by informing them about the impact of different exercise tasks on their physical and mental wellbeing. At the same time, the instructors did not bond with their participants on a personal level or try to be integrated within the group, they had a positive relationship with the members but maintained their professional boundaries and responsibility as group leaders. With their caring attitude, the instructors were likely to act as role models for the participants, which might have fostered a positive dynamic in the group and led participants to be welcoming and inclusive with each other. Previous research found that group dynamics and social support were developed in a community-based exercise intervention and it improved the adherence of older adults (Christensen et al., 2006). Our results add to previous findings by highlighting that the instructors' encouraging and inclusive teaching style could facilitate perceived social support and the development of participants' self-efficacy beliefs regarding exercise. This is likely to improve older adults' motivation to exercise and "loyalty" to the group. The exercise instructors also pointed out an important benefit of the community-based



exercise programmes is that they provide a transitional setting for older adults where the environment is comforting and less intimidating than, for example, in a leisure centre. Therefore participants can build confidence and friendship that enable them to get active in other settings and sustain their exercise participation. Overall, the instructors used a compassionate approach to lead the exercise group, which was likely to provide an emotionally safe environment for the participants where they can feel included and supported. Compassionate care and leadership have been recently introduced in healthcare settings and defined as an approach that involves role modelling, person-centred care and compassion towards patients and staff (Ali & Terry, 2017). Applying a compassionate approach to train older adults might support inactive older adults who are likely to feel vulnerable and lack confidence when joining an exercise programme. Future research could investigate how compassionate training approaches could be introduced in exercise programmes for older adults.

The physical aspect of the instructors' person-centred approach refers to the way they creatively adapted exercises and fitted their approach to suit older adults to progress their skills. By suiting the exercises to the wide range of physical abilities, they aimed to ensure safety and support each participant to gain physical competence, regardless of skills or length of experience in the exercise. Furthermore, while delivering the sessions, the instructors tried to give individual attention to everyone and be flexible by responding to the actual physical conditions and needs of the participants. This compassionate, person-centred teaching style likely facilitated enjoyment and a sense of competence during exercise. Etnier et al. (2018) found that a teaching style with similar features improved adherence in older adults by reducing fear, anxiety, or concerns related to exercise. This teaching style was often used by confident and experienced instructors who don't "see themselves too seriously" (Etnier et al., 2017). Most of the instructors in our study were experienced and placed enjoyment as their priority goal.

The main focus of the instructors was to motivate older adults to be active, facilitate a positive atmosphere during exercise and they considered the content of their class as a vehicle to achieve this goal. Overall the instructors created a task-involving and caring climate during the exercise (as opposed to an ego-involving climate). In such a climate that is safe and supportive, the participants could feel valued and welcomed, trust their instructors and perceive that the focus is on each person's effort and improvement (Ruiz et al., 2019). Brown and Fry (2011) found that this type of climate in exercise has been associated with better enjoyment (Brown & Fry, 2011; Fry & Gano-Overway, 2010; Vazou et al., 2006), self-esteem, feelings of competence,

autonomy and sense of relatedness to the group (Reinboth & Duda, 2006; Ruiz et al., 2019). We found that the instructors aimed to give participants individual attention and provide not only an enjoyable exercise experience but to help participants develop their skills and experience the benefits from the exercise which might have given older adults purpose to adhere. Improving the awareness and knowledge of the instructors about how their approach can facilitate intrinsic motivation and how they can create a task-involving and caring climate might further improve their teaching and help them increase exercise adherence.

#### *4.4.1 Conclusion*

This study explored the perception of the instructors on how group-based exercise within the community setting, and specifically their teaching method, influence adherence. Enjoyment, as a first impression, was an essential aspect for adherence of older adults from the beginning of them joining an exercise programme. From the instructors' point of view, the group exercise programme itself serves to provide social interaction and therefore enjoyment of exercise for older adults, as they believed that the two are often dependent on each other. Enjoyment can also be promoted by including social gatherings before and after the exercise sessions to provide additional opportunities for social interactions. This suggests that the "sandwich" setup of the exercise programme should be implemented more widely to sustain the engagement of older adults in exercise. A more joined-up approach between community organizations could enable the resources for social gatherings before and after the exercise programmes. The instructors' teaching methods can also facilitate enjoyment in older adults further through employing a compassionate and person-centred teaching style and catering for skill development at the individual level. Based on these findings, we recommend, that professional training for instructors should include material on task-involving, caring and motivational teaching style tailored to older adults. This can help new instructors start their careers with more confidence and knowledge on how to improve exercise adherence in older adults.

#### *4.4.2 Relevance for the following chapter*

Chapter 4 showed that the instructors' perspective complemented the perspectives of older adult exercise participants that we saw in Chapter 3 and many of the themes identified in Chapter 2. The 'Enjoyment from the start' theme of this chapter is aligned with most of the previous themes on the Interpersonal and Organizational level in Chapter 2 and 3, and highlights the factors that instructors found essential to help older adults (both newcomers and

experienced exercisers) enjoy exercise. 'Making a difference' complements the content captured in the 'Benefits of exercise' theme while 'Including everyone' mirrors the findings captured in the Instructor's approach theme in Chapter 2 and 3. The triangulation of the findings from previous studies, the focus groups and the instructors reinforced that enjoyment is crucial at the start and experiencing the benefits of exercise is crucial for adherence in older adults. The social context of exercise seems to play important role in both phases. Learning from these perspectives helped us develop practical recommendations (Table 7.2) and informed the theoretical contributions of the thesis presented in Chapter 7. The information gained from older adults and instructors about the factors on the interpersonal and environmental level could help us identify the setting and design of the exercise programmes that might create enjoyment for older adults who join for the first time. Chapter 5 was conducted in a diverse urban setting and used two different types of exercise which shared the same intensity, programme design and location, to assess the feasibility of the programmes to impact the emotional wellbeing and cognitive function of older adults.

**Appendix 4.1** Focus group discussion guide B | Providers

Focus	Questions	Materials	Time
<p>Introductions and warm up</p>	<p><i>Moderator to introduce themselves, LSBU and subject matter</i></p> <ul style="list-style-type: none"> <li>• <i>Explain ground rules (no phones, listen to each other, its ok to agree or disagree*, might ask specific people, might ask more talkative participants to give others a chance)</i></li> <li>• <i>* Moderator highlights that the aim of the discussion is to facilitate improvement and therefore comments should be expressed with the best intention and be stated as areas for development. Participants will be asked to avoid any statement which might affect emotionally any other attendees. The Moderator will stop the current topic and asked the participants to write their thoughts down if she feels that there is any risk arising during the conversation and continue with the next topic.</i></li> <li>• <i>Introduce any observers</i></li> <li>• <i>Reassure participants of confidentiality</i></li> <li>• <i>Secure permission to record</i></li> </ul> <p>I'd like to begin by asking each of you to introduce yourself. Please share:</p> <ul style="list-style-type: none"> <li>• Your first name</li> <li>• A little bit about you: What is your job and the service you provide for older adults?</li> <li>• Please describe what happens at a session, the most important parts of your sessions from the beginning to the end of the session (in 5-10 steps)</li> </ul>	<p>Recording devices</p>	<p>10</p>
<p>The impact of activities on quality of life, emotional health, cognitive health and monitoring outcome</p>	<p>Group discussion</p> <p><i>What do you do on your session to maximize the impact of the exercise?</i></p> <p><i>Do you think different exercises have different effects?</i></p> <ul style="list-style-type: none"> <li>• <i>On physical health?</i></li> <li>• <i>On mood, well-being?</i></li> <li>• <i>On cognitive health?</i></li> </ul>	<p>Recording devices</p>	<p>15</p>

Characteristics of programme	<p><i>We would like to know more about factors that might make people to start and come back every week or helps people to start again if they miss any session.</i></p> <p><i>Please write down the followings:</i></p> <ul style="list-style-type: none"> <li>• On a 10-point scale How important do you think the class is to your participants and why?</li> <li>• Do you monitor attendance and how?</li> </ul> <p>Follow up group discussion:</p> <ul style="list-style-type: none"> <li>• What do you think motivates participants to attend?</li> <li>• What do you think motivates participants to stay in the class long-term?</li> <li>• Do you think others (families, friends, and professionals) influence your participant's attendance?</li> <li>• What do you think the barriers are to participants attending your classes?</li> </ul>	Paper Recording devices Flip chart	10
Areas for improvement Factors to help inactive people to get started	<p><i>We would like to identify things what could be improved about the current services and make it easier for non-exercisers to join.</i></p> <p><i>1. Please list 3 things what we could be improved to make it available and convenient for inactive people and to make it easier to join.</i></p>	Papers, flip chart	15
Promotion of activity	<p>Group discussion</p> <ul style="list-style-type: none"> <li>• How do you promote your classes and encourage participants to attend?</li> <li>• <i>What we can do to increase attendance?</i></li> <li>• <i>Circumstances and situations that make the participant feel safe and competent to exercise?</i></li> <li>• <i>How we can help people to adhere to the programme more?</i></li> </ul>	Recording devices	10
Final group task	<p>Task 4</p> <p><i>Moderator to ask participants to say 1 sentence how they would promote their sessions. Write together a summary similar to an advert to promote physical activity, exercise with those sentences.</i></p>	Flip Chart	5

**London South Bank**  
University

Direct line: 0207 815 5422  
E-mail: dawkinl3@lsbu.ac.uk  
Ref. SAS1809

Tuesday 13<sup>th</sup> March 2018

Dear Zsofia,

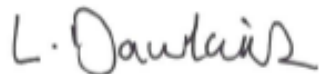
**RE: Talk, move, have fun and repeat / Engage, exercise, enjoy and repeat,  
Determinants and impact of community-based exercise programmes on  
adherence**

Thank you for submitting your amendments.

I am pleased to inform you that full Chair's Approval has been given by Dr.  
Lynne Dawkins, on behalf of the School of Applied Sciences.

I wish you every success with your research.

Yours sincerely,



Dr. Lynne Dawkins  
Chair, Research Ethics Coordinator  
School of Applied Sciences



### Engage, exercise, enjoy and repeat:

#### Determinants and impact of community-based exercise programmes on adherence

You are invited to participate in an investigation which has been approved by the London South Bank University (LSBU) Research Ethics Committee. Before formally agreeing to participate, please read the following information, making sure you fully understand what the study involves. If you have any questions regarding the investigation please feel free to ask, and we will do our best to explain and provide any further information you may require.

**The aim of this study** is to understand what makes it easy or difficult for older adults to participate in different types of exercise programmes available in the community. This study will evaluate several types of local exercise programmes by focusing on the participants' experiences and views related to the impact of the programme on health and mood, on the likes/dislikes of programme characteristics, and enjoyment during exercise.

#### Why have I been invited to participate?

You are invited to participate because your job is involved with older adults' physical activity in London Borough of Lambeth or Southwark. We would like to know more about the available programmes and services. Your views and experiences will help to improve the current services and to motivate older adults to adhere and therefore increase the level of physical activity in the boroughs.

#### Do I have to take part?

Participation in this research study is voluntary. If you choose to participate you will be given this information sheet to keep and be asked to sign a consent form. You are free to withdraw from the study at any time during data collection without giving a reason and without any consequences. You can withdraw from the study up to 1 week after participating in the focus group by contacting the Researcher via email/telephone, however only your filled questionnaires can be removed from the data analysis. Your verbal comments during the Focus group/Interview are not possible to be identified and removed.

#### What will happen if I take part and what are the possible benefits of taking part?

This study involves taking part in a group discussion or interview and you will be also asked to fill in a short questionnaire. The group discussion will involve no more than 8 participants at one time, and will last between 60 and 90 minutes. It will take place in the London Southbank University in a meeting room. The benefits to you of participating include an improved knowledge of how we can help to motivate older adults to adhere and it might increase the attendance rate of your programme. In case you prefer to participate in an interview instead of the group discussion, the researcher will contact you to conduct a telephone interview.

#### What are the possible risks of taking part?

This study has been reviewed by the London South Bank Research Ethics Committee to ensure that potential risks are limited. You are free to leave discussions at any time and are advised to seek help from physical activity providers or GP's in the case of any discomfort.

#### Will the data collected in this study be kept confidential?

Your confidentiality will be protected at all times. All information will be securely stored in a locked cabinet and the anonymous data will be stored in a password protected computer accessible only by the research team.

#### What should I do if I want to take part?

If you wish to participate you will be asked to sign and return a consent form and then take part in the group discussion/interview.

#### What will happen to the results of the research study?

The study will provide understanding of how characteristics of the programme influence participant's motivation to adhere. The study will also highlight areas for improvement in the current exercise programmes and services. The results will inform practitioners who evaluate or recommend physical activity for older adults about the available programmes and about how they can motivate people to start an exercise. All information gathered will be anonymised, and the group's views will then be used in publications including reports and scientific articles and will be disseminated to key public, scientific and professional stakeholders via presentations and leaflets.

#### Who is organising the research and who has reviewed the study?

This research is conducted by the University's Sport and Exercise Science Research Group in partnership with several physical activity organisations in the London Borough of Southwark and Lambeth. The research has been approved by the University Research Ethics Committee of London South Bank University.

#### Contact for Further Information

If you have any questions regarding this project, please contact the physical activity provider, or the research team. If you have any concerns about the way in which the study has been conducted, please contact the Ethics Committee of London South Bank University.

<b>Research team:</b> Dr Rita de Oliveira Email: <a href="mailto:r.oliveira@lsbu.ac.uk">r.oliveira@lsbu.ac.uk</a> Phone: 020 7815 7959 Dr Lisa Zaidell Email: <a href="mailto:zaidell2@lsbu.ac.uk">zaidell2@lsbu.ac.uk</a>	Dr Katya Mileva Email: <a href="mailto:milevakn@lsbu.ac.uk">milevakn@lsbu.ac.uk</a> Miss Zsofia Szekeres Email: <a href="mailto:szekerez@lsbu.ac.uk">szekerez@lsbu.ac.uk</a>	<b>University Research Ethics Committee:</b> Email: <a href="mailto:ethics@lsbu.ac.uk">ethics@lsbu.ac.uk</a> Ethics approval registration Number: SAS1809
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## Appendix 4.4 Informed Consent form



### Consent Form

Ethics approval registration Number: SAS1809

**Engage, exercise, enjoy and repeat:**

Determinants and impact of community-based exercise programmes on adherence

Taking part (please tick the box that applies)	Yes	No
I confirm that I have read and understand the information sheet and the project brief and/or the investigator has explained the above study. I have had the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw as it has been explained on the Information sheet.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>	<input type="checkbox"/>

Use of my information (please tick the box that applies)	Yes	No
I understand my personal details such as phone number and address will not be revealed to people outside the project.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my data/words may be quoted in publications, reports, posters, web pages, and other research outputs.	<input type="checkbox"/>	<input type="checkbox"/>
I would like my real name to be used in the above.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data I provide to be stored (after it has been anonymised) in a specialist data centre and I understand it may be used for future research.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data to be audio-recorded, stored anonymised and be transcribed to use for research purposes.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications.	<input type="checkbox"/>	<input type="checkbox"/>
I confirm that I have completed the screening form and questionnaire.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of my contact details by the researcher in order to invite me to participate in other research project in the future.	<input type="checkbox"/>	<input type="checkbox"/>

Taking part in the study is voluntary and you are free to withdraw at any time without any penalty, without providing a reason. If you experience any emotional or physical discomfort/harm from taking part in the study please seek medical advice from your GP and we advise you to inform the researcher or her supervisor.

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Researcher	Date	Signature

Project contact details for further information: Zsofia Szekeres Email address: [szekerez@lsbu.ac.uk](mailto:szekerez@lsbu.ac.uk)

# **CHAPTER FIVE**

## **The effects of a novel dance-based exercise for improving health and wellbeing in older adults – a feasibility study**

### **Abstract**

This study aimed to assess the feasibility and acceptability of a novel dance-based exercise programme for older adults and provide preliminary evidence for the health benefits from adding cognitive challenges to a conventional exercise programme. The emotional wellbeing, cognitive function and physical fitness of nineteen 55+ years old participants were evaluated before and after they completed either a 12-week Cheerleading or an Indoor cycling exercise programme. The acceptability and feasibility of the two programmes were assessed using attendance rates and subjective evaluation scales. High rates of adherence, enjoyment and social connectedness were registered in parallel with improved emotional wellbeing and blood pressure responses to physical effort upon completion of both programs. Additionally, the Cheerleading exercise significantly improved the blood pressure responses to cognitive effort and the executive function while reducing the perceived cognitive effort during mental stress. This trial supports the feasibility of both Cheerleading and Indoor cycling programmes for older adults and provides preliminary evidence that, by embedding requirements for learning and following a routine, the Cheerleading exercise programme may be more effective for improving the cognitive function and emotional wellbeing of the participants.

## 5.1 Introduction

Older adults are at increased risk of physical inactivity. The most recent data shows that 40% of middle-aged and older adults do not achieve the required physical activity that could effectively maintain physical health (Active Lives Survey, 2019-2020). Physical activity is known to have a number of benefits to both physical and mental health. Therefore it is a key component of interventions that aim to prevent health decline in older adults. However, the vast majority of interventions focus on improving only physical health.

The age-associated decline in cognitive function due to lack of adequate social support and deterioration in physical health can cause psychological distress (Osmanovic-Thunström et al., 2015) and decrease emotional well-being (Lupien et al., 2009; Ma, 2020). On the same note, emotional stress in older adults is associated with a higher systolic blood pressure response (Uchino, Birmingham & Berg, 2010), which can negatively affect the cardiovascular system and facilitate cognitive decline (Oken et al., 2011). Cognitive function can also decline as part of the ageing process, with declines in cognitive function due to lack of adequate social support and deterioration in physical health, and emotional wellbeing being (Lupien et al., 2009; Ma, 2020) as well as psychological distress (Osmanovic-Thunström et al., 2015). On the same note, the systolic blood pressure response to emotional stress in older adults is higher (Uchino, Birmingham & Berg, 2010), which can negatively affect the cardiovascular system and facilitate faster cognitive decline (Oken et al., 2011). Establishing time- and cost-effective interventions for maintaining or improving cognitive function is a key priority for addressing the individual and societal challenges of the UK's rapidly ageing population (Williams & Kemper, 2010).

Activities such as chess, bridge (Mireles & Charness, 2002), memory training (Kramer, Bherer, Colcombe, Dong, & Greenough, 2004), and social programmes (Béland, Zunzunegui, Alvarado, Otero, & del Ser, 2005) have been demonstrated to positively influence cognitive function. Regular exercise can also improve cognition (Nagamatsu et al., 2013), emotional wellbeing (Stewart et al., 2003) and facilitate social interaction (Kirk-Sanchez & McGough, 2013) in addition to the benefits for physical fitness. Morphological changes in the brain, such as increased hippocampal volume has been observed with aerobic exercise training (ten Brinke et al., 2014), and when combined with resistance training, can improve, can improve memory in women with mild cognitive impairment (Nagamatsu et al., 2013).

While aerobic fitness has been found to mediate the exercise-induced protection of cognitive function with ageing (Norman et al., 2018), both psychological and physiological

mechanisms such as improved cerebral blood flow, neuroplasticity, arousal, mood and self-perception of competence, contribute to the neuroprotective effects from exercise (Marmeleira, 2013). Furthermore, recent evidence suggests that group-based programmes not only promote adherence and enjoyment in older adults but may preserve cognitive performance if the activity incorporates cognitive challenge or social support and may prove more efficient than conventional exercise for preserving cognitive performance (Ballesteros et al., 2015; Diamond & Ling, 2016). For example, dance-based exercise involves rhythmic motor coordination, memory recall and, usually, social interaction (Lima & Vieira, 2007). A six-month trial demonstrated that dance-based exercise improved attention, reaction time, wellbeing, and motor performance compared to a non-exercising control group, without altering cardiorespiratory fitness (Kattenstroth et al., 2013).

To date, the evidence supporting the beneficial effects of exercise on cognitive function is largely considered in comparison with a non-exercising or a walking control group (Merom et al., 2016) rather than other forms of conventional exercise used within exercise programmes. Furthermore, the effect of stress perceived during cognitive performance has rarely been considered in previous research that investigated the cognitive benefits of exercise in older adults. While there is strong evidence showing that exercise attenuates the detrimental effects of stress on cardiovascular function (Salmon, 2001), most evidence comes from cross-sectional studies in younger adults (Forcier et al., 2006) and there is a lack of studies that investigate the benefits for older people. Furthermore, there is a need to develop feasible community-based programmes and improve the popularity of non-conventional exercise for older adults to increase engagement in exercise programmes that could effectively support healthy ageing. Cheerleading is traditionally a type of sport for youngsters but can be adapted into an exercise programme for older adults (Talbot & Roberson, 2011). The observational findings showed that the exercise tasks required coordination, memory, timing and rhythm, raised the heartbeat and included stretching and strengthening. Participants reported “feeling good in a group”, they smiled throughout the session and enjoyment motivated them to take part. Cheerleading’s popularity amongst older women in Tokyo has grown since the Japan Senior Cheer Association was established in 2014, as reported in grey literature. Most recently, Cheerleading has become popular in London as a form of exercise class that is open both to women and man. Cheerleading as a public health intervention may invite critique by conservative audiences for its association with youngsters and women, and historically there has been limited opportunities in the UK to take part in Cheerleading classes for adults. Nevertheless, because of its characteristics of multimodality, it deserves attention to understand its value for improving health and wellbeing.

For example, some of the movements have been shown to improve cognitive function in older adults (Kwok et al., 2011) and its modalities are recommended for older adults (WHO, 2020, Table 1.1). The studies in Chapter 3 and 4 revealed that Cheerleading is a multi-modality exercise programme at a light-to-moderate intensity that includes an added cognitive challenge as well as a social element, therefore might be more beneficial for the cognitive function and emotional wellbeing in older adults. Feasibility studies are needed to produce evidence that such interventions are appropriate for older adults and larger-scale studies are justified.

Therefore, the primary aim of this study was to assess the acceptability of a novel community-based Cheerleading compared to a traditional physical exercise programme for older people and the assess the feasibility of a research design that measures the impact of these programmes on cognitive, emotional wellbeing and physical health. As a secondary objective, the study aimed to obtain preliminary evidence for the added health benefits from the participation of older adults in more cognitively challenging exercise. The findings are intended to guide the design of future studies that seek to determine the efficacy and effectiveness of community-based exercise programmes in independently-living older adults and inform their implementation.

## **5.2 Methods**

### *5.2.1 Study design*

This randomized experimental mixed design study compared the effects of two group-based exercise programmes with different levels of cognitive demand consisting of 12-weeks attendance to either danced-based (Cheerleading) or conventional (Indoor cycling) exercise. The study protocol was approved by the University Ethics Committee (SAS1617).

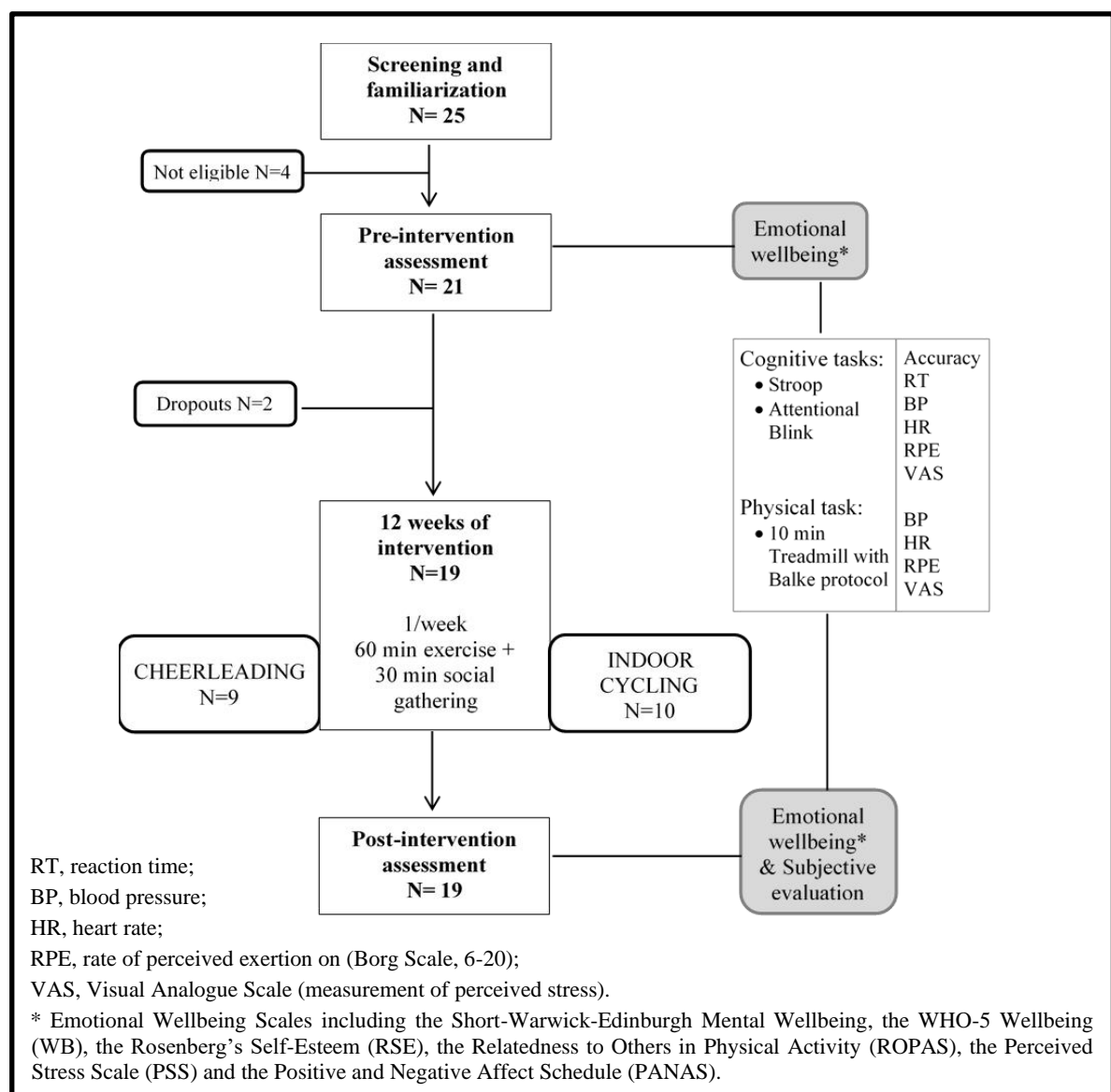
### *5.2.2 Participants and recruitment*

Older adults were recruited from the community between November 2016 and March 2017 from two boroughs in central London that have an ethnically diverse population. Participants were recruited via community-based organizations, advertisements and word-of-mouth. For recruitment, a group of sixty-three professionals working in health, social care, community leisure and volunteer sectors were asked to place posters and/or flyers at their organizations to inform their members about the exercise programmes and the opportunity to take part. The exercise programmes and the research study were also promoted in a local newspaper, at local

networking and community engagement events organized for older adults and by visiting four sheltered accommodations and distributing flyers to the residents.

The eligibility criteria included: (a) being aged 50-75 years old; (b) not meeting the requirements for sufficient level of weekly physical activity (Gibson-Moore, 2019); (c) being healthy to the degree that participation in exercise would not exacerbate any existing symptomatology (custom health-screen form); (d) having adequate mental status (score 24 or higher on the Mini-Mental State Examination; Folstein, Folstein, & McHugh, 1975); and not having participated in a similar programme before this study.

Before the start of the 12-week intervention, participants underwent a familiarisation session where they provided written informed consent to participate, and underwent screening for cognitive and physical health. Participants were then randomly allocated to either the Cheerleading (intervention group) or Indoor cycling (control group) programme. Laboratory-based assessments were performed one week before and one week after the exercise intervention period. Figure 5.1 shows the flow of participants through the study. For a detailed description of the screening procedures see Table 5.1.



**Figure 5.1.** Main phases of the study and flow of participants.

### *5.2.3 Intervention*

The Cheerleading and Indoor cycling exercise programmes have been delivered in a community-based leisure centre. The implementation of the exercise programmes was funded by the London South Bank University's Ageing Fund. The exercise classes were open to the community. The exercise classes were organized by the same provider who continued running the classes for the longer term with additional funding sources. The participants joined the classes once a week for one hour, delivered by trained exercise professionals. The attendance fee was £1.50 per session, however, the participants of this study attended free of charge. Each session included 10 min of warm-up exercises (mobilization and balancing), 30-40 min of Cheerleading or cycling workout followed by 10-min cool-down exercises. Background music was provided throughout (100-132 bpm). Cheerleading included learning different choreographies of steps and arm movements with hand-held pom-poms. In the cycling classes, the participants were instructed to cycle at a self-selected moderate-to-high intensity. Both sessions were followed by a 30-min joined social gathering.

### *5.2.4 Data collection*

At the pre-and post-intervention lab-based assessments participants returned their completed questionnaires of demographics and emotional wellbeing. The lab-based assessment lasted 90 min and started with a 5-min seated rest for measurements of cardiovascular fitness and mental status followed by two cognitive and one physical tasks separated by 5-min seated rest. The physical task consisted of a modified Balke running protocol on a treadmill (ACSM, 2006), followed by a 5-min seated recovery (Figure 5.1). Measurements of cognitive or physical effort and cardiovascular fitness were taken during and after each task. Table 5.1 provides a detailed description of the assessment procedures.

### *5.2.5 Study measures*

The primary outcomes were feasibility of the study and acceptability of the exercises.

Predetermined targets were set to evaluate whether the study design was feasible and the exercise programmes were acceptable for community-dwelling older adults. Feasibility of the study was defined as the willingness of older adults to enter and remain a participant in this study for 12 weeks (including completion of pre-and post-intervention assessment) and assessed by the rates of recruitment within the recruitment window and the rates of dropout from the study. The recruitment target was set at 30 participants (15 in each group) and the recruitment window was set at four months from the start of advertising as we wanted to capture the early stage after the exercise programmes had been implemented into the community leisure centre.

Acceptability of the exercise programmes was assessed by the average rates of attendance, retention over the 12 weeks of the exercise and the subjective evaluation of the programmes. The attendance rate was calculated as the percentages of participants attending each weekly exercise class. The retention rate was evaluated by the percentage of older adults who attended at least 10 exercises classes over 12 weeks. The retention rate was provided by the charity and included both study participants and older adults who did not take part in the study. The retention target was set at 75%. Attendance was recorded before each class by a volunteer exercise ambassador of the charity. The subjective evaluation of the programmes during exercise was assessed at mid-term using the Physical Activity Enjoyment Scale (Kendzierski & DeCarlo, 1991) and the subjective evaluation scale at post-intervention.

The secondary outcomes were cognitive function, emotional wellbeing and cardiovascular fitness. The effects of training on cognitive function were evaluated with accuracy and reaction time tested on the colour-word interference version of the Stroop test (Stroop, 1935) and with the first target accuracy rate tested on the Attentional Blink (AB) test (Raymond, Shapiro, & Arnell, 1992). AB was performed immediately after the Stroop test to increase the sustained attention load and induce mental stress. Both tests were performed using E-Prime 2.0 (Psychology Software Tools, Pittsburgh, PA). Perceived cognitive effort and perceived stress level were measured after the cognitive tests using the standard RPE scale (Borg Scale, 6-20) and Visual Analogue Scale (VAS, 1-20). Emotional wellbeing was evaluated using a battery of seven pen-and-paper questionnaires including Short Warwick Edinburgh Mental Wellbeing, the WHO-5 Wellbeing, the Rosenberg's Self-Esteem, the Relatedness to Others in Physical Activity, the Perceived Stress Scale and the Positive and Negative Affect Schedule (see Table 5.1). Cardiovascular fitness was assessed by measuring systolic (SBP) and diastolic (DBP) blood pressure, heart rate (HR), perceived effort (RPE using Borg Scale, 6-20) before, after and 5 min after physical tasks (see Appendices 4 and 5). Physiological responses



to cognitive stress were assessed by measuring systolic (SBP) and diastolic (DBP) blood pressure and heart rate (HR) before and after cognitive tests.

#### *5.2.6 Statistical analyses*

Data were analysed using SPSS Statistics 21 for Windows (IBM Corp., Armonk, NY, USA). Descriptive statistics and results are presented as *M* and *SD*. All data were tested for normality using the Shapiro-Wilk test. The secondary outcome measures were submitted to a mixed ANOVA with factors Visit (pre- vs. post-intervention) and Group (Cheerleading vs. cycling). For the outcome measures of RPE, VAS and blood pressure the factor Time was added (before vs. immediately after vs. 5-min after the treadmill and the cognitive tasks). For data not normally distributed, non-parametric comparisons were used for groups and visits. Cohen's *d* effect size was calculated based on the partial eta squared statistics (Cohen, 1988). The cut-off level for statistical significance was set at  $p < .05$ . For further details, see Table 5.1.

**Table 5.1** Detailed description of the procedure, questionnaires, scales and lab based tasks used in the study to evaluate the effects of participation in either 10 weeks of Cheerleading (CL, n = 9) or Indoor cycling (IC, n = 10) exercise programmes on emotional wellbeing, cognitive function and fitness of older adults.

Procedure	Aspect evaluated	Additional information	Data reduction and analysis
<b>1. Screening and familiarization visit</b>			
Duration: 40 min, location: university lab, Information provided about the intervention design, test procedure, risks involved, written informed consent gained and the Pen and paper screening form was completed			
Screening Form	Eligibility Demographics Health screening Physical activity level Mental Status	Demographic information (Age, education, ethnicity) London South Bank University Health Screening form Mini Mental State Examination (MMSE, Folstein et al., 1975) International Physical Activity Questionnaire - Short Form (IPAQ-SF, Hagstromer et al., 2006)	Assessing eligibility criteria for age, health status, having MMSE score 24+, activity level (according to the health-enhancing physical activity recommendation doing less than 3 days per week vigorous activity accumulating 1500 MET-minutes/week or less than 7 days per week any combination of moderate-intensity or vigorous-intensity activities achieving a minimum of at least 3000 MET minutes/week and have not participated in a similar programme before enrolling into the study. Data used for evaluation of between-group baseline differences: Age, Years of Education, MMSE score and activity level (MET: metabolic equivalent of minutes of activity during a week)  t-test: age, MET score Nonparametric test: MMSE and years of education
<b>2. Battery of Emotional Wellbeing Questionnaires</b>			
Pen and paper questionnaires being completed at pre-and post-intervention in participants' own time before starting the lab-based assessments			
Short-form Warwick-Edinburgh Mental Wellbeing (SWEMWBS, Crawford et al., 2011)	Emotional and Mental Wellbeing	The scale includes 7 questions and answers are given on a 1-5 Likert scale (None of the time – All of the time) Short and reliable measures of mental wellbeing and positive psychological functioning.	Total score of Emotional and Mental Wellbeing (ranging from 7-35) Normal distribution, mixed 2 x 2 ANOVA
WHO-5 Wellbeing Index (WHO-5, Bech, Staehr-Johansen and Gudex, 1996)	Global index of wellbeing	The scale includes 5 questions and answers are given on a 0-5 Likert scale (At no time – All of the time) Short and reliable measures of global wellbeing related to positive mood, vitality, and general interests.	Total score (WHO-wellbeing) ranging from 0-25 Not normally distributed, Wilcoxon signed rank test
Rosenberg's Self-Esteem Scale (RSES, Rosenberg 1965)	Global self-esteem	The scale includes 10 questions, answers are given on a 1 - 4 Likert scale (Strongly agree – Strongly disagree)	Total score (RSE) ranging from 10-40 Normal distribution, mixed 2 x 2 ANOVA

Relatedness to Others in Physical Activity Scale (ROPAS, Wilson & Bengoechea, 2010)	Connectedness in physical activity	The scale includes 6 questions and answers are given on a 1-6 Likert scale (False – True). The sense of relatedness during engagement in physical activity.	Total score (ROPAS) ranging from 6-36 Not normally distributed, Wilcoxon signed rank test
Perceived Stress Scale (PSS, Cohen et al., 1983)	Perceived stress	The scale includes 10 questions and answers are given on a 0-4 Likert scale (Never – Very Often). The scale assesses the degree to which participants perceived their lives as stressful, uncontrollable, and overloaded in the last month.	Total score (PSS) ranging from 0-40 Normal distribution, mixed 2 x 2 ANOVA
Positive and Negative Affect Schedule (PANAS, Watson and Clark, 1988)	Positive and negative affect status	The scale includes 10 positive and 10 negative mood states and answers are given on a 1 - 5 Likert scale (Never – Very often) indicating how often someone had these feelings and thoughts during the last month.	Total scores for PANAS-positive and PANAS-negative ranging from 10 - 50 each. Positive PANAS: Normal distribution, mixed 2 x 2 ANOVA Negative PANAS: not normally distributed, Wilcoxon signed rank test
Short Form Health Survey version 2 (SF-12v2, Ware, Kosinski, & Keller, 1995, 1996)	Physical and mental health-related quality of life	The scale included 12 questions related to physical health, emotional health and functioning in different situations. The answers are given on a 1 - 6 Likert scale (None of the time – All of the time) indicating how often someone had certain feelings and thoughts during the last month.	Standardized scores for sub-scales: General Health, Physical Functioning, Role Physical Function, Role Emotional Function, Bodily Pain, Vitality, Social Functioning and Mental Health. The sub-scales were transformed to z-scores. Further, data were aggregated into 2 scores: Physical Health and Mental Health component scores. The eight subscales and the two main scores were analysed separately. Sub-scale scores: not normally distributed, Wilcoxon signed rank test Main scores: Normal distribution, mixed 2 x 2 ANOVA
<b>3. Cognitive function tasks</b>			
Being completed in the university lab after 5 min baseline seated rest at pre-and post-intervention. It was followed by 5 min seated recovery.			
Stroop test (Stroop, 1935) Duration: 3-5 min	Selective attention: accuracy (percentage) Processing speed: reaction time (RT, in milliseconds)	Setup: computer-based test using E-prime software Task: In which colour the item is presented? (Response: on keyboard) Practise trials (Max 3 times until 80% of accuracy achieved): 20 items (X X X X in red, blue, yellow or green) Test trial: 1 x 120 items including 48 congruent (same meaning as the ink) and 72 incongruent (different meaning than the ink) colour words (red, yellow, green or blue in capital letters)	Incorrect responses were excluded and RT data were omitted from the analysis if the response went undetected, or it was less than 150 ms, or it was more than $\pm 2.99$ SD from the mean for a block of trials. Two participants' data were excluded from all the ANOVA and the non-parametric analysis because they did not achieve a minimum of 10% incongruent accuracy rate. Mixed 2 x 2 ANOVA and non-parametric comparisons on congruent and incongruent accuracy and congruent RT because data were not normally distributed. Incongruent RT: mixed 2 x 2 ANOVA

		Participants were not informed about their performance throughout.	The expected effect of Congruency was achieved as showed by the main effect of Task (comparing congruent and incongruent trials).
Attentional Blink test (AB) Purpose of the test: to induce mental stress and assess the ability to sustain attention Duration: 5-10 min	Sustained attention: T1 accuracy rate  Perceived cognitive effort (RPE) and stress level (VAS)  Cardiovascular reactivity to mental stress (BP)	32 trials (each including 10-21 letters in rapid serial visual presentation stream with 2 target letters) First target: B, S or G and T2 target: X (at lag 1-8 following T1 but never at the end) Feedback (updated record of correct answers) is given after each response. Immediately after the task rating on perceived effort and perceived stress scales (RPE and VAS) was measured. Blood pressure was measured before the Stroop test and immediately after the AB test, HR was monitored throughout.	Two participants' data were excluded as they did not achieve 70% of T1 accuracy. The stereotypical AB and AB recovery were not identifiable in all datasets therefore only T1 identification performance was included in the analysis. 2 X 2 mixed ANOVA and Non-parametric comparisons BP and HR: Normal distribution, mixed 2 x 3 x 2 ANOVA RPE and VAS scores: mixed 2 x 2 x 2 ANOVA and non-parametric comparisons Where appropriate, degrees of freedom were adjusted for violations of sphericity using the Huynh-Feldt correction.
<b>4. Physical function tasks</b>			
Being completed in the university lab after the block of Cognitive tasks and 5 min seated recovery. It was followed by 5 min seated recovery.			
Physical treadmill test According to the Balke protocol Duration: 10 min	Physical fitness (HR)  Cardiovascular reactivity to physical stress (BP)  Perceived physical effort (RPE) and stress level (VAS)	Participants walked at their brisk walking speed (the same speed pre-and post-intervention) and the inclination increased by 2% in continuous stages of 2 min from 1% to 9%. To determine the pace for the test, participants were instructed to walk at their fastest, comfortable pace during a 2 min warm-up. The elevation of the treadmill was increased every 2 min while speed remained at the participants' fastest, comfortable pace. The test was terminated if participants reported their perceived exertion on RPE 17+ or until reaching 80% of max HR or after 10 min. RPE and VAS were measured at every 2 min stages during the test. BP was measured before, immediately after the test and 5 min recovery.	HR: monitored continuously and after 5 min recovery (Polar chest strap)  BP and HR: Normal distribution, mixed 2 x 3 x 2 ANOVA RPE and VAS scores: measures mixed 2 x 2 x 2 ANOVA, Non-parametric comparisons Where appropriate, degrees of freedom were adjusted for violations of sphericity using the Huynh-Feldt correction.

Note. RT, reaction time; BP, blood pressure; HR, heart rate; RPE, rate of perceived exertion on (Borg Scale, 6-20); VAS, Visual Analogue Scale; MET multiples of resting energy expenditure (Reported minutes per week of physical activity were weighted by a metabolic equivalent)

## 5.3 Results

### 5.3.1 Participants

Nineteen participants completed the whole study as either part of the Cheerleading ( $n = 9$ , all female,  $M = 61.7$ ,  $SD = 3.94$  years old) or the Indoor cycling ( $n = 10$ , 8 female,  $M = 65.7$ ,  $SD = 6.21$  years old) group. The randomly assigned group allocation of one participant had to be changed due to the doctor's recommendation to avoid weight-bearing exercises. At baseline, the groups differed only by seated diastolic blood pressure (Table 5.2).

**Table 5.2** Baseline Characteristics of the Two Study Groups

Characteristic	Cheerleading	Indoor cycling	P-value
<b>N</b>	9 female	8 female 2 male	
<b>Age (years)</b>	61.70 (3.94)	65.70 (6.21)	0.11
<b>Education (years)</b>	13.66 (2.18)	12.00 (1.89)	0.09
<b>MMSE score</b>	29.20 (0.83)	29.20 (1.25)	0.74
<b>Activity index (MET)</b>	1276.40 (435.03)	1065.20 (344.66)	0.24
<b>BMI (kg/m)</b>	28.12 (4.02)	26.97 (4.72)	0.57
<b>Systolic BP</b>	130.33 (16.06)	118.40 (14.99)	0.12
<b>Diastolic BP</b>	82.67 (7.76)	71.80 (8.57)	0.01
<b>HR</b>	68.21 (5.53)	66.16 (7.86)	0.52

*Note.* MMSE is Mini Mental State Examination; MET is multiples of resting energy expenditure (reported minutes per week of physical activity were weighted by a metabolic equivalent); BMI is body mass index; BP is resting blood pressure; HR is resting heart rate. Statistically significant set at  $p < 0.05$ .

### 5.3.2 Secondary outcomes

#### Cognitive function

For the Cheerleading but not the cycling group the reaction time in the congruent Stroop trials significantly improved ( $p = .01$ ) and the accuracy rate in the incongruent Stroop trials tended ( $p = .06$ ) to improve post-intervention (see posthoc tests, Table 5.3). On the attentional blink test the first target accuracy rate also tended to change differently between the groups (Visit  $\times$  Group,  $F(1,12) = 13.29$ ,  $p < .07$ ). Post-intervention the accuracy rate was significantly lower in the cycling but was maintained in the Cheerleading group compared to pre-intervention (Table 5.3).

**Table 5.3** Outcomes on emotional wellbeing scales and the cognitive function measures

Variable	Group	Pre		Post		Group differences at baseline			Effect of Visit		Effect of Visit x Group		The effect of Visit within the groups	
		Mean (SD)	(SD)	Mean (SD)	(SD)	P-value	P-value	Cohen's d	P-value	Cohen's d	P-value	95% Confidence interval		
<b>Cognitive performance</b>														
Congruent accuracy rate (%)	CL	97.22	(4.03)	98.15	(4.09)	0.63	0.64	N/A	0.87	N/A	0.59	-5.39	3.54	
	IC	94.01	(14.50)	95.83	(5.23)									
Incongruent accuracy rate (%)	CL	68.06	(30.02)	78.24	(33.01)	0.38	0.04	1.02	0.46	N/A	0.06	-20.79	0.43	
	IC	79.34	(19.90)	84.38	(21.23)									
Congruent reaction time (ms)	CL	1387	(423)	1205	(436)	0.68	0.01	2.68	0.46	N/A	0.01	66.28	296.67	
	IC	1558	(441)	1479	(156)									
Incongruent reaction time (ms)	CL	1639	(616)	1449	(478)	0.57	0.17	0.57	0.57	N/A	0.32	-158.88	538.44	
	IC	1813	(617)	1731	(791)									
First target accuracy rate (%)	CL	82.81	(13.26)	86.72	(14.73)	0.17	0.65	N/A	0.07	1.09	0.22	-2.90	10.71	
	IC	91.41	(10.53)	85.16	(11.05)									
<b>Emotional Wellbeing</b>														
Emotional and Mental Wellbeing	CL	29.78	(1.86)	29.56	(2.30)	0.11	0.91	N/A	0.68	N/A	0.82	-1.94	2.39	
	IC	26.60	(5.48)	27.00	(3.16)									
Self-esteem	CL	34.44	(4.36)	35.22	(3.38)	0.36	0.41	N/A	0.92	N/A	0.58	-2.32	3.87	
	IC	32.00	(6.58)	32.60	(5.32)									
WHO Wellbeing	CL	18.67	(3.16)	19.11	(2.37)	0.29	0.51	N/A	0.97	N/A	0.49	-1.24	2.13	
	IC	16.50	(5.19)	17.00	(2.62)									
Connectedness in physical activity	CL	27.44	(3.81)	28.44	(3.64)	0.43	0.08	0.99	0.81	N/A	0.29	-1.00	3.00	
	IC	25.70	(5.33)	27.00	(4.69)									
Perceived Stress	CL	10.78	(5.33)	9.33	(4.53)	0.39	0.06	0.59	0.75	N/A	0.11	-0.40	3.29	
	IC	13.90	(9.31)	11.90	(5.82)									
Positive Affect	CL	40.33	(4.30)	41.44	(4.22)	0.08	0.01	0.22	0.16	0.88	0.40	-1.75	3.97	
	IC	33.90	(9.56)	37.40	(7.52)									
Negative Affect	CL	13.67	(3.08)	12.67	(1.80)	0.27	0.06	0.99	0.24	0.59	0.40	-1.31	3.31	
	IC	17.40	(9.44)	13.50	(3.63)									

*Note.* Population average (mean  $\pm$  SD) scores of the emotional wellbeing and cognitive function of older adults evaluated before (pre) and after (post) completion of 10 weeks of either Cheerleading (CL, n = 9) or Indoor cycling (IC, n = 10) exercise programmes. Cohen's d effect size was calculated for statistically significant results. CL, Cheerleading; IC, Indoor cycling; SD, standard deviation; N/A, not applicable; WHO, World Health Organisation; P<0.05, statistically significant difference

## Emotional wellbeing

The scores on the emotional wellbeing scales did not improve significantly in the Cheerleading group. However, the positive affect scores were significantly higher, connectedness in physical activity scores tended to be higher, and scores for perceived stress tended to be lower in both groups combined (effect of Visit; Table 5.3). Post-hoc tests confirmed that the positive affect score improved and the negative affect score tended to improve from pre- to post-intervention in the cycling group (Table 5.3). They also improved on the Physical ( $p = .02$ ) and Emotional function component scales of the SF12 Health Survey ( $p = .01$ ; posthoc tests in Table 5.4).

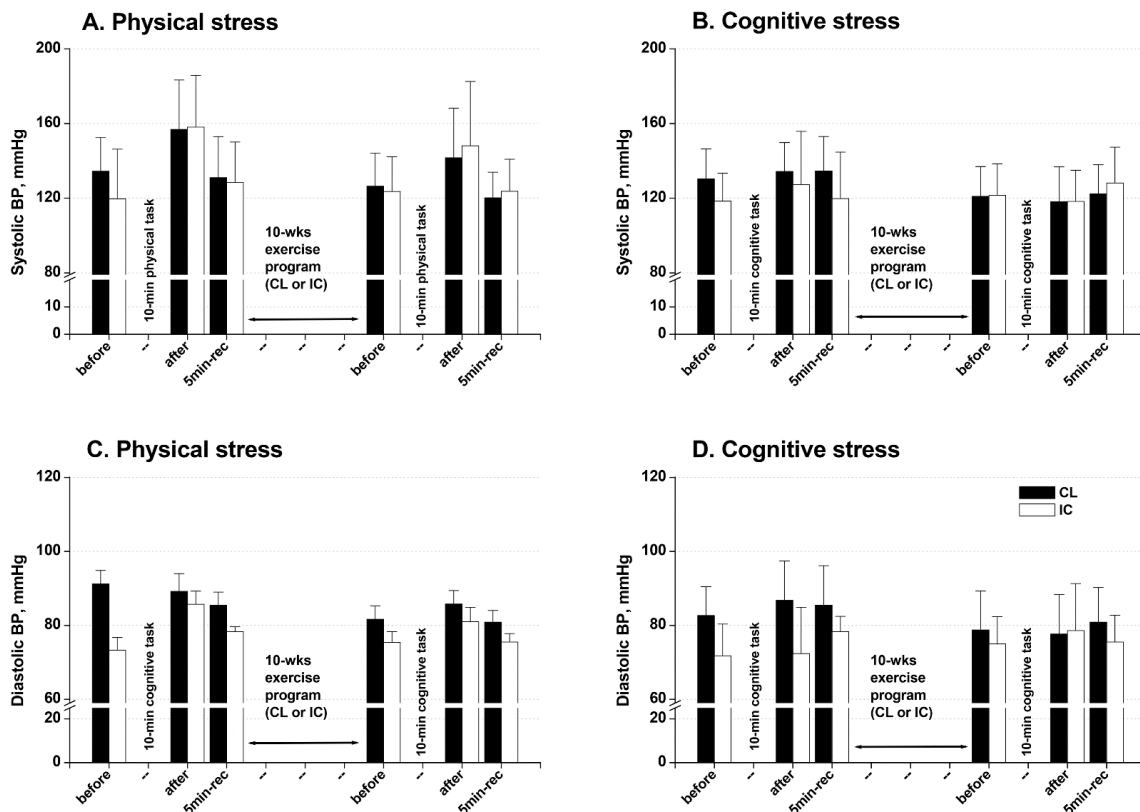
**Table 5.4** Population average (mean  $\pm$  SD) scores of the perceived physical and mental health of older adults reported on the Short Form Health Survey version 2 (Ware, Kosinski, & Keller, 1996) pre versus post completion of 10 weeks of either Cheerleading (CL,  $n = 9$ ) or Indoor cycling (IC,  $n = 10$ ) exercise programmes.

Variable	Group	Pre		Post		Baseline group difference		Effect of Visit		Effect of Visit x Group		Post hoc test
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	P-value	P-value	Cohen's d	P-value	Cohen's d	P-value	
<b>Physical Health Summary Score</b>	CL	71.14	(23.61)	70.45	(28.42)	0.59	0.25	N/A	0.21	N/A	0.95	
	IC	63.14	(32.65)	79.82	(27.99)							
<b>Mental Health Summary Score</b>	CL	52.59	(5.76)	52.74	(4.23)	0.80	0.61	N/A	0.55	N/A	0.95	
	IC	51.89	(5.73)	50.69	(4.26)							
<b>General Health</b>	CL	71.67	(22.64)	71.67	(22.64)	0.92	1.00	N/A	1.00	N/A	1.00	
	IC	72.50	(13.18)	72.50	(13.18)							
<b>Physical Functioning</b>	CL	94.44	(11.02)	83.33	(21.65)	0.24	0.38	N/A	0.30	N/A	0.10	
	IC	85.00	(21.08)	90.00	(12.91)							
<b>Role Physical Function</b>	CL	84.72	(12.15)	88.89	(14.58)	0.03	0.02	1.31	0.08	0.92	0.61	
	IC	63.75	(23.90)	87.50	(17.68)							
<b>Role Emotional Function</b>	CL	86.11	(18.16)	91.67	(13.98)	0.09	0.02	1.30	0.09	0.84	0.55	
	IC	66.25	(27.67)	92.50	(12.08)							
<b>Bodily Pain</b>	CL	88.89	(13.18)	86.11	(18.16)	0.37	0.62	N/A	0.28	N/A	0.65	
	IC	82.50	(16.87)	90.00	(12.91)							
<b>Vitality</b>	CL	63.89	(25.34)	63.89	(18.16)	0.20	0.07	0.94	0.07	0.94	1.00	
	IC	47.50	(27.51)	67.50	(16.87)							
<b>Social Functioning</b>	CL	97.22	(8.33)	94.44	(11.02)	0.20	0.53	N/A	0.18	N/A	0.56	
	IC	85.00	(26.87)	92.50	(12.08)							
<b>Mental Health</b>	CL	77.78	(16.27)	80.56	(9.08)	0.10	0.05	1.01	0.20	N/A	0.60	
	IC	62.50	(21.25)	75.00	(11.79)							

Note. Cohen's d effect size was not calculated for not statistically significant results (N/A). Data is presented for the physical and mental health composite scores and the scores of the eight subscales;  $P < 0.05$ , statistically significant difference. Post hoc test was calculated to compare the scores pre versus post completion of 10 weeks of exercise programmes separately for the groups.

## Physical fitness

Participants in both groups perceived the cognitive and physical tests completed during each visit as causing significant effort and stress (see Appendices 5.1 and 5.2). Perceived cognitive effort tended to change between the groups as only the Cheerleading group rated their cognitive effort significantly lower at post-intervention compared to pre-intervention (posthoc test; Appendix 5.1). The post-intervention changes induced by the cognitive tasks in systolic blood pressure  $F(1, 17) = 9.49, p = .01$  (Figure 5.2B) and diastolic blood pressure,  $F(1, 17) = 11.64, p = .01$  (Figure 5.2D) were also group-specific (Visit  $\times$  Group interaction). Between visits, the perceived physical effort induced by the physical task did not change. After the intervention, the increase induced by the physical task in SBP,  $F(2, 1.63) = 35.60, p = .05$  (Figure 5.2A) and DBP,  $F(1.54, 26.09) = 7.01, p = .01$  (Figure 5.2C) was significantly lower in both groups compared to pre-intervention.



**Figure 5.2** Population average (mean  $\pm$  SD) systolic (A, B) and diastolic (C, D) blood pressure registered before, immediately and 5 min after the performance of cognitive (B, D) and physical (A, C) tasks undertaken by older adults before (pre) and after (post) completion of either 10 weeks of Cheerleading (CL,  $n = 9$ ) or Indoor cycling (IC,  $n = 10$ ) exercise programmes.



### 5.3.2 Primary outcomes

#### **Feasibility**

The recruitment rate of the study was 70% (N=21) within the recruitment window of 4 months. Although the recruitment target was not met, the dropout from the study was only 10% (N=2). In total, 39 older adults showed interest to participate and enrolled on the exercise programmes during the recruitment window of four months however 64% (N=25) were eligible to take part in the study. They were invited to the screening and familiarisation visit. The other 14 were not eligible for study inclusion but were invited to enrol on the exercise programmes of their choice. After the screening and familiarization visit, 21 participants (54% of those who responded to the research adverts) provided informed consent and took part in the pre-intervention assessment. Two of them dropped out after the assessment and could not attend any exercise classes due to personal reasons or changes in their medical conditions. In total, nineteen participants completed both pre-and post-intervention assessments and attended regular exercise classes during the 12 weeks between these assessments.

#### **Acceptability**

The average attendance rate to both programmes was similar (Cheerleading:  $M = 78.6$ ,  $SD = 10\%$ ; cycling:  $M = 82.6$ ,  $SD = 9.5\%$ ;  $p = .78$ ). Over 12 weeks, 95% of the participants in both groups attended at least 10 exercise classes and only one participant in the Cheerleading group attended 9 classes. The overall retention rate of the exercise programmes was above 80% over the 12 weeks as reported by the charity. The Physical Activity Enjoyment scores showed similar enjoyment in both programmes (Cheerleading: 87, cycling: 76;  $t(17) = 1.7$ ,  $p = .10$ ). There was no difference between the groups on the subjective evaluation scales,  $t(17) = 0.23$ ,  $p = .82$  because 90% of participants described the activities as interesting, pleasurable and fun. Post-intervention, 89% of the participants felt more vital, 100% felt better after the classes, 68% experienced less pain, 100% felt that it was good to do something for themselves and would recommend the exercise programmes to their peers. Importantly, 90% of the participants reported that they would like to continue the weekly activity. These results indicate that the community-dwelling older individuals find the group exercise programmes highly acceptable; therefore, such exercise programmes can be implemented as exercise interventions in larger-scale community-based trials.

## 5.4 Discussion

This study investigated the feasibility of a research study that measures the health benefits of community-based exercise programmes and assessed the acceptability of a novel Cheerleading exercise programme in older adults. Cheerleading was found to be an acceptable community-based exercise, although some aspects of the feasibility of the research need to be considered. Furthermore, the results indicated that adherence to short-term Cheerleading exercise, with its higher cognitive demands, produced superior improvement in reaction time, perceived cognitive effort and blood pressure response to mental stress. To our knowledge, this is the first study providing primary evidence comparing the effects of short-term exercise interventions with different levels of cognitive demand on mental stress reactivity, emotional wellbeing and cognitive function.

The areas that supported the acceptability of the Cheerleading exercise programme were as follows: high attendance and retention rates similar to conventional exercise; was perceived to be a pleasurable and beneficial exercise and participants wanted to continue for the longer term. Most importantly, both exercise programmes were enjoyable, highly valued for older adults and had high attendance rates over 12 weeks. The attendance rates were higher than the average attendance rate found in previous reviews of community-based exercise (Chapter 2, Farrance et al., 2016, Franco et al., 2015). One reason might be that the setting and the elements of the sessions, for example, the joined social gathering after the exercise classes helped build a sense of community soon after the programmes were implemented. As found in Chapter 3 and 4 and in previous studies (Robert et al., 2017; Hartley & Yeowell, 2015; Mehra et al., 2016; Parnell et al., 2015) the social factors of exercise may facilitate motivation to adhere to the exercise programme. Together, these data indicate that the Cheerleading exercise programme can be sustainable and used in any community-based setting to increase older adults' engagement in exercise.

Some areas challenged the feasibility of the research design. Engaging inactive older adults to take part in the study was challenging, although not surprising as we targeted a population who were relatively isolated and often face perceived barriers such as their physical health (Bethancourt et al., 2014; Biedenweg et al., 2014; Farrance et al., 2016; Guell et al., 2018; Murtagh et al., 2015). The drop-out rates remained low throughout the study, however, the recruitment target was not met within the set recruitment window of four months. It is

necessary to keep in mind that the community-based exercise classes had a limited number of new joiners in the first instance therefore only a low number of participants could be recruited for the study who committed to attend the lab-based assessments and the exercise programmes. It is recommended for further research to include field-based and shorter versions of pre-and post-intervention assessments, therefore a higher number of participants are likely to volunteer in the research. Furthermore, future research trials could address the challenges of recruitment by using a wide range of recruitment strategies including an advisory Patient and Public Involvement group (PPI), targeted mail invitations, radio and social media advertisement, finding gatekeepers and recruiting participants through General Practitioners, social prescribers and health professionals (Withall et al., 2020). The impact of other forms of multimodality exercise programmes with complex coordination, for example ballroom dancing, line dancing, circuit training or netball could be further investigated. Some already existing exercise programmes for youngsters could be modified for older adults that might be more appealing for men, for example kick-boxing or martial arts. Novel approaches to designing exercise interventions, for example, co-design and public involvement have been found important as part of research that targeted inactive older adults (Guell et al., 2018; Stathi et al., 2020; Withall et al., 2020). Setting up an advisory group of older adults in the development phase of the research could help design more effective intervention, recruitment methods and materials. Of course involvement in a research study as part of an exercise intervention may influence participants' adherence (either motivation to complete the post-intervention assessments or commitment to the project/researcher) but it may also offer valuable insights into specific communities. Clinical research trials often centre around clinical rehab or fall prevention exercise interventions that involve a patient population who have a health motive, but the findings might not be representative of the general older adult population in a community setting. Finding better ways to research community-based programmes are needed, such as those with field tests, a steering advisory group, evaluation surveys and qualitative interviews.

Nevertheless, we found that these exercise programmes have the potential to improve mental and physical health in older adults. Previous research established that leisure-time physical activity (Black et al., 2015), multi-component group-based exercise, or flexibility classes (Brown et al., 2009) have the potential to improve mood and emotional wellbeing in older adults regardless of the type of exercise. Similarly, in the present study, both groups showed improvement in specific aspects of emotional wellbeing. Larger improvements in the emotional state and health-related quality of life found in the Indoor cycling group may be

explained by baseline differences. Cheerleading participants entered the programme with higher levels of positive affect and physical health-related quality of life, which was retained at its completion. Overall, the results imply that regardless of activity, but most likely from increased peer socialization (Baez et al., 2017), community-based group exercise has positive effects on aspects of emotional wellbeing in older adults.

The present findings extend previous studies showing improved executive function following 6-months of dance-based exercise compared to a non-exercising control (Kattenstroth et al., 2013). Also, 16-weeks of moderate-intensity walking resulted in a larger improvement in executive function compared to high-intensity or resistance exercise (Coetsee & Terblanche, 2017). The enhanced performance on the Stroop Incongruent task in the Cheerleading group demonstrated that similar improvements can be achieved even with lower frequency and intensity of exercise. This is essential because older adults are more likely to feel competent and adhere better to exercise programmes with lower intensity (Tse et al., 2015) and shorter duration (Mcphate et al., 2013). Arguably, as a reduction in perceived physical effort during exercise implies improved physical fitness (Travlos & Marisi, 1996), so does the lower cognitive effort perceived by the Cheerleading group suggest improved cognitive function and resilience to mental stress. Excessive reactivity to stressors is one of the main risk factors for age-related cognitive and emotional decline (Stawski, Sliwinski, & Smyth, 2006). Reduced blood pressure reactivity to mental stress has been previously demonstrated in older hypertensive women after acute resistance exercise (Gauche et al., 2017). The present study extends this finding by showing significantly lower systolic blood pressure response to the cognitive tests at post-intervention in the Cheerleading group only, which is in line with reported lower perceived cognitive effort. This finding supports the consensus that cardiorespiratory fitness is not the only factor mediating improvements in cognitive function with exercise (Young et al., 2015). In fact, better health-related quality of life and mood were associated even with relatively small amounts of regular exercise and slight increases in fitness. Here, at the entry point, the Cheerleading group had higher systolic and diastolic blood pressure compared to the cycling group. Therefore, it appears that the benefit from participating in moderate-intensity exercise was more pronounced in Cheerleading, which supports previous evidence for the positive effect of this exercise modality to reduce blood pressure reactivity to mental stress (King et al., 2002). The combined improvements of physiological fitness, emotional state and resilience to mental stress post-intervention are likely to have equipped the Cheerleading participants with the resources to focus better and therefore achieve improved

performance on the cognitive tests. Considering that lower intensity (Tse et al., 2015) and more stimulating programmes are preferable for older adults (Farrance et al., 2016), these findings might inform the design of exercise interventions and increase adherence in this age group.

#### *5.4.1 Limitations of the study*

Notwithstanding the contributions of this research, several limitations have to be considered. First, a self-selection bias may limit the findings of this research as older adults voluntarily applied to participate in the research. Therefore they may have had a more favourable view of exercise or be more aware of the benefits and importance of physical activity for older adults (Hernán et al., 2004). Future research might consider using gatekeepers such as healthcare professionals to identify highly sedentary individuals and refer them to the research. Secondly, the population studied is not entirely representative of the general population regarding gender, ethnicity and education level. London's population is diverse, with around 27% of older adults from Black, Asian and Ethnic communities and we recruited 21% from ethnic communities. We invited older adults from several culture-specific community clubs but did not directly engage with these communities, nor did we use other recruitment strategies. However, it is important to do so in future to ensure that research is equitable and representative. Finally, the sample size of 19 older adults is relatively small and limits generalizability of the results on cognitive function and emotional wellbeing. The insufficient level of recruitment might have been affected by the types of exercise offered. Cheerleading and indoor cycling might have both been perceived as too intense and cheerleading may have been associated with women and youth. Recruitment might have been also affected by the length and location of the pre- and post-intervention assessments which took place at university not the community setting. Future research studies could test the impact of different multimodality exercises on cognitive function compared with an active control group and use novel approaches for recruitment and intervention testing.

#### *5.4.2 Conclusion*

In summary, this study demonstrated that a novel Cheerleading exercise programme could be an acceptable, pleasurable and beneficial exercise programme for older women. Furthermore, the design of the programmes has the potential to improve exercise adherence in previously inactive older adults. The secondary outcomes showed the positive impact of exercise programmes on mental health and blood pressure reactivity. Both regular short-term dance-based classes with increased cognitive demand and conventional exercise showed

potential to act as preventative strategies against the age-associated decline of mental health potentially including dementia. The more cognitively challenging exercise had the additional capacity to produce superior improvements in executive function and emotional resilience compared to conventional exercise.

Future research should be conducted with larger populations to further evaluate the effectiveness of dance-based exercise programmes on cognitive function and emotional wellbeing. Such programmes might consider recruitment strategies that involve men and also older adults from different ethnic backgrounds. Such programmes should also consider culturally-significant types of dance that would be attractive for different communities. For example, Bollywood dance within Indian communities.

#### *5.4.3 Relevance for the following chapter*

The findings indicated that the design of the exercise programmes that were found in Chapter 3 and 4 has the potential to improve exercise adherence in inactive older adults. However the failure to meet recruitment target highlighted the challenges of engaging inactive older adults to participate in exercise. Therefore in the final chapter we aim to further understand the barriers of inactive older adults and investigate the factors that might help them engage in exercise.

## Appendices

**Appendix 5.1** Population average (mean  $\pm$  SD) scores of the perceived cognitive effort (RPE) and perceived stress (VAS) registered before and immediately after the performance of cognitive tasks undertaken by older adults pre and post completion of either 10 weeks of Cheerleading (CL,  $n = 9$ ) or Indoor cycling (IC,  $n = 10$ ) exercise programmes. Post hoc test was calculated to compare the changes pre and post completion of 10 weeks of intervention separately for the groups. Post hoc test was not calculated for not statistically significant Visit  $\times$  Group interaction (N/A);  $P < 0.05$ , statistically significant difference.

	Cheerleading		Indoor cycling		Effect of Visit (pre vs post)		Effect of Visit $\times$ Group		Effect of Time (before vs after)		Post hoc test		
	Pre	Post	Pre	Post	<i>P</i> -value	<i>Cohen's d</i>	<i>P</i> -value	<i>Cohen's d</i>	<i>P</i> -value	<i>Cohen's d</i>	<i>P</i> -value		
<b>Perceived cognitive effort (RPE)</b>												<b>CH</b>	<b>IC</b>
Before tasks	7.67 (1.22)	8.44 (1.42)	8.40 (1.84)	8.80 (2.44)	0.09	0.87	0.06	1.00	< 0.001	2.35	0.02	0.34	
After tasks	13.22 (3.07)	11.22 (2.39)	13.35 (1.76)	12.80 (1.40)									
<b>Perceived stress (VAS)</b>													
Before tasks	5.00 (2.29)	5.67 (2.69)	5.30 (3.16)	3.90 (0.88)	0.79	N/A	0.71	N/A	< 0.001	2.50	N/A	N/A	
After tasks	8.67 (3.61)	8.56 (3.61)	10.50 (3.72)	10.20 (4.24)									

**Appendix 5.2** Population average (mean  $\pm$  SD) scores of the perceived physical effort (RPE) and perceived stress (VAS) registered before, after the peak inclination and 5 min after the performance of physical treadmill tasks undertaken by older adults pre and post completion of either 10 weeks of Cheerleading (CL, n = 9) or Indoor cycling (IC, n = 10)

	Cheerleading		Indoor cycling		Effect of Visit (pre vs post)		Effect of Visit $\times$ Group		Effect of Time (before vs after peak inclination)	
	Pre	Post	Pre	Post	P-value	Cohen's d	P-value	Cohen's d	P-value	Cohen's d
<b>Perceived physical effort (RPE)</b>										
Beginning of Physical task	9.78 (2.73)	11.00 (1.66)	10.70 (1.34)	9.60 (1.84)						
Peak inclination	12.78 (1.72)	13.11 (1.62)	14.05 (1.67)	12.90 (1.66)	0.93	N/A	0.07	0.94	< 0.01	0.98
5 min Recovery	7.67 (1.22)	7.89 (1.62)	8.40 (1.51)	8.70 (1.16)						
<b>Perceived stress (VAS)</b>										
Beginning of Physical task	7.22 (2.95)	7.11 (2.89)	7.50 (1.96)	6.20 (1.55)						
Peak inclination	8.44 (3.71)	8.56 (3.28)	10.40 (2.88)	9.00 (2.71)	0.62	N/A	0.19	N/A	< 0.01	2.49
5 min Recovery	4.89 (1.90)	6.22 (3.31)	4.40 (2.17)	4.20 (1.23)						



## Appendix 5.3 Ethical approval

**London South Bank**  
University

Direct line: 0207 815 5422  
E-mail: dawkinl3@lsbu.ac.uk  
Ref. SAS1617

Wednesday 26<sup>th</sup> October 2016

Dear Zsofia

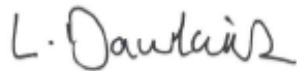
**RE: Physical Activity for Healthy Ageing: Does type of activity matter?**

Thank you for submitting your amendments.

I am pleased to inform you that full Chair's Approval has been given by Dr. Lynne Dawkins, on behalf of the School of Applied Sciences.

I wish you every success with your research.

Yours sincerely,



Dr. Lynne Dawkins  
Chair, Research Ethics Coordinator  
School of Applied Sciences

## Participant Information Sheet

### Physical Activity for Healthy Ageing: Does type of activity matter?

You are invited to participate in an investigation which has been approved by the London South Bank University (LSBU) Research Ethics Committee. Before formally agreeing to participate, please read the following information, making sure you fully understand what the study involves. If you have any questions regarding the investigation please feel free to ask, and we will do our best to explain and provide any further information you may require.

**Study Purpose:** The number of adults reaching old and very old age is dramatically rising in the UK, therefore new strategies are needed to target successful ageing. The purpose of this study is to evaluate the impact of two different types of exercise on physical, cognitive and mental health. One exercise will be indoor-cycling on a stationary bike, the other will be a dance-based activity; both led by qualified instructors. In this pilot project, we will compare the beneficial effects of these exercises. Understanding the influence of physical activity type on different health outcomes will inform local and national policy to shape the framework for physical activity prescription and referral.

**Procedures:** To help us achieve our aims, you will be asked to attend the LSBU laboratory on 3 separate occasions. In the first session you will be introduced to all methods that will be used during the main sessions and be introduced to all the questionnaires used in the study. You will be allocated to an exercise group and will be required to attend 1h/week training for 12 weeks on Tuesdays at 2-3pm and after the activity you will have chance to have a cup of tea and coffee together

Your second and third visits to the lab will involve performing some pre- and post- training tests as described below.

**Pre- and post-training assessment:** 1-2 weeks prior to the start of the training programme, you will be asked to attend the lab to assess factors relating to your physical and mental health. You will undergo a set of physical measurements including body composition (height and weight), blood pressure, heart rate (monitored by chest strap) and brain blood flow (using a sensor positioned on the forehead). You will be asked to complete a battery of questionnaires (outlined below), two types of challenging cognitive tasks, a physical function test (joint repositioning test – outlined below) and one physical training task (outlined below).

For the post-training assessment the same tasks and measurements will be repeated and you will be asked to take part in a short interview where you will be asked about your experiences in taking part in the study, attending the sessions and completing the measurements in the lab.

Assessments will be performed before and after your 12-week training programme and will include the following:

- Abdominal Circumference –the circumference on waist level will be measured using a flexible tape.
- Body Composition Analysis – a segmental bioelectrical impedance analyser (TANITA) will be used to determine whole-body and segmental mass of bone, muscle, fat and water content.
- Questionnaires: International Physical Activity Questionnaire, Health Related Quality of Life, subjective Well-being scale, self-esteem scale, emotional state and perceived Stress Scale
- Cerebral perfusion: We will attach a small sensor to your skin overlying the forehead. This will be recorded during both mental and physical stress tests and throughout recovery. This procedure assesses regional blood flow and oxygenation status of the frontal lobe of the brain – it is non-invasive.
- Physical Stress Test: you will be asked to walk on a treadmill at your self-selected preferred walking speed. The treadmill incline will be increased every 2 min from 1% to 9%. The

walking test will last no more than 10 minutes or until volitional fatigue. You will indicate your perceived effort at the end of each 2 min stage; your well-being and HR will be monitored throughout and the investigator will terminate the test if HR reaches 80%max.

- **Mental Stress Test: 'Stroop' Test** - Using an online timed colour word test, you will be shown a series of names of colours or neutral words written in a different colour from the colour specified in four different task condition. You will need to identify the colour of the word correctly and work as fast as possible to obtain a high score.
- **Mental Arithmetic Test**: you will be presented a two or three digit number and will be asked to repeatedly subtract seven from each number, new numbers were given every 5–10 sec. You will be asked to assess task difficulty on completion of the protocol, using a standard Borg Scale and current emotional state using PANAS questionnaire.
- **Sensorimotor Test**: Sensorimotor function will be assessed through joint-repositioning task (ankle and knee) during standing with eyes closed. The investigator will actively position the your joint at a set angle, and you will then be asked to replicate the joint position.

**The training programme:** You will be allocated into either Danced-based training or Indoor cycling training and asked to attend those training sessions 1 day a week for 12 weeks; an hour long training session will be conducted by a trained exercise professional to include a standardised warm-up and cool down (10 min each). Your attendance will be recorded and you will be asked to monitor your perceived exertion and mood after each session.

**Requirements and time commitment:** For study purposes you will need to refrain from other types of structured exercise training throughout the entire trial. You will also need to refrain from caffeine, alcohol and nicotine 12 h before your 2 laboratory visits (pre- and post-assessments). Both visits will last approximately 1.5 h.

**Exclusion criteria** – For your own safety, if you have any of the following conditions, you will not be able to take part in the study:

- an unstable medical condition, neurological, metabolic or cardiovascular disorder or any history of seizure or epilepsy.
- recent surgery
- recent or current upper respiratory tract infection or a fever;
- taking drugs (prescription, investigational or recreational);
- allergic to adhesive tape or alcohol swabs to which you will be exposed in the course of the study

**Possible risks and discomfort:** The exercise you will perform may feel exhaustive but is designed to be within your limits of comfort. As with any exercise you may feel sore or tired afterwards. The cognitive tests are challenging – they are designed to be mentally stressing but should not cause you any distress.

We will ensure good practice throughout the trials. Your physical and mental wellbeing will be monitored and support will be provided if necessary. Any test can be stopped immediately should you feel the need to do so.

**\*\*\*\*You are free to withdraw from the study at any time. If you are student volunteer, this will not jeopardise your course of study\*\*\*\***

**Benefits** – You will attend a 12 week training programme at a moderate intensity which is beneficial for your cardiovascular, musculoskeletal system, physical function and wellbeing. During the assessments you will be able to find out more about your current level of physical and mental health.

**Confidentiality** –In accordance with the Data Protection act, your personal information/results will be recorded and filed using a code rather than your name, and you will not be individually identifiable. Data stored on computer will be password protected and accessed only by the investigators. A full record of your individual results can be provided upon request. Your data will be kept for 2 years, after which it will be permanently deleted or destroyed.

Taking part in the study is voluntary and you are free to withdraw at any time without any penalty, without providing a reason. If you experience any emotional or physical discomfort/harm from taking part in the study please seek medical advice from your GP and we advise you to inform the researcher or her supervisor.

**Further information** -Should you currently have any queries or require further information, please do not hesitate to contact:

- Zsofia Szekeres

Room E245, Applied Sciences, LSBU

E-mail: [szekerez@lsbu.ac.uk](mailto:szekerez@lsbu.ac.uk)

Tel: 07598432571

- Lisa Zaidell

Room E226, Applied Sciences, LSBU

E-mail: [zaidell2@lsbu.ac.uk](mailto:zaidell2@lsbu.ac.uk)

Tel: 0207 815 7986

If you would like to make a comment about the study or the researchers involved in the project please do not hesitate to contact the Head of the Department of Applied Sciences Mandy Maidment at: [maidmem@lsbu.ac.uk](mailto:maidmem@lsbu.ac.uk); Tel: 0207 815 7937

You may also contact the University Research Ethics Committee if you wish to discuss the ethical conduct of the study: [sasethics@lsbu.ac.uk](mailto:sasethics@lsbu.ac.uk) Ref#: SAS1617

**London South Bank  
University**

**Consent Form**

**Physical Activity for Healthy Ageing: Does type of activity matter? Evaluation of the impact of different type of exercises on physical and mental health**  
Ethics approval registration Number:

<b>Taking part (please tick the box that applies)</b>	<b>Yes</b>	<b>No</b>
I confirm that I have read and understand the information sheet/project brief and/or the investigator has explained the above study. I have had the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw at any time without any penalty, without providing a reason.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>	<input type="checkbox"/>

<b>Use of my information (please tick the box that applies)</b>	<b>Yes</b>	<b>No</b>
I understand my personal details such as phone number and address will not be revealed to people outside the project.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my data/words may be quoted in publications, reports, posters, web pages, and other research outputs.	<input type="checkbox"/>	<input type="checkbox"/>
I would like my real name to be used in the above.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data I provide to be stored (after it has been anonymised) in a specialist data centre and I understand it may be used for future research.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data of my interview at my final visit to the university to be audio-recorded, stored anonymised and be transcribed to use for research purposes.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to assign the copyright I hold in any materials related to this project to London South Bank University	<input type="checkbox"/>	<input type="checkbox"/>
I confirm that I have completed the health screening form.	<input type="checkbox"/>	<input type="checkbox"/>

Taking part in the study is voluntary and you are free to withdraw at any time without any penalty, without providing a reason. If you experience any emotional or physical discomfort/harm from taking part in the study please seek medical advice from your GP and we advise you to inform the researcher or her supervisor.

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Researcher

\_\_\_\_\_  
Date

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Signature

**Project contact details for further information:**  
Zsafia Szekeres      Email address: [szekerez@lsbu.ac.uk](mailto:szekerez@lsbu.ac.uk)



## CHAPTER SIX

# Inactive by choice or inactive by force: a mixed-method study of barriers and motivation to exercise in inactive older adults during a pandemic

### Abstract

Physical inactivity impacts the emotional wellbeing and physical health of older people. This study aimed to investigate the perceived barriers, facilitators, and physical activity patterns during the Covid-19 pandemic. Participants were 24 older adults ( $M = 74$  years,  $SD = 5.0$ , 17 female) who were either physically active or inactive before the first UK national lockdown in the Spring of 2020. Semi-structured interviews and questionnaires were taken during the lockdown period and followed up after 2 and 8 weeks. Both active and inactive participants reduced the amount of time they spent walking at the beginning of lockdown but increased it when some restrictions were lifted at 8 weeks. Template analysis of the interviews revealed three main themes: sense of purpose (which distinguished active from inactive participants), routes to motivation, and responses to forced inactivity. Sense of purpose was found to be a key source of motivation to exercise and was influenced by both the belief in the importance of exercise and the affective valence participants assigned to it. Active participants valued the physical and social benefits of exercise and the enjoyment they gained from it. However, by missing the social context of exercise during lockdown the sense of purpose in exercise was lost. Inactive participants could not find a sense of purpose in exercise due to lack of interest, pain, health, mobility problems or loss of confidence. However, during the pandemic all participants found purpose in walking and outdoor activities as a response to the lockdown restrictions. We suggest that finding a sense of purpose in exercise is a crucial factor for engagement. Emphasising the importance of physical activity and its benefits on physical health and emotional wellbeing could support inactive older adults to take up exercise. Our main recommendations are for educating, promoting, supporting and enabling exercise for all ages and levels of mobility.

*Keywords:* physical inactivity, older adult, exercise, mixed-method, Covid-19

## 6.1 Introduction

Physical inactivity is a global concern that is also prevalent in the UK population, especially in older adults. Recent statistics show that 27% of 55 to 74-year-olds and 47% of 75 to 84-year-olds do less than 30 minutes of physical activity a week (Active Lives Survey, Sport England, 2021). In the course of the present research, the Covid-19 virus was circulating globally and the UK Government ordered a national lockdown in spring 2020, which restricted people to their homes for 23 hours daily to control the spread of Covid-19 (similarly to what happened in many countries worldwide). This meant “forced inactivity” for many older adults, especially for those who lived in urban areas, those who had attended community-based exercise classes, and those who were clinically vulnerable (Public Health England, 2020). These measures may have accelerated the already ongoing ‘physical inactivity pandemic’ in older adults (Hall et al., 2020; Roschel et al., 2020) because several studies found that older adults engaged in less physical activity due to the pandemic (Senem et al., 2021; Yamada et al., 2020).

Physical inactivity harms emotional wellbeing (Milligan et al., 2015; Owen et al., 2010) and aspects of physical wellbeing such as immunity and physical function (De Rezende et al., 2014). In contrast, regular physical activity at a sufficient level positively impacts physical and mental health by reducing the risks of declining physical and cognitive function (Damiot et al., 2020, Morgan et al., 2019, Cunningham et al., 2020). Exercise has further potential to provide enjoyment and social ties in later life and to help older adults have a purposeful and engaging retirement (Guell et al., 2016; Leavy & Åberg, 2010; Morgan et al., 2019). In this study, we aimed to understand the effects of the Covid-19 pandemic on older adults’ (in)activity. This is important because it will provide insights into the crucial motivations for physical activity engagement as well as the crucial barriers. These can then inform strategies to facilitate the engagement and re-engagement of older adults in physical activity or exercise in the community.

The barriers to physical activity and exercise engagement have most often been assessed in cross-sectional studies that found many intrapersonal and some interpersonal and environmental factors (Compernelle et al., 2020; Gomes et al., 2017; Greenwood-Hickman et al., 2016; Mcewan et al., 2017; Murtagh et al., 2015; Thøgersen-Ntoumani et al., 2008). For instance, the number of friends exercising (Thøgersen-Ntoumani et al., 2008), living in an urban area, lack of social support and having competing responsibilities as a grandparent were identified at the interpersonal and environmental levels (Gomes et al., 2017; Murtagh et al., 2015). At the intrapersonal level, some of the barriers are demographics, poor physical and

mental health status (Murtagh et al., 2015), lack of awareness about the adverse health correlates of increased sedentary time, and enjoyment of sedentary activities (Compernelle et al., 2020; Greenwood-Hickman et al., 2016), self-efficacy and attitude towards exercise (Thøgersen-Ntoumani et al., 2008). Taken together, these studies highlight that individuals' engagement depends on themselves as well as their social and physical surroundings (for an extensive review of correlates and determinants of exercise framed by an ecological model see (Bauman et al., 2012). Understanding these provides us insight into the needs of older adults for getting more physically active that could help design research on further questions such as how does lack of opportunity/facility affect physical activity behaviour under lockdown circumstances.

Ecological models (Bronfenbrenner, 1977; Gibson, 1979; Sallis et al., 2015) are useful in qualitative research as they help to contextualise individual behaviour by considering factors at the intrapersonal, interpersonal, organisational, environmental and policy levels (e.g., Falvo et al., 2021; Hull et al., 2018, 2021). Because ecological models can be defined as metaconcepts (rather than theories), research has often paired them with another behaviour change theory (Salmon, Hesketh, Arundell, Downing, & Biddle, 2020). In this study, the self-determination theory (Ryan & Deci 1985, 2017; Ng & Abbas, 2020) and in particular, the basic psychological needs theory (Ryan & Deci, 2000b), is used as a theoretical framework to reflect on how the experiences of older adults may (de)motivate them to exercise by affecting their sense of autonomy, competence and relatedness. Briefly, the theory posits that the fulfilment of the three fundamental psychological needs leads to optimal functioning and wellbeing, and facilitates sustained engagement in an activity (Adams et al., 2017; Ntoumanis et al., 2017; Teixeira et al., 2012). Conversely, if these needs are not met, motivation to participate will be diminished (Lox et al., 2016; Ntoumanis et al., 2009; Silva et al., 2016). Physically inactive older adults are not a homogeneous group of individuals (Quested et al., 2018) and will have different motivations and barriers. For example, a physical impairment may constitute a barrier at the personal level and/or at the environmental level, or constitute a motivator at both levels if certain psychological needs are met. Using this theory within the ecological model enables us to draw connections between the lower-level motivations/barriers and the higher-level psychological needs, in relation to the different levels of the ecological model (for an extensive review and discussion see Buchan et al., 2012).

Qualitative studies uncovered that professional support (Dismore et al., 2020), exercising in a fun environment, and social bonds were motivators to continuing exercise engagement



(Chapter 2, 3 and 4; Dismore et al., 2020; Farrance et al., 2015; Killingback et al., 2017). The environmental barriers to exercise maintenance included affordability, time, weather and transport (Chapter 3 and 4, Dismore et al., 2020; Maula et al., 2019). A qualitative study that included older adults with inactive or active status explored the different barriers and facilitators and suggested three categories of older adults: active, inactive, and ‘out-and-about’ (Guell et al., 2018). Another study also identified that many community-dwelling older adults are busy with social activities or volunteering. Although they are doing light physical activity by being up-and-about, lack of time is a barrier for them to do a form of exercise that might help them improve their physical function. This also suggests that exercise is not a priority for many older adults (Guell et al., 2018; Maula et al., 2019). The important question arising from these findings is how the needs and interests of inactive older adults could be met to motivate them to engage in exercise and increase their physical activity.

To summarise, most of the previous research in older adults' exercise placed a higher emphasis on investigating the barriers and facilitators of engagement in those who had participated in or dropped out from physical activity or exercise interventions. In comparison, there is limited knowledge regarding the underlying factors that impact motivation to take up exercise in inactive older adults. This is important because engagement in health-enhancing activities has been a chief priority, but it is equally crucial to help older adults go from inactive to active status due to the notion that some exercise is better than none (Gibson-Moore, 2019; Strain et al., 2020; Tudor-Locke et al., 2011). This study aimed to elucidate the multi-level factors limiting or supporting older adults to exercise regularly before and during a pandemic. The main objectives set to achieve this aim were to identify: (1) the perceived barriers/facilitators that influence motivation to exercise and physical activity; (2) physical activity patterns when living under the external restrictions of the first UK lockdown in spring 2020 due to the Covid-19 pandemic; (3) how the lockdown restriction impacted the motivation and exercise behaviour in the perspective of older adults.

## **6.2 Methods**

### *6.2.1 Philosophical approach*

In line with the study aim, critical realism was used to account for both the reality of participants' personal and social influences (i.e., realist ontological position) and the agentic roles of participants (i.e., constructivist epistemological position) when exploring their perspectives and experiences related to exercise. Epistemological constructivism underpinned

our approach; we considered that the participants' answers to the interview questions were directly related to what participants valued and how they behaved. Semi-structured interview technique was chosen as qualitative method because of the individual subject position and isolation that was reinforced by the Covid-19 pandemic. Interviews could help to focus primarily on the individual's internal capabilities in relation to the demands of the external contexts. We acknowledged that the limitations of the public health regulations due to the COVID-19 pandemic could add to the already existing limitations of age-related physical health decline (Bennett et al., 2018) and together they can shape older adults' meaning of their subjective experiences. These underpinnings guided us in (a) designing the interview questions based on previous evidence and the socio-ecological model yet they were used flexibly during the interviews to take into account the individual experiences; (b) analysing the data through an iterative process (see detail below) and (c) presenting participant quotes and explanations in the results to show results as a third-person account and stay close to their discourse.

By triangulating the findings from different methods and emphasising the qualitative methodology within the mixed-method study design and using a theoretically-driven interview guide in this study the researchers believe that they can identify aspects, which may not be possible to elucidate by using only one type of method. The integration of quantitative and qualitative data is particularly useful in the case of under-researched topics (Creswell & Clark, 2017) such as physical activity when living under the external restrictions. Also, collecting data over time could lead to a more comprehensive understanding of the aspects of (a) motivation to exercise in older adults.

### *6.2.2 Participants*

Participants were 24 adults over 65 years ( $M = 74$  years,  $SD = 5.0$ ; 17 female and 7 male) who resided in Greater London (Table 6.1). For recruitment, the research was advertised via notice boards in libraries, community halls and churches (before lockdown restrictions were in force), and by email or telephone contact to community centres, older adult day services, and social care organisations, who then advertised the study to older people. Inclusion criteria for study participation were: living independently, being cognitively able to participate, being aged 65 years or older and self-reporting as physically inactive or having reduced physical activity under the recommended level (WHO, 2020) in the two weeks before recruitment. This means that some participants had been sufficiently active before lockdown (hereafter called *Active*), while others had not been sufficiently active according to the current global physical activity

guidelines (WHO, 2020) (hereafter called *Inactive*). From the 24 participants recruited, 10 (42%) were categorised as Inactive, and 14 (58%) as Active at the time of the first data collection point (Table 6.1). The study gained ethical approval (ETH1920-0142) and was conducted per the Declaration of Helsinki.

**Table 6.1** Socio-demographic characteristics of participants and mean/median scores of the inactive and active participants on the self-reported questionnaires related to attitudes towards being physically active and health-related quality of life at Phase 1

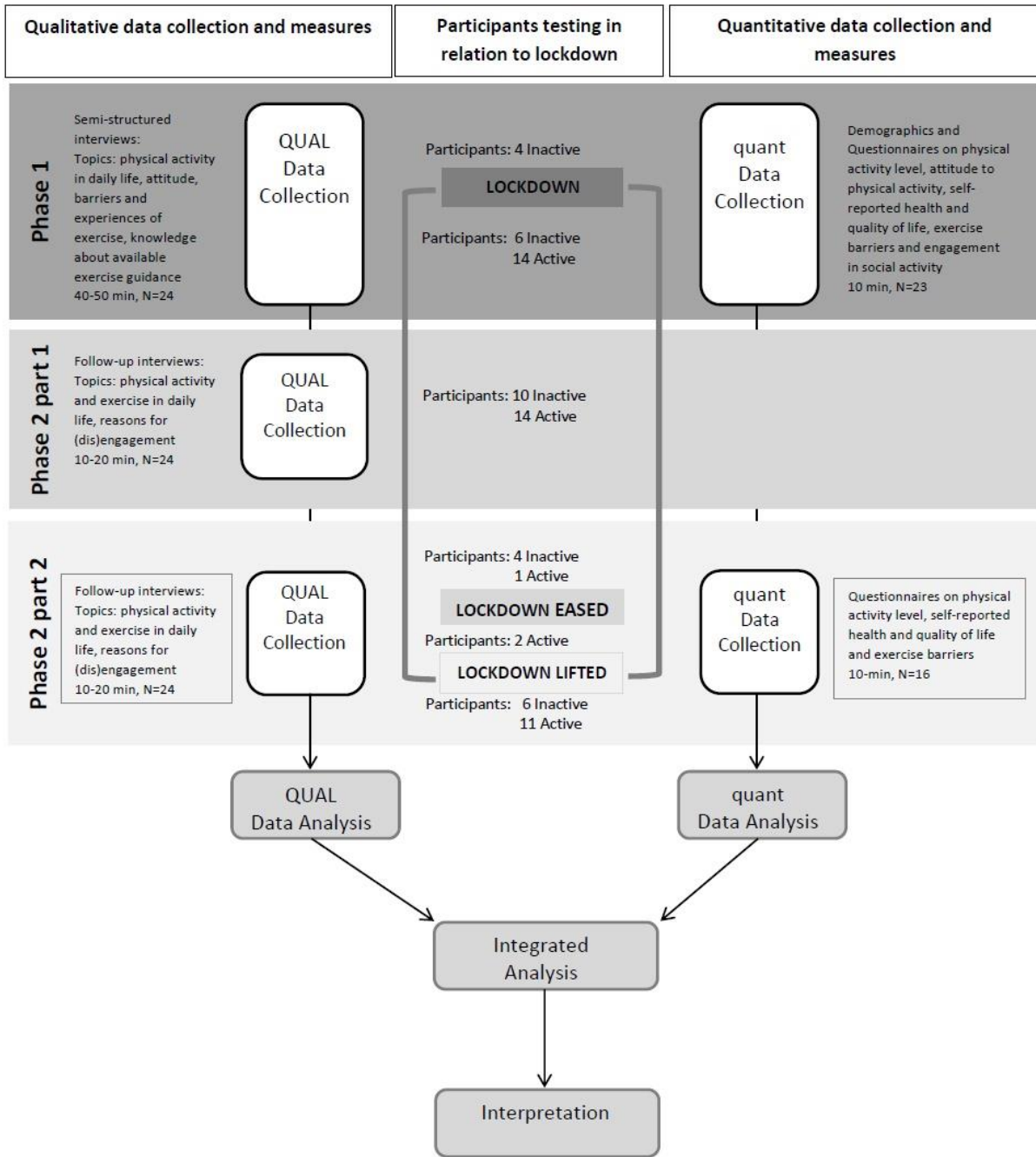
		<b>Inactive participants (n=10)</b>		<b>Active participants (n=14)</b>	
<b>Mean Age</b>		76.2 years	SD=5.9	72.4 years	SD=3.7
<b>Gender</b>	Female	6	60%	11	79%
	Male	4	40%	3	21%
<b>Ethnicity</b>	White British	10	100%	8	57%
	White other origins	0		4	29%
	Asian	0		1	7%
	Black African	0		1	7%
<b>Marital status</b>	Single	1	10%	2	14%
	Widow, divorced or separated	5	50%	6	43%
	Married	4	40%	6	43%
<b>Level of education</b>	GCSE	3	30%	3	21%
	Diploma	2	20%	5	36%
	Degree	5	50%	6	43%
<b>Work status</b>	Retired	6	60%	8	57%
	Volunteer	3	30%	5	36%
	Employed	1	10%	1	7%
<b>Health conditions *</b>	Total mean	3.5	SD=2.1	1.8	SD=1.3
<b>Clinically vulnerable **</b>	Total	5	50%	5	37%
<b>Importance (1-10)***</b>	Total median	7.5		10	
<b>Confidence (1-10)***</b>	Total median	6		8	
<b>SF-12 Physical Composite Score (24 – 57)****</b>	Total mean	44.6	SD=9.7	39.4	SD=13.6

<b>SF-12 Mental Health Composite Score (19-61)****</b>	Total mean	49.2	SD=9.6	45.7	SD=10.9
<b>Activity index before lockdown (MET)*****</b>	Total mean	553.8	SD=225.0	1205.3	SD=543.4

*Note.* \*Health conditions is the number of physical health conditions reported by the participants; \*\*During the Covid-19 pandemic; \*\*\*Perceived Importance/Confidence to exercise; \*\*\*\*Short-form Health Survey Composite Scores; \*\*\*\*\* Metabolic equivalent

### 6.2.3 Study design

An embedded mixed-methodology approach was used to analyse the collected data on perceived barriers to exercise in older adults and on factors that might have impacted their behaviour or perceptions regarding exercise. The study was run in two phases: Phase 1, where baseline data were collected via interviews and questionnaires; Phase 2, where follow-up interviews were held after 2-weeks (part 1) and 8-weeks (part 2; Figure 6.1). In part 2, a follow-up questionnaire was also completed. It is important to note that the original study was amended due to the lockdown being imposed in the UK at the beginning of data collection. The amendments were to add questions regarding the impact of lockdown on physical activity, the interviews being conducted over the telephone, and the inclusion of older adults who had been active before lockdown but were currently inactive. The lockdown restricted personal contact between people from different households, and no exercise programmes were running in the community during the study. This presented an opportunity to include a third objective to the study and investigate how older adults might change their exercise behaviour due to the restrictions imposed by a lockdown. Ethical approval was gained for the original and the amended study (ETH1920-0142) and was conducted in accordance with the Declaration of Helsinki. The interviews in Phase 1 were conducted in person before the lockdown, and in Phase 2 via telephone during and after the lockdown (respectively, part 1 and part 2). The questionnaires were completed on paper after the in-person interviews, or online after the telephone interviews.



**Figure 6.1** Flow chart of the study showing data collection, analysis and points of integration of the qualitative (QUAL) and quantitative (quant) strands

#### 6.2.4 Measures

##### Questionnaires

At the start of Phase 1 participants provided information about their current levels of physical activity on the IPAQ and socio-demographics (age, gender, education level, marital status, living situation). After the Phase 1 interview, participants were asked to complete 44 questions

within a battery of questionnaires: Physical activity and exercise participation, Exercise barriers scale, the Short-form Health Survey, Importance and confidence scale (related to physical activity), Extraversion scale and Perceptions of loneliness. The description of the questionnaires is presented in Appendix 6.1. The first three questionnaires were repeated at Phase 2, part 2.

## **Interviews**

### *Phase 1*

Individual interviews (in person or telephone) were conducted by the lead researcher using a semi-structured interview guide. The interview guide was informed by previous literature, qualitative research with active older adults regarding the determinants of adherence and the self-determination theory (Ryan & Deci 2000b). In line with socio-ecologic models of health (McLeroy et al., 1988), the questions aimed to cover different levels of influence, from intrapersonal (physical, cognitive, emotional), and interpersonal, to some aspects of the environment and policy levels. The interview guide included both open and closed questions. Three independent professionals working with older adults reviewed the interview guide to ensure that the questions were relevant and clear. The interview guide content is synthesised in Table 6.2 (presented in full in Appendix 6.2). Following the interview, participants were informed about exercise programmes available in their borough (pre-lockdown) or online (post-lockdown) and how to access those programmes. They were asked which programme felt more attractive to them in Phase 2, part 1.

### *Phase 2*

Two and eight weeks after Phase 1 (respectively parts 1 and 2), participants were interviewed again via a telephone call. During the call, their self-reported physical activity was re-assessed and they were asked whether they took up any exercise. Participants were also asked about their emotional wellbeing and day-to-day life during the lockdown period. At the final follow-up interview (part 2), which took place when lockdown had been eased, participants were asked also if they had felt supported by the local authorities and national government to stay physically active over the previous two months.

**Table 6.2** Topics of the semi-structured interviews and the questionnaires collected at the different phases of the study, organised by the different levels of the ecological model

<b>Topics of the semi-structured interviews and follow-up interviews</b>	<b>Questionnaires</b>
<b>Intrapersonal factors</b>	
Phase 1 and 2: <ul style="list-style-type: none"> <li>• Experience of exercise in the past and preferences for leisure activities</li> <li>• Perception about exercise barriers (including risk of falls)</li> <li>• Factors supporting motivation for exercise</li> <li>• Support needs for becoming more active</li> <li>• Coping mechanisms for becoming more active</li> <li>• Changes in physical activity and daily life experienced due to the lockdown</li> </ul>	Phase 1: <ul style="list-style-type: none"> <li>• Demographics</li> <li>• Physical Activity Importance and Confidence Scales</li> </ul> Phase 2, part 2: <ul style="list-style-type: none"> <li>• Physical activity and exercise participation</li> <li>• The Short-Form Health Survey</li> </ul>
<b>Interpersonal factors</b>	
Phase 1: <ul style="list-style-type: none"> <li>• Needs and preferences for engaging in social activities</li> <li>• Needs for social support to exercise</li> <li>• Needs and preferences regarding instruction/instructor</li> </ul>	Phase 1: <ul style="list-style-type: none"> <li>• Engagement in social activities</li> <li>• Perceptions of loneliness</li> </ul>
<b>Environmental factors</b>	
Phase 1: <ul style="list-style-type: none"> <li>• Needs and preferences concerning exercise setting</li> <li>• Needs and preferences concerning location and cost</li> </ul>	Phase 1 and Phase 2, part 2: <ul style="list-style-type: none"> <li>• Exercise Barriers Scale</li> </ul>
<b>Policy factor</b>	
Phase 2: <ul style="list-style-type: none"> <li>• Feelings about the support received from the government / local authority</li> </ul>	

### 6.2.5 Data analyses

#### Qualitative analysis

All interviews were transcribed verbatim and framework thematic analysis was used to analyse the data (Gale et al., 2013). Data were analysed from a critical realist perspective and both deductive and inductive approaches were used. In the deductive phase, an initial framework was developed based on the topic list of the interviews and the levels of the socio-ecological model (McLeroy et al., 1988). It allowed the researchers to explore the data in-depth and identify codes at each level of the model. While reading and analysing the interview transcripts, new codes were added and the analytical framework was reviewed. At this stage of analysis, the researchers found that the themes and sub-themes which were relevant to the research

question were mostly identified at the intrapersonal, interpersonal and environmental levels. Therefore the categorisation of socio-ecological model was removed and the themes and sub-themes were developed inductively by reviewing the content of the codes and re-organizing them to create a new analytical framework. Three researchers were involved in data analysis by transcribing and coding and discussing themes and sub-themes to reach the final framework. Patterns and themes in the data from Active and Inactive participants were reviewed using a framework matrix which was useful in interpreting results. In the final stage, themes and sub-themes were discussed by all the research team to reach conclusions and recommendations. The analysis was done using computer-assisted qualitative analysis software NVivo Pro (QSR International Pty Ltd., 2020, released in March 2020). The research team members have different academic and scientific backgrounds: three in sport and exercise psychology, two in sport and exercise sciences, and all of them have several years of experience in research relating to exercise in older adults.

### **Quantitative analysis**

Descriptive statistics (mean, median, standard deviation, and percentage change) were used to analyse the scores on the Importance and Confidence scale, Exercise barriers scale, the Short-form health survey, Extraversion scale, the Perceptions of loneliness and the measures of Physical activity (frequency of exercise, time spent sitting and time spent walking).

### **Integrated analysis of qualitative and quantitative data**

The percentages of ‘yes’ and ‘no’ answers to the closed interview questions were calculated to describe differences in preferences regarding exercise settings. Coding matrices (Bazeley, 2009) were constructed in Nvivo to integrate (sub-themes with the direction of change in physical activity level over time (Appendix 6.3). By exploring participants’ quotes in the overlap of these components, we evaluated patterns in the data of active and inactive participants.

## **6.3 Results**

### *6.3.1 Qualitative Results*

Our findings are presented in separate sections related to inactive and active participants and their experiences before and after the lockdown. The themes which emerged from all interviews



(in Phases 1 and 2) are **Sense of purpose for being physically active**, **Routes for engagement** and **Inactive by force (lockdown)**. Table 6.3 includes all themes and sub-themes, and throughout the results, quotes are presented to illustrate our findings. To reflect the diversity of our sample, quotes were selected from participants in either group, either gender, different ages, ethnicity and living situations. It is important to note, that the main themes and sub-themes, which distinguished inactive from active participants and could answer the research questions, were identified at the intrapersonal, interpersonal and environmental levels. However, the interview guide did include questions concerning organizational and policy level factors which the participants did not mention in the interviews.

**Table 6.3** Themes and sub-themes found in the interviews of inactive and active participants

Themes	Inactive participants	Active participants
<b>Sense of purpose for being physically active</b>		
	<i>Purpose linked with interest or the benefits of exercise</i>	<i>Having a sense of purpose for exercise</i>
	<i>Purpose linked with social interaction</i>	
	<i>Purpose linked with physical competence/confidence</i>	
<b>Routes for engagement</b>		
	<i>Being aware of the need for exercise</i>	<i>Being aware of the need for exercise</i>
	<i>Strategies to complete unpleasant tasks</i>	<i>Strategies to complete unpleasant tasks</i>
	<i>Convenient location and affordability</i>	<i>Convenient location and affordability</i>
<b>Inactive by force (lockdown)</b>		
	<i>Staying physically active at home</i>	<i>Staying physically active at home</i>
	<i>Starting points for exercise</i>	<i>Resilience in keeping up with exercise</i>

### **Sense of purpose for being physically active (Inactive participants)**

#### *Purpose linked with interest or the benefits of exercise*

Participants had difficulties finding a purpose for exercise and this was one of the main reasons why they did not exercise. At the same time, most of those who attempted to take up exercise in the past, had not enjoyed it and had disliked the exercise tasks or the setting. They described the exercise groups or the gym as something they have never found interesting and as a “waste of time and money”. Some inactive participants did not believe in the benefits of exercise or did not feel the need for it and felt that due to their age exercise was not for them.

*I just want to stay being able to do my daily chores fine and survive. I have a few problems doing them, but I can still cook, dress myself. I am also not sure if those*

*exercises would do me any good. (Inactive 72-year-old man, White British, at Phase 1)*

The inactive participants tended to prioritise exercise low in their “to-do list” therefore could not establish a routine of exercising. Finding excuses and procrastinating the exercise often dominated their answers. As one participant explains, she would like to be active, but her motivation is not strong enough to get started;

*But again it is about motivation, which sort of mood I have in the morning. Because of the age, I am retired, so I have that choice, don't I, so I can do whatever I want to....Oh, the motivation [to go for a walk in the park], sometimes I just start doing something else and I then forget. (Inactive 78-year-old woman, White British, at Phase 1)*

On the other hand, walking, not as an exercise but as part of daily life was the most popular physical activity for inactive participants: “not doing necessarily a lot of physical exercises like touching my toes or anything like that, but I think walking is one of the best exercises one can do.” Other activities such as volunteering, working, being a grandparent or a carer were identified as an important part of participants’ daily lives which not only provided an occupation and a structure to their days but often represented a part of their identity. These responsibilities provided opportunities for Inactive participants to incorporate purposeful physical activity into their life, for example, gardening with a charity or visiting a friend with dementia in her care home. As one participant described who does not engage in any type of exercise but does other forms of physical activity that he finds purpose in:

*I have a garden, so I do a lot of gardening, and I volunteer with a charity and that has stopped during the lockdown. We do horticultural therapy, so more gardening. I do that with children who have Down syndrome. (Inactive 69-year-old man, White British, at Phase 1)*

#### *Purpose linked with social interaction*

Missing company was a barrier in the past which made some participants lose the purpose in attending a certain activity or exercise class. For example, they stopped an activity when their friend was not able to go with them anymore, as reflected by one of the participants who stopped dancing although she enjoyed it, “when you are at the age of 77 you are not invited to so many parties” and others also found that “the older you get the fewer friends are doing it

(exercise)”. Nevertheless, social support from friends or family members as well as joining group-based exercise was identified as a promising starting point for inactive participants who might not have the confidence or struggle to find a sense of purpose and do not have a strong initial drive for exercise. For example, one inactive man have found it difficult to get out of his comfort zone due to low confidence:

*If someone would come with me I think. I was actually talking with my partner about it and thinking that we could go to the leisure centre together. But he works until 5 every day and after he is tired of course. And in the weekends we have other things to do. (Inactive 67-year-old man, White British, at Phase 1)*

Inactive participants also said they might join an exercise class if it came with a recommendation from a friend. However, the class would also have to meet their interests as it can be “very well recommended but if it is not your sort of thing you wouldn’t stick to it”. Some participants mentioned that regular face-to-face or telephone support from a physiotherapist also helped them start mobilisation or rehabilitation exercises, in which case they also had an initial drive to regain physical function. On the other hand, some participants were instructed by their GP to stop exercising while investigations took place, but were not told whether to get back to exercising afterwards.

#### *Purpose linked with physical competence/confidence*

Limitations in physical health were outlined by some inactive participants and these related to heart problems or cancer. These limitations, even if they were present only for short period of time, often built roadblocks for older adults and stoped them to be active also in the longer term. As we found in the examples of an old woman who struggled to get out of her comfort zone physically after some health problems:

*I had some health problems and while those were investigated, my GP said that I shouldn't do exercise. These were some problems related to my heart. Probably now I could do some exercise, I just didn't really get back to it. But maybe the other thing that stops me is that I know I would tire more quickly now and I get out of breath more quickly. (Inactive 79-year-old woman, White British)*

Limitations in physical function were mentioned by several participants, who had musculoskeletal problems, arthritis or balance problems. They reported that these problems stopped them from doing certain types of exercise they had enjoyed in the past. After a fall, an

injury or increased pain they were not able to do their favourite exercise or do it to the same level, therefore they lost confidence, put on weight or their fitness level significantly dropped. Some of them felt that alternative exercises would be too vigorous, not interest them, or not be enjoyable for them.

*I can walk about 5-10 min slowly and then I have to stop and sit down somewhere, my legs would not take anymore. And when I tried Tai chi, I felt a bit embarrassed because I couldn't do all the exercises. I have a bad knee so I couldn't stand on one leg. I have a bad knee and a bad hip but on different sides. (Inactive 67-year-old man, White British, at Phase 1)*

Back pain and joint or musculoskeletal problems in the legs were mentioned the most frequently and many participants had stopped exercising due to these problems. Some of them changed exercise and tried something different but after unsuccessful trials, they stopped exercising altogether. One of the inactive participants reported severe debilitating functional problem which “drastically changed” her life and her physical activity was “massively reduced due to misdiagnoses and unnecessary immobilisation with plaster”.

Psychological limitation due to cognitive and emotional challenges was identified as another significant barrier to exercise by inactive participants. Physical health problems or injury seems often linked with anxiety about exercising and permanently impacted confidence. Participants felt that it was a “mental thing”, that “something has changed” and they did not feel like doing exercise anymore, or they “got a bit down” and became “anxious about it”. Feeling self-conscious about body-image and difficulty concentrating was presented by only a few inactive participants while low motivation and lack of self-discipline came up more frequently. In contrast to these limitations, a few inactive participants who had done exercise before, mentioned enjoyment and socialising as potential motivating factors and they explained how important it is to find an exercise that matches their physical abilities and their interest such as an activity fitting to their health needs or giving them a sense of accomplishment. As one participant described who had a positive experience of a form of exercise she had done before:

*Dancing was good fun, we put some shows on. And there was an end result, I think that is what I like, so you can see you achieved something. And that was nice and sociable as well. (Inactive 78-year-old woman, White British, at Phase 1)*

## **Sense of purpose for being physically active (Active participants)**

### *Having a sense of purpose for exercise*

The initial drive to exercise for most active participants were health reasons or socialising, particularly for those with limitations in their physical health or physical function. They regularly completed their hydrotherapy or physiotherapy exercises to facilitate their recovery from an injury and they appreciated that these exercises allowed them to “be able to walk, doing everything by (themselves)” and having no “need for any help from others; so doing the exercises helps me a lot”. Maintaining physical fitness and healthier ageing was one of the main reasons to exercise for those participants who have attended vigorous exercise for many years. Many active female participants shared their experience of first joining a gym or exercise group with a friend. In the past, some of them continued to adhere even on their own as they had positive experiences, while others found it harder to carry on if their friend dropped out. Socialising, feeling open to suggestions and trying something new were also identified as starting points as it helped active participants to find an activity that suits their physical needs and that they feel comfortable doing. For example, having a friend to go with had helped a participant to find an exercise they enjoy and adhere for long term:

*My friend told me about it (Aqua aerobics) and then I started to go with her. I cannot swim, but I gave it a try and found it very good. First, I was a bit unsure, a bit afraid about it. But once I started, I just stuck to it, I found it really beneficial and I go on my own now. (Active 71-year-old woman, Black African, at Phase 1)*

Some of the active participants reported that having an incentive, such as losing weight or doing a challenge, motivated them to start an activity in the past but in order to adhere they need to find the activity enjoyable or with perceivable benefits.

Benefits of exercise, including functional, physical and emotional health, and social benefits of exercise were all presented in the active participants’ accounts with most of them stating that it makes them feel generally better, more energetic and “lifted”. The positive effect of exercise in maintaining mobility and balance or managing arthritis was just as commonly mentioned as emotional benefits. Those active participants who attended group-based exercise classes reported that a sense of community had developed in their exercise group and they believed that “joining a class is always helpful and motivating”:

*I think it improves mental health, I think it does. It makes you feel more tired but it’s good. If it is part of a group then it is a nice social activity as well. (Active 71-year-old female, White British, at Phase 1)*

On the other hand, individual exercise may be less likely to build a sense of community:

*At the swimming club I wouldn't mix with the people for the rest of the week, I would just meet them there, they come from all over [the city]. Sometimes we have a coffee but most of the time people just come and get back home. (Active 68-year-old female, White Irish, at Phase 1)*

Interestingly, a gender difference was identified in relation to the exercise format. Most male participants said they preferred to do exercise alone (e.g., cycling or going to the gym), while all the female participants preferred to exercise “with other people, as you get more motivated” and with exercise guidance from an instructor.

To summarise this theme, both inactive and active participants needed a sense of purpose to engage in their leisure activities. The active participants found purpose in exercising due to their positive experiences regarding enjoyment, socialising and improved health or fitness. Inactive participants reported previous struggles to gain positive experience in exercise participation due to lack of interest, social support, physical competence, and confidence. Therefore, finding a type of physical activity which provides an added purpose or value to participants' lives could be identified as a crucial factor for adherence.

### **Routes for engagement (Inactive participants)**

#### *Being aware of the need for exercise*

The maintenance of health and physical function might be a starting point for inactive participants who acknowledged “as I get older it would help get around better and have less problem with falling over”. Receiving a diagnosis of ill-health in the past made some of the inactive participants take up exercise for some time, for example, a participant with diabetes thought “I have to do something, it was a wake-up call” but with time they stopped exercising. Guidance from a medical professional seemed to improve awareness about the importance of physical activity for some participants. On the other hand, even specific advice on physical activity from the general practitioner was not sufficiently motivating for other inactive participants, as one of them expressed:

*My GP is always telling me that I should exercise, but I wouldn't do it even if I am told, that doesn't work for me. I need to be interested in it. (Inactive 72-year-old man, White British, at Phase 1)*

The importance of keeping active was highly rated for most inactive participants who generally recognised the need for maintaining their mobility in their old age. Yet, the majority understood “keeping active” not as doing exercise but as being mobile and incorporating physical activity in their daily life as a way to avoid losing their independence. As one of them highlighted “when I damaged my Achilles tendon that was shocking, I was unable to do things, so it is important to keep active”. When asked how important exercise was for them, some inactive participants said “I know it should be a 10 [very important]” but they “just don’t feel that way, to be honest” or “no, it is not that important, it is somewhere in the middle”. The interview data from these participants indicated no acknowledgement of the strong link between doing regular cardiovascular, strengthening or balance exercises and “keeping active and healthy in old age”. One inactive participant, for example, was lacking interest because of not having knowledge and belief in the importance of resistance exercise for bone health:

*I am not in favour of doing weight lifting and all of that stuff because I don't think it does me any good. We have to take into account my age, it is something I use as an excuse. I think something, I suppose, which promotes me is that generally speaking - apart from the diabetes which shocked me, I think my health is good. I am very lucky, I have a good set of genes. (Inactive 79-year-old man, White British, at Phase 1)*

It is noteworthy that, for some inactive participants, exercise used to be very important in the past, for example, they had active childhoods or had a favourite exercise, but they gave that up due to injury, changing and competing responsibilities in adulthood, and lacking the confidence to re-engage.

*I think it is a matter of where my head is and where my heart is at the moment. I just don't have the enthusiasm for the spinning what I used to have. I lost confidence somehow. (Inactive 79-year-old woman, White British, at Phase 1)*

#### *Strategies to complete unpleasant tasks*

Participants described the strategies they use to motivate themselves to complete unpleasant tasks that involved physical activity (e.g., cleaning). These strategies are individual-specific and reflective of their problem-solving style. Having a social commitment helped participants overcome low motivation towards an activity because they found that if they “promise” a friend they will do it, they “don’t like letting people down and feel guilty”. Some other motivators mentioned were, “I tend to tell myself that things will become easier” or “listening to jazz” or

breaking down difficulties in smaller parts, or just get on with a task due to necessity, as the following participant said:

*Because it needs to be done and I like to keep my house tidy, and I don't like things piling up and not get things done so I just do it, get it out of the way. (Inactive 77-year-old woman, White British, at Phase 1)*

#### *Convenient location and affordability*

Location was identified as having a positive influence on the decision to take up exercise or not. Participants expressed a preference for joining an exercise group or going to the gym in their local area, “somewhere in walking distance” or at around 20 minutes bus journey in their close neighbourhood, “if there would be a gym on the bottom of my stairs I would be in the gym all the time.” On the other hand, most of the participants acknowledged that they have a local leisure centre which they could access at an affordable price. The proximity of opportunities on its own was insufficient to encourage some inactive participants or they “would rather do it at home”.

*“But I shouldn't really have any excuses because we have a big leisure centre right next door virtually. But I don't want to do any of the group activities, I don't think. (Inactive 87-year-old woman, White British, at Phase 1)*

Most inactive participants would rather not use exercise equipment and we found inconsistency about inactive participants' preferences for using tools to monitor achievements as captured in the following quote of a woman who did not find a value in the often-recommended step-counting.

*I know women who have got that thing in their wrist and they go to do 10000 steps every day, I think that is a load of rubbish actually. I would never do that. (Inactive 78-year-old female, White British, at Phase 1)*

While another participant explained how an activity monitor device has helped her to avoid being sedentary:

*I do wear a watch actually, it tells you how many calories you burnt at a certain time and it rings to tell me “stand up”, so yes I am aware of my movement and I think it helps. (Inactive 77-year-old woman, White British, at Phase 1)*

Affordability was found likely to enable inactive participants to take up exercise and do it regularly, as most participants live on pension. They often stated that they “wouldn't feel



comfortable paying” and they would appreciate the exercise being free at their age or doing it as part of an exercise referral scheme.

### **Routes for engagement (Active participants)**

#### *Being aware of the need for exercise*

The importance of active leisure as part of their weekly activities was particularly highlighted by the active participants. Before the lockdown, they regularly attended group-based exercise classes or went to the gym. For them, exercise was often part of their identity: “For me, it is very important, I have been active from a very young age, my family were very sport-oriented and then I carried that on from a child until now really.” Active participants also explained the importance of reminding themselves about the benefits or using other tools to keep themselves motivated towards an exercise, such as setting a target, or a regime, “I sing while I am doing it” or having an emergency plan in place like a chair nearby if they feel too fatigued during exercise, and only doing the exercises they can do.

*I have a look at the benefits what it will do to me, what I would achieve from the plan. If I think it would be very good for me and be a benefit, then I force myself to go and do the plan. (Active 71-year-old woman, black African, at Phase 1)*

#### *Strategies to complete unpleasant tasks*

Barriers to regular exercise were rarely mentioned by active participants (apart from barriers experienced after lockdown described later). Participants who had had injuries or a history of falls reported that it may have reduced their confidence or made them stop certain types of exercise, but they took up exercise alternatives better suited to their needs. Another barrier to adherence was changing priorities, but they had the confidence to overcome such barriers. For example, some of them changed their exercise class because they suddenly had a new responsibility in their lives, while others mentioned other priorities as the reason for occasionally missing a weekly exercise class and replacing it by doing more walking or another exercise class in the week.

#### *Convenient location and affordability*

The proximity to home and the affordability of sessions was not always indicated as important by active participants. Some of them attended their favourite exercise class which was available

at a large distance and they even took the train or car to get to the location. Also, some participants paid yearly membership in the local gym and the cost was less important than convenience. Other active participants went to their local leisure centre or park; they preferred not to travel further and preferred to pay session by session anything between £2 and £10.

To sum up, both inactive and active participants valued physical activity and rated its importance high but their interpretation of what it means to be physically active was different. For inactive participants, being physically active meant keeping their mobility in old age. For active participants, being physically active meant doing regular exercise and keeping their sense of fitness and strength. Both for inactive and active participants, individual-specific strategies to complete unpleasant everyday tasks, convenience and affordability were identified as factors which could facilitate long-term engagement in physical activity. These findings highlighted how some of the previously identified intrapersonal and environmental level themes of Chapter 3 and 4 could facilitate exercise uptake in previously inactive older adults and continuous engagement in sufficiently active older adults.

### **Inactive by force (lockdown, Inactive participants)**

#### *Staying physically active at home*

The baseline interviews established that the activities around the home kept inactive participants busy and provided them with opportunities to do purposeful physical activity before and soon after the start of lockdown. Keeping a structure with similar daily habits as before was found to be important as they valued achieving something and “don't let things just go all day, without it, it's easy not to bother.” They listed activities, such as “gardening, tidying up”, a variety of housework chores or cooking and “sitting in the garden in the nice weather”. Some of them also mentioned using puzzles, crosswords or reading to keep their “brain active”.

The interviews conducted in Phase 2 revealed that as the “novelty” of the lockdown wore down and they managed to complete the majority of home-based jobs they wanted, boredom and lack of motivation became more prominent. Participants' mood changed over the two to eight weeks into the lockdown with feelings of low-level external stimulation, boredom, frustration, being “fed-up” and feelings of low mood. These negative feelings strongly reduced their motivation to exercise or to do other activities, as some participants stated: “it is like the less you do the less you want to do”. The final follow-up interviews revealed that with the ease of lockdown restrictions, participants' mood started to change as they became more “excited

about meeting friends and family” and these opportunities provided a purpose for them to go out and increase their activity level.

### *Starting points of exercise*

Some participants, on the other hand, reported that they also took-up new physical activities which they planned to continue after the lockdown. They realized the importance of exercise to “stay active” and not let their “fitness level deteriorate, particularly during this lockdown” and they felt it positively impacted their mood. Some of them started to do their physiotherapy exercises at home, climbed the stairs in their flat, or went on regular walks as exercise. Having a target, large or small, supported some inactive participants to do physical activity during the lockdown, for example, “going for the newspaper” or completing a “[Couch to] 5K challenge with the NHS”. Those with balance or mobility problems preferred home-based exercises due to a fear of falling if walking outside, mainly because the “last thing I want to do is go to the hospital [due to the perceived risk of infection]”.

Participants were not always aware of the guidelines for physical activity. They appreciated the information given to them by the research team about the recommended exercise, as one of them stated “if it means that I got to do 150 min of exercise per week I would do that yes. If that is proven that helps, then I would do that.” The follow-up interviews revealed that the few inactive participants who became more active during the lockdown did that mainly because they felt exercise could help with their physical function or physical health problems, and some took the information we gave them to re-start exercising. For example, a man who had some physical limitations due to arthritis said:

*I started doing it after I spoke with you, I'm doing the strengthening exercises for my knee on YouTube, there is a guy who does about 15-20 min exercise. It is good because I can feel that it helps, my knee is not hurting that much when I walk on the stairs for example. (Inactive 69-year-old man, White British, at Phase 2 part 1)*

### **Inactive by force (lockdown, Active participants)**

#### *Staying physically active at home*

All active participants stated that they wanted to maintain their good level of physical function, sense of fitness and strength during the lockdown. At the start of the lockdown, reduction in fitness was often perceived by those participants who had attended more than one exercise

session a week before the lockdown, because they were not training as intensively as before or were sitting more throughout the day. Some of them stated that they did not expect their fitness to improve during the lockdown “because of the difficult circumstances but definitely not to deteriorate”. At both follow-up interviews, reduction in fitness was not mentioned by the active participants as most of them found different ways to keep active. Importantly, they stated that being in lockdown made them realize the importance of exercise even more as “it is the time in your day when you feel human, you go out so it is very important doing exercise”. Those who managed to maintain their exercise level experienced emotional benefits such as better mood, sense of energy and achievement. Structuring the day and managing weight by continuing to exercise was also appreciated. For example, one woman, who kept physically active described the multi-factorial benefits of exercise in these adverse circumstances:

*It is keeping me a lot more bouncy. My body feels quite relaxed and smooth when I get up from my chair and do that sort of thing. I am sure that it does me good. Because you know it is very easy just to sit indoors doing nothing but these sort of things make you say: "ahh ok I do some of the exercise routines. So it gives me the motivation as well to do things as well as it keeps you fit. (Active 68-year-old woman, White British, at Phase 2 part 2)*

At the same time, active participants perceived several barriers to exercise during the lockdown, similar to the experiences that inactive older adults had before the lockdown. Lacking the sense of purpose, missing the company of others and mood changes were identified as the main reasons why some active participants struggled to adhere to regular exercise at home. Participants found that it was hard to get motivated and follow videos or use other resources to exercise on their own, and they rarely found that enjoyable. Interestingly, during the lockdown, some active participants experienced that they prioritised activities around the house more than exercise. They filled their days with physically active tasks around the house or went for a walk, but they “don’t do anything for exercise sake”.

*The difficulty is that you cannot get motivated. I feel that when you are consciously going for something it is very difficult. You could do a lot of things but these are all just by yourself... . You can start doing it and then it phases out, isn't it? (Active 69-year-old woman, White Croatian, at Phase 2 part 2)*

### *Resilience in keeping up exercise*

Overcoming difficulties was important to stay active during the lockdown restrictions. To overcome the limitations and the anxieties related to the risk of infection, most participants used strategies, such as “getting up very early in the morning before anyone is around” to go for a walk, or telling themselves “you used to go out a lot and you can't now, so you have to do something to get your body moving”. Establishing a regime of exercise during the lockdown was identified of high importance to some active participants because they realized that “like washing teeth” the routine of their weekly exercise sessions contributed to their health and structured their days. Establishing a new schedule of exercise or walking motivated them to maintain their active lifestyle. On the other hand, others found it difficult to set-up a schedule without having the opportunity to “go out of the door” or having company while they are exercising. At the final follow-up, these participants appreciated that their organisation restarted their (outdoor) exercise sessions and they could book their place. The majority of participants stated a preference to be physically active in the morning [the interviews took place over Spring and Summer months] however, a few participants felt that afternoon suited them better. Only a few active participants mentioned that monitoring their daily steps supported them to maintain their physical activity level during the lockdown.

Many active participants stated that having company or support from a friend or family member was a strong motivator for them to go for a walk, which was an exercise that allowed social distancing. One woman who replaced her regular Pilates class explained:

*My neighbour who is at similar age and she is very active, she decided that we should go on walks together keeping distance. I am 72 and my neighbour is 84, but very fit person. She is a very active person, Mrs Motivator, so she walks first and I am behind her. (Active 72-year-old female, White Polish, at Phase 2 part 1)*

Apart from having regular walks as a routine, some active participants stated that they are using exercise videos, live sessions on Zoom or they do the exercises from memory. The videos were chosen because they were similar to their usual activity or challenged them, or they felt its benefits, so they tried to do that regularly.

*And the other thing I do daily is that I do the Tai chi exercise on YouTube that you also sent me. That is 36 min and I actually don't need to do it sitting, I do that standing. My balance is good enough to do that standing. And I think actually it helped my balance by doing that. (Active 75-year-old female, White British, at Phase 2 part 1)*

Rather than doing 45-minutes to 1-hour sessions as they would normally do, a shorter 15 to 30 minutes bouts seemed to work better for them. Others experienced barriers to exercise: technical difficulties in using their devices, did not find enough space in their home, or did not find the level suited to their abilities. Living in an environment that supported exercise was important. While some participants were supported by their natural surroundings and garden where they could do physical activity, for others living in a flat in the city centre, the lack of facilities and space were strong barriers, which negatively impacted their physical activity level and their mood. For example, one woman who had to shield in her flat and used to attend regular tai chi classes with her friends before the lockdown explained:

*This lockdown is a problem, I used to go out every day and walk around to different places, but now you have to stay at home, and you cannot just walk around the kitchen all day, can you? So it has been distress really for people who need to exercise. (Active 77-year-old woman, Asian, at Phase 2 part 2)*

New barriers appeared with the ease of the lockdown regulations. Many participants raised their concerns about people not respecting the social-distance regulations and the crowdedness of the open spaces where they were walking and the streets where they go shopping. At the same time, seeing more and more people exercising in the wider community of the local area also encouraged a few participants to follow them.

*When I go around the park, because everyone else is exercising, I also don't mind. So I do sort of swings with my arms and things like this. As everyone else is exercising I don't think that they would laugh at me because they do that themselves. (Active 68-year-old woman, White British, at Phase 2 part 2)*

Both inactive and active participants acknowledged the need for and tried to incorporate physical activity into their days during the lockdown but with different success. All participants tried to become active by doing housework, gardening and some of them went for a walk. Most active participants also tried to maintain their fitness by doing exercises at home but found that difficult without the social component of exercise. For both groups, the main facilitators of being physically active were scheduling, going outdoors for a walk alone or with some company, finding an exercise matching their needs and abilities, and living nearby green spaces. Both inactive and active participants described outdoor physical activity as an important part of the daily activities which brought positive benefits to their wellbeing and helped them overcome the adverse impact of lockdown.

### 6.3.2 *Quantitative Outcomes*

Mean (SD) scores on self-reported questionnaires are reported in Table 6.4. Active and inactive participants were similar in the Loneliness and Extraversion scores. The active group rated higher on the importance of physical activity (7.5 vs. 10 in 10) and on confidence to stay physically active (6 vs. 8 in 10).

#### **Physical and mental health-related quality of life**

The active and inactive participants were similar in their physical and mental health quality of life in both Phases. However, the inactive participants reported more physical health conditions than the active group (3.5 vs. 1.8). Both groups reported improved mental health-related quality of life from Phase 1 to Phase 2 (respectively, during and after the lockdown; see Table 6.4).

#### **Frequency of participation in weekly exercise sessions**

As expected, before lockdown (Phase 1) the active group participated in a larger number of moderate and vigorous sessions than the inactive group (Figure 6.2). However, the two groups were more similarly active at Phase 2 in both the 2-week and the 8-week follow-ups, mainly due to the active group reducing the frequency of their exercise sessions. At the 2-week follow-up, 4 inactive and 10 active participants (54% of all participants) had started an exercise with online guidance however of them, only 1 inactive and 4 active participants (21% of all participants) continued to adhere up to the final 8-week follow-up.

#### **Walking and sitting**

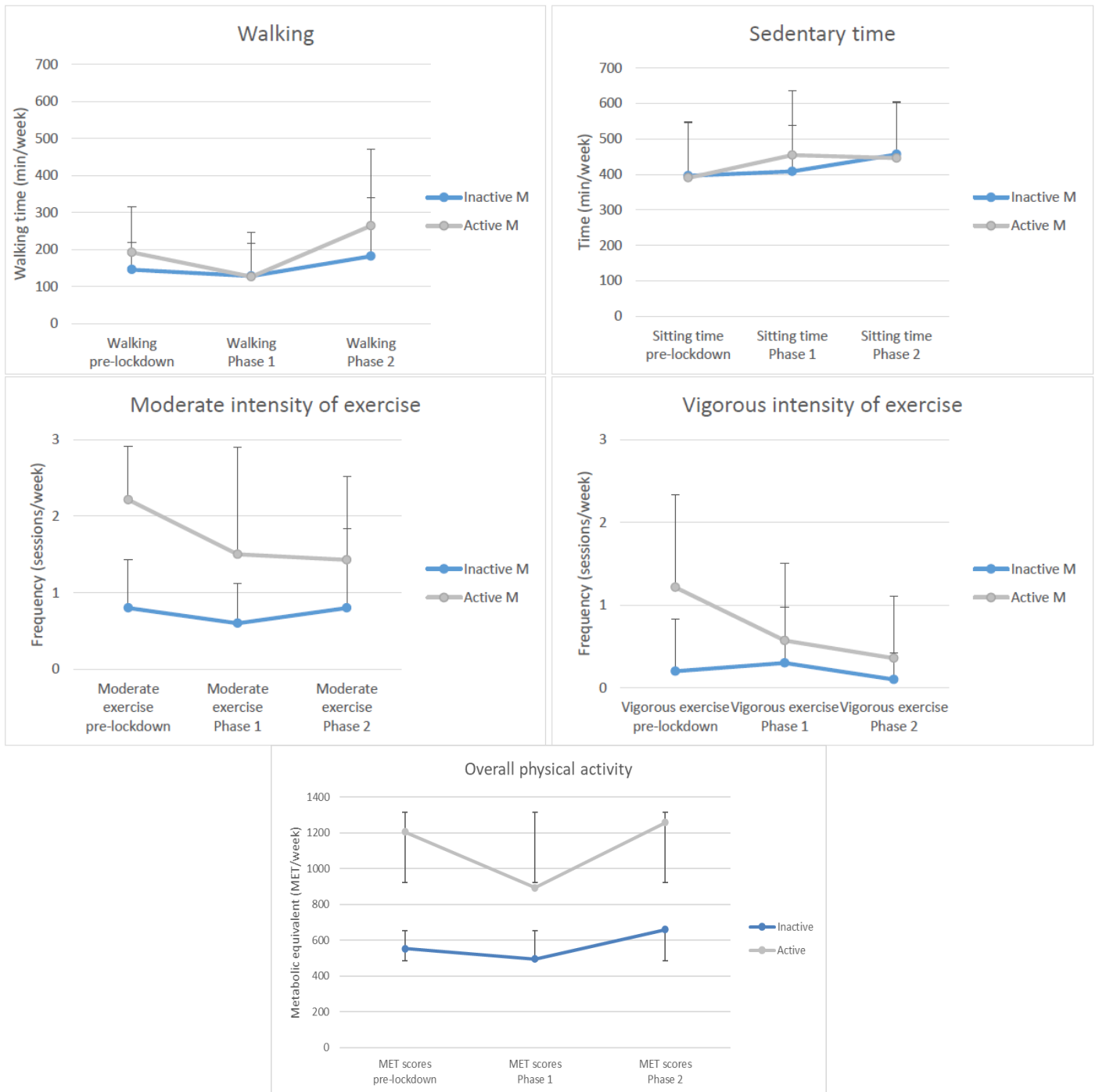
Compared to pre-lockdown, both the active and inactive participants spent less time walking in a week at the beginning of lockdown but much more by the 8-week follow-up (Figure 6.2). Both groups increased walking time at the 8-week follow-up but this was more pronounced in the active group.

**Table 6.4** Mean scores on self-report questionnaires at Phases 1 and 2

Variable (score range)	Participants	Phase 1		Phase 2	
		Mean (SD)		Mean (SD)	
Loneliness (3-9)	Inactive	4.4	(1.8)	-	-
	Active	5.5	(1.9)	-	-
Extraversion (10-50)	Inactive	27.8	(3.9)	-	-
	Active	31.3	(5.0)	-	-
Importance (1-10)	Inactive	7.5	#	-	-
	Active	10	#	-	-
Confidence (1-10)	Inactive	6	#	-	-
	Active	8	#	-	-
Exercise Barriers Scale (14-56)	Inactive	27.5	(5.2)	27.4	(5.4)
	Active	26.7	(1.9)	27.4	(6.1)
SF-12 Physical Composite Score (24 – 57)	Inactive	44.6	(9.7)	39.7	(8.0)
	Active	39.4	(13.6)	43.5	(13.0)
SF-12 Mental Health Composite Score (19-61)	Inactive	49.2	(9.6)	52.7	(10.4)
	Active	45.7	(10.9)	48.2	(6.3)
Activity index (MET)	Inactive	496.1	(323.2)	660.6	(535.2)
	Active	894.1	(532.4)	1257.9	(717.0)

*Note.* #Medians are presented instead of mean; SD is standard deviation; a dash indicates the measure was not taken at Phase 2.





**Figure 6.2** Frequency of exercise, walking, sitting time and the metabolic equivalent over a week before lockdown, in Phase 1 and in Phase 2

### 6.3.3 Results from the integrated analysis of qualitative and quantitative data

#### Preferences for exercise setting

The majority of the participants (83%) preferred or would prefer exercising with others and with an instructor. They reported “need for support” for participating in exercise and most of those who increased their walking time at the 8-week follow up started to go for a walk with a

friend. Only four participants (17%) would prefer exercising alone. All of them were male and inactive. They reported “need for support” only about having an instructor or physiotherapist who motivates them and gives them guidance to exercise. Interestingly, these participants had lower extraversion and lower loneliness scores than the overall mean. They preferred solitary activities in their leisure time, they would prefer exercising in a gym, at home or going for a walk on their own, which is reflected in their low extraversion scores. This also suggests that although they spend much of their leisure time on their own, this is not perceived as loneliness. A third of participants (30%), 3 in the inactive and 4 in the active group, reported that they would like to have an exercise buddy who meets with them the first time they join an exercise group. These participants reported lower levels of confidence than the average in their group regarding maintaining their physical activity level.

Living in a location surrounded by green spaces was the most important environmental factor which helped participants increase or maintain their walking time. Exercising outdoors was preferred by 60% of inactive and 29% of active participants, while 20% of inactive and 29% of active participants preferred indoor exercise and the remaining participants did not have any preference. Those participants who preferred outdoor exercise reported limitations with their physical function as a barrier more often. They preferred walking, Nordic walking or gardening as outdoor activities because they experienced less pain by doing these activities than by doing other forms of exercise. Most participants who preferred outdoor exercise increased walking time at the 8-week follow-up.

### **Barriers, facilitators and change in physical activity**

Inactive participants reported more health conditions and barriers to exercise than active participants (irrespective of demographic characteristics); 80% of inactive participants had more than one health condition. Their barriers most often related to limitations in their physical function, health problems or psychological obstacles, for example, “procrastinating and excuses”, or “disliking” the exercise or not having enough confidence due to discomfort which they linked to their age or health problems. Only 36% of the active participants had more than one health problem and they reported “physical limitations” and “pain” which did not allow them to do certain types of exercise which they had enjoyed in the past. At the same time, the management of those conditions was their main drive to do specific strengthening and rehabilitation exercises. A meta-matrix is presented in Appendix 6.3 outlining the

characteristics, quantitative variables, and qualitative themes of those sixteen participants who completed the final questionnaires.

Some patterns also emerged with respect to qualitative themes and exercise frequency or walking time. Active participants, who reduced their weekly moderate exercise due to lockdown reported “missing company” and “procrastinating” more often than those who did not. Active and inactive participants who reduced their walking time at the final 8-week follow-up were those who reported “limitations in their physical function”; they had had to self-isolate for twelve-weeks because they were clinically vulnerable during the Covid-19 pandemic. Increased scores on the Physical Exertion subscale of the Barriers to Exercise scale from Phase 1 to Phase 2 indicate that exertion was the greatest barrier across all participants. Interestingly, those active participants who felt increased physical exertion also reduced the number of their weekly exercise sessions but increased their walking time which means they switched to lower intensity activity. This indicates that they found an alternative to overcome the limited opportunities for group-based exercise or use of exercise facilities. This finding is reinforced by the follow-up interviews where most participants reported that their main physical activity was walking and they found it difficult to motivate themselves to do more vigorous exercise at home on their own. Those participants who increased their walking time reported that “having a regime” or “incentives“, “health reasons”, “matching with competence” facilitated their motivation. Participants who identified “benefits of exercise” and had “strategies to complete unpleasant tasks” scored higher on the Mental Health score. Better mental health came from participants who identified psychological benefits of physical activity and kept physically active during the lockdown for example by finding activities to do around their home.

## **6.4 Discussion**

This study explored the factors that limit or support older adults’ engagement in regular exercise. An important result was that finding a sense of purpose for exercise was the main facilitator which distinguished active from inactive older adults. Other facilitators of adherence to physical activity (or exercise) were establishing a routine, having social support and perceiving an immediate benefit from exercising, especially when there is no access to community-based exercise classes.

The sense of purpose for exercise was identified as a key element of exercise motivation in this study. It was found to be influenced by both the belief in the importance of exercise and the value of assigned to exercise. The sense of purpose for exercise seemed to be missing from

the perceptions of inactive older adults due to cognitive and affective processes. In terms of cognitive processes, being aware of the importance of maintaining mobility in later life did not lead to adherence to exercise. They saw their age as a barrier and thought the gym or intensive exercise was not for them. Importantly, they were not aware of how certain types of exercise could improve their strength and balance and help manage their physical function. In terms of affective processes, the sense of purpose when it comes to enjoyment had been lost through negative experiences in the past. For example, feeling pain or having physical limitations caused withdrawal from a favourite exercise or caused a lack of success in trying a new exercise. This reduced competence and fitness led to losing confidence and developing negative feelings about exercising. Therefore, the barrier is not only the physical limitation itself, as was reported in several previous studies (Franco et al., 2015; Guell et al., 2018; Jancey et al., 2009), but what the physical limitation means. According to the Affective-Reflective Theory, experiences, feelings and thoughts connected with exercise can cause negative affective valuation which reduces the motivational drive towards exercise (Brand & Ekkekakis, 2018). The application of this theory to our findings helps us understand the reason why most of the inactive participants who have physical limitations do not exercise regularly despite valuing long-lasting mobility and independence. Therefore, older adults should be supported with a variety of strategies to regain confidence and a sense of purpose for exercise.

What factors contribute to gaining a sense of purpose in exercising and what can we do about it? Some facilitators of exercise can be derived from the active participants' accounts, and some by combining them with inactive older adults' barriers. Exercise facilitators in this study were a combination of perceived immediate benefits to: routine, mental and physical health and social life. While routine before lockdown came in the form of volunteering, caring or social leisure activities for most inactive participants, for active participants it was exercise and physical activity that often provided routine. During the lockdown, active participants missed that routine and struggled to adhere to home-based exercise without having a structure. We found that regular exercise had a meaningful role to play in adding a structure to the week of older adults during the lockdown. Several participants reported that having a routine of walking or short exercise bouts had a positive impact on their mood and reduced anxiety. This is in line with previous research which also found that routine is particularly important and can contribute to wellbeing and improved self-esteem after retirement (Morgan et al., 2019). These findings indicated that a routine which includes exercise may provide an added sense of purpose and this should be promoted to inactive older adults.

Another factor that can contribute to gaining a sense of purpose is perceived improvement in mental and physical health. During the Covid-19 lockdown, going for a walk outdoors provided a strong sense of purpose in all participants' lives. The increased external barriers to exercise and the restricted opportunities for outdoor activities had negative effects on participants' mental health and made them more conscious about the importance of being physically active outdoors. Therefore, going out for a walk with the purpose to exercise increased the total weekly walking time for most participants. This included inactive participants who recognised the negative impact of being sedentary on their ease of mobility and mood. For all participants, walking provided a rare opportunity to leave their home, or to meet with their relatives and friends as the lockdown was eased. Participants reported the meaningful effect that walking outdoors had on their mental health. Taken together these findings suggest that experiencing the immediate benefits of exercise might be an excellent way to engage inactive older adults, and walking may be the best starting point. Importantly, some inactive participants thought exercise was not for them (given their age and mobility problems) so informing them that physical activity and exercise is beneficial for all ages and abilities is crucial.

The final factor that can contribute to gaining a sense of purpose is social connectedness. The lockdown meant that some of the active participants lost their sense of purpose in exercising because exercising at home, on their own, did not allow them to connect with others. Losing the social element of exercise resulted in a lack of enjoyment which seemed to cause similar psychological barriers that were experienced by inactive participants. Other studies also found that by losing the social ties many older adults gave up fall-prevention exercises (Iliffe et al., 2018) and did not follow exercise videos at home in lockdown (Goethals et al., 2020). Therefore we suggest that once community-based exercise is re-opened it is important to allow participants to re-connect before or after the sessions to re-build those social ties within the group. For inactive older adults, strategies to engage them in exercise should consider the use of an exercise buddy. For example, strategies can capitalise on some communities having being brought closer together as a result of lockdown, or the fact that some inactive older adults started walking with the company of a friend or family member.

Community-based exercise programmes had provided active participants with a setting where not only their physical but also their psychological needs were met. Ryan and Deci (2000b) describe the importance of the psychological needs for competence, relatedness and autonomy in order to build motivation. In particular, active participants had felt competent by

doing exercise tasks which were suited to their abilities and by feeling improvements; they had felt relatedness by building meaningful relationships and feeling connected to others, and they had felt autonomy because they consciously took action to maintain or improve their physical function. In contrast, inactive participants shared their story about previous failed attempts to take up exercise due to not having a sense of competence or not having company for exercise. Recent reviews suggest that interaction with peers is an important motivational factor for older adults, which facilitates enjoyment, drives exercise uptake and adherence (Chapter 2; Farrance et al., 2016; Morgan et al., 2019). Inactive participants, on the other hand, were not able to realize the fulfilment of any of the three psychological needs in the context of exercise. Instead, these needs were met through other activities. For example, doing crosswords met their need for competence, visiting friends met their need for relatedness, and doing their shopping met their need for autonomy. Therefore, we suggest that for inactive older adults, interventions should focus on breaking down barriers to build a positive perception of exercise for example, through government-led media campaigns. To address the need for competence, we suggest that campaign messaging clarifies that exercise is for all ages and levels of mobility, and that exercise provision is adapted to the needs of older adults. To address the need for relatedness we suggest that exercise is combined or fitted around other social activities which they already engage with and are in line with their interests. To address the need for autonomy it is important that exercise provision offers choice and that it includes positive messaging around older people taking charge of improving their mobility.

The context of this study, which took place during a national lockdown, provided unique insights into the pathways for motivation to exercise. Both active and inactive older adults resorted to walking as the main source of exercise and reported immediate health benefits and a sense of achievement from doing so. Research has shown that walking outdoors is a significant source of physical activity and has several benefits for physical health, and emotional wellbeing (Hawkins et al., 2013; Rahman et al., 2019). Even when performed for a relatively short time or at a slow pace, walking has several health benefits (Harris et al., 2015; Rose & Parfitt, 2007) requires no specific skills or equipment and is convenient and accessible to many people, therefore walking has been identified as one the most practical way of improving physical activity levels in older adults (Amireault et al., 2018; Kelly et al., 2018; Mutrie et al., 2012; Niven & Markland, 2016; Segar & Richardson, 2014). Moreover, five of the inactive participants reported 150 minutes of physical activity a week (pre-lockdown) by walking to shops or to social activities, gardening and housework. These activities could be

modified to become moderate-level intensity which would re-classify them as active. This emphasises the potential for walking and potentially other activities to transition older adults from inactive to active (Gibson-Moore, 2019). Both active and inactive participants also often reported walking with a companion as a source of commitment and enjoyment. There is scarce evidence on the effectiveness of commitment-making as a tool to increase adherence in physical activity and the available research reported no significant improvement (Coupe et al., 2019). However, the studies included behavioural contracts rather than committing to a friend. Based on the integration of our quantitative findings regarding the increase in walking time and the qualitative results, we suggest that commitment-making to a friend might be a potential facilitator for exercise uptake which should be further tested in research trials. Furthermore, based on the strong evidence on social ties as a facilitator in older adults, the social opportunity during exercise should be emphasised as part of physical activity advice for inactive older adults. Together, these results indicate that walking (with a friend) may be the single best strategy to get inactive older adults to engage with exercise. This together with education about the benefits of exercise for all ages and levels of mobility could be the core of government-level communication that would be crucial for post-pandemic recovery. Despite the turmoil caused by the pandemic, these unusual circumstances provided precious insight into inactive older adults.

This study has several important limitations. First, the study sample was limited to older adults who self-reported their activity levels; it did not measure their physical activity level objectively. However, if we had used pedometers or accelerometers to measure participants' physical activity this may have changed their behaviour. Participants in this study may have been more aware of the benefits of physical activity and more motivated towards behavioural change than those who are sedentary and did not participate in the study. This study has a limited sample of very sedentary participants therefore we do not know whether the recommendations of this study could be applied to them. Future research might consider using gatekeepers such as Health Care professionals to identify highly sedentary individuals and refer them to the research. Another limitation is the limited demographic variability in our sample which means we cannot address important factors such as ethnicity and socioeconomic status. Although we intended to recruit varied demographics we did not use specific recruitment strategies to reach different demographics and this may be needed in future. Because the quantitative data were collected in a QUAL-quant study, the sample size was necessarily small, deeming inferential testing under-powered. Notwithstanding, by using a mixed-methodology

approach and collecting qualitative data over time, the quantitative variables were useful in explaining and interpreting the qualitative results. A final limitation is that the majority of semi-structured interviews were completed over the phone, so establishing rapport with the participants was more difficult than in person and it may have impacted the depth of the information being shared by the participants.

#### *6.4.1 Conclusion and recommendations*

This research provides insight into the nature of perceived barriers and facilitators for engagement in physical activity among both physically active and inactive older adults. The mixed-method approach we used was useful in providing depth to the interpretation of the data. Our main results show that all older adults rely heavily on having a sense of purpose in their daily leisure activities. We found that the main routes for potentially engaging in exercise were similar for active and inactive older adults and included perceived benefits to mental and physical health, socializing and routine. Importantly, during the Covid-19 lockdown, both active and inactive participants found a renewed sense of purpose in walking outdoors for exercise. Our main recommendations are for educating, promoting, supporting, and enabling older adults to engage in physical activity and exercise (see Table 6.5).

#### *6.4.2 Relevance for the following chapter*

These sub-themes expanded the previously identified ‘Lacking interest’, ‘Difficulty in getting out of comfort zone’ and ‘Roadblocks’ of Chapter 2 and 3 and provided examples of how older adults might find purpose in different forms of physical activity. These are also examples of how we could tap into their interests and needs at the start by embedding or linking exercise with those activities. We found that inactive older adults need a friend to go with or need to find an activity that matches their physical function and interest. These intrapersonal and interpersonal level factors could help older adults have a positive experience while exercising and the roadblocks could be broken down.

These findings highlighted how some of the previously identified intrapersonal and environmental level themes of Chapter 3 and 4 could facilitate exercise engagement. Building awareness of the importance of exercise to maintain physical health and independence is a route for ‘Having a drive for exercise’. Using effective ‘Thought processes and strategies’ and the ‘Affordability and convenience’ of the exercises on offer could help to maintain motivation.



The suddenly changed circumstances that took place with the enforced physical restrictions meant a novel roadblock on the interpersonal and environmental level both for inactive and active participants. We found that all of the previously identified ‘Starting points’, ‘Thought processes and strategies’ from Chapter 2 and 3 were at play and helped most of the participants do some level of physical activity. Again, being or becoming aware of the importance of exercise, having support, finding an enjoyable or beneficial activity and a supportive environment were crucial to help participants not become sedentary even if their levels of physical activity were not optimal.

**Table 6.5** Recommendations for the engagement of older adults in physical activity and exercise based on the themes and sub-themes found in Chapter 6

<b>The target area of recommendation</b>	<b>Recommendations</b>
<b>Educating</b>	
<i>Purpose linked with the benefits of exercise</i>	Older adults can be educated about the benefits of exercise for all ages and levels of mobility, especially concerning mobility and emotional wellbeing.
<i>Purpose linked with physical competence</i>	Older adults can be educated about establishing a routine of physical activity by using, at first, outdoor activities such as walking or gardening.
<i>Purpose linked with social interaction</i>	Older adults can be advised that finding a friend or family member with whom they can exercise or go on regular walks with can help them to take up exercise by providing accountability.
<i>Starting points for exercise</i>	Older adults can be advised that exercise has the potential to break the monotony of regular daily activities.
<b>Promoting</b>	
<i>Being aware of the need for exercise</i>	Government advertisement should include positive messages about physical activity or ('being mobile') in older adults and guidance. For example, older adults can be informed about the types, intensity and amount of exercise required to gain health benefits and to avoid losing independence. The information should include advice on how to fit 10-min bouts of exercise into their daily routine, so they can link the exercise with other activities they value and prioritise.
<i>Staying physically active at home</i>	The Government should be aware that older adults are not sufficiently physically active at home (even if they try). There should be policies to incentivise older adults to go outside for physical activity.
<i>Starting points of exercise</i>	Promotion of the benefits of outdoor physical activity can encourage older adults to improve their physical activity. It is important to ensure the time and availability of public places where older adults can do outdoor activities safely.
<b>Supporting</b>	
<i>Purpose linked with interest (or priorities)</i>	Older adults can be supported by a healthcare professional to establish personal goals related to their health and physical function. Professionals working with older adults can assess their interests and priorities in daily life, and signpost them to local activities which meet their interests. For example, if they are interested in volunteering, encourage them to find a volunteer role, which requires some physical activity or if they like gardening, signpost them to a gardening club.

<i>Purpose linked with social interaction</i>	Older adults who like socializing can be signposted to team sports or group-based exercises which include an element of social gathering.
<i>Purpose linked with social interaction</i>	“Exercise befriending” can be provided over the phone where active older adults encourage inactive peers to do physical activity while under lockdown restrictions.
<i>Starting points for exercise (in lockdown)</i>	Organisations should endeavour to facilitate the contact between older adults who were previously engaged in group exercise as a way to re-engage the whole group back into group exercise sessions.
<i>Purpose linked with physical competence</i>	Exercise professionals working with older adults should continue tailoring exercise tasks to individual needs and physical abilities to improve confidence and provide a positive experience during exercise.

## Appendices

**Appendix 6.1** Detailed description of the questionnaires and scales used in the study to examine differences between Inactive participants (n = 10) and Active participants (n = 14) on physical activity, exercise, health related quality of life and social engagement.

Name of Questionnaire	Items	Details
<i>Physical activity and exercise participation</i> <i>International Physical Activity Questionnaire - Short Form (IPAQ-SF, Sjöström et al., 2006)</i>	4	The questions assess physical activity undertaken across different domains including leisure time, domestic and gardening (yard) activities, work-related and transport-related activity. The IPAQ short form asks about three specific types of physical activity and sitting: walking, moderate-intensity activities and vigorous intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity. The metabolic equivalent of minutes of activity during a week were calculated and presented in MET scores. To improve the validity of the questionnaire the followings were added during the interview: details of types of activities participants did on a daily basis, examples of a daily break down of typical activities performed by the participant (Cleland et al., 2018).
<i>Physical Activity Importance and Confidence Scales</i> <i>(the scales were adapted from Rollnick et al., 1999)</i>	2	The 10-point scale was adapted from Motivational Interviewing techniques. It was used to determine the perceived importance of physical activity to the participants and assess how confident the participants were to increase their physical activity level (Rollnick et al., 1999). Questions: ‘How important is it to you to be active? And how confident are you that you can be more active?’
<i>Exercise Barriers Scale</i> <i>(EBS, Sechrist et al., 1987)</i>	14	Measuring the perceived barriers to exercise participation. 4-point Likert scale (higher values indicating greater perceived barriers). The internal consistency of the barriers scale was reported as 0.86, while test re-test reliability was 0.77 (Gyurcsik et al., 2006). It has shown good psychometric properties in different populations and age groups including older adults (Victor et al., 2012). Subscales: Exercise milieu, Physical exertion, Facility obstacles, Family discouragement, Time expenditure
<i>The Short Form Health Survey</i> <i>(SF-12; Gandek et al., 1998)</i>	12	Measuring subjective health-related quality of life and functioning through. Physical health composite score (PCS) and a mental health composite score (MCS) were computed, with higher scores indicating better functioning. High levels of reliability and validity in research with older adult populations (Gandek et al., 1998).
<i>Engagement in social activities</i> <i>(adapted from Big-Five Extraversion factor markers reported by Goldberg (1992)</i>	10	Questions of the International Personality Item Pool measuring self-perception regarding social activities. The big five personality traits are one of the most commonly used models of personality in academic psychology. 5-point Likert scale on the level of agreement/disagreement.

**Appendix 6.2** Semi-structured Interview guide at Phase 1 including topics and questions related to the levels of socio-ecologic model (SEM, McLeroy, Bibeau, Steckler, & Glanz, 1988) and previous findings of the research team

SEM Level	Areas to explore (Themes and sub-themes found in previous chapters)	Questions
Intrapersonal	<p>Preferences in leisure activities past and present</p> <ol style="list-style-type: none"> <li><i>Being active at leisure time</i></li> <li><i>Exercise history</i></li> </ol> <p>Roadblocks</p> <ol style="list-style-type: none"> <li><i>Changing circumstances</i></li> <li><i>Lacking interest</i></li> <li><i>Difficulty in getting out of comfort zone</i></li> </ol> <p>Starting point</p> <ol style="list-style-type: none"> <li><i>Having a drive for exercise</i></li> </ol> <ol style="list-style-type: none"> <li><i>Need for support</i></li> </ol> <ol style="list-style-type: none"> <li><i>'Giving it a try'</i></li> </ol> <p>Mindsets - Thought processes and strategies</p> <ol style="list-style-type: none"> <li><i>Overcoming negative thoughts</i></li> <li><i>Being able to adapt</i></li> <li><i>Looking forward to it</i></li> </ol> <p>Benefits of participation</p> <ol style="list-style-type: none"> <li><i>"Gave me something back" (relatedness and competence)</i></li> <li><i>Perceived health and well-being</i></li> </ol>	<p>Preferences</p> <ol style="list-style-type: none"> <li>How do you spend your leisure time? (The activities could fit in one of these categories: <ul style="list-style-type: none"> <li><i>Social/individual</i></li> <li><i>Active/Inactive</i></li> <li><i>Cognitively challenging/Repetitive</i></li> </ul>                     If you think about exercise what comes into your mind? Why?                 </li> <li>Have you tried any exercise in the past? Which kind of exercise you did in the past you really enjoyed? Why did you enjoy it? What stopped you?</li> </ol> <p>Roadblocks</p> <ol style="list-style-type: none"> <li>Currently what stops you from doing exercise regularly?</li> <li>How the lockdown impacted on your physical activity and on the things you normally do?</li> <li>How important is it to you to be active? (1-10) Why?</li> <li>How confident are you that you can be more active? (1-10) Why?</li> </ol> <p>Starting point</p> <ol style="list-style-type: none"> <li>What would make you be more physically active right now? (For example: <ul style="list-style-type: none"> <li><i>Thinking about physical/cognitive/emotional health</i></li> <li><i>Socializing</i></li> <li><i>Try something new</i></li> <li><i>Being fit/lose weight</i></li> <li><i>Schedule your day</i></li> <li><i>Recommendation from a trusted person</i></li> </ul> </li> <li>What could help you to start? How did you start XY leisure activity? Would you happy to start exercise on your own? Or who could help you? <ul style="list-style-type: none"> <li><i>If needing support: friend/family/in a group/contact with someone initially</i></li> </ul> </li> <li>How competent do you feel to give it a try? (1-10) Why?</li> </ol> <p>Mindsets - Thought processes and strategies</p> <ol style="list-style-type: none"> <li>How do you cope with the changes caused by COVID19?</li> <li>How do you keep active?</li> <li>What helps you carry out a plan when you don't feel like it?</li> <li>What would you do if other appointment or responsibility need to be scheduled in? (note: strong commitment to plan vs. strong commitment to pleasure)</li> </ol> <p>Benefits of participation</p> <ol style="list-style-type: none"> <li>What do you think participating in exercise might give you?</li> <li>If you were certain to get that benefit, would you participate? (note: different areas of life and health; how would you feel about yourself in general)</li> </ol>
	Interpersonal	<p>Sense of community</p> <ol style="list-style-type: none"> <li><i>Welcoming</i></li> <li><i>Social support</i></li> <li><i>Similar others</i></li> <li><i>Benefits of the social aspect</i></li> </ol> <p>The instructor's approach</p> <ol style="list-style-type: none"> <li><i>Encouragement and supporting enjoyment</i></li> <li><i>Setting the right level</i></li> <li><i>Teaching style</i></li> </ol>

<b>Environmental/ Organizational</b>	<p>Supportive surrounding (all needs)</p> <p><i>a) Orientation</i></p> <p><i>b) Elements of the session</i></p> <p>Affordability and convenience</p> <p>Advertisement</p>	<p>If you were starting an exercise activity:</p> <ul style="list-style-type: none"> <li>• Would you like to exercise outdoor or indoor? Do you have a garden?</li> <li>• Would you like to exercise with music or without?</li> <li>• Would you like to exercise with gym equipment or not? Do you have any equipment?</li> <li>• Would you like to monitor your achievements? (what? and how?)</li> <li>• Would you like regular reminders or emails about your exercise? What about other exercise opportunities?</li> <li>• Would you like to exercise in the morning or afternoon? For how long?</li> <li>• How far would you be willing to travel to join an exercise activity in normal circumstances?</li> <li>• How much would you pay for one session of exercise (both online and in normal circumstances)?</li> </ul>
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**Appendix 6.3** Summary of scores at Phase 1, patterns of change on the scores at part 2 of Phase, exercise barriers and types of exercise/physical activity reported at Phase 2 for sixteen participants (for whom full data is available)

Variables (score range)	Gender	Living alone	Number of health conditions	Change on SF-12 Composite scores		Change on Exercise Barriers Scale		Exercise barrier (qualitative results)	Physical activity		Change in physical activity		
				Physical (24 – 57)	Mental (19 – 61)	Phase 1 total (14-56)	Subscale that changed at Phase 2	Barrier identified at Phase 1 and/or 2	Importance scale (1-10)	Confidence scale (1-10)	Walking (min/week)	Activity at Phase 2 part 1 (qual)	Activity at Phase 2 part 2 (qual)
<b>Inactive participants</b>	male	no	5	52 ↓	56 ↓	27 ↑	Exercise milieu increased	Psychological limitations Physical limitations	5	7	210 ↓	gardening, walking	gardening, walking
	female	yes	7	41 ↓	40 ↓	28 ↑	Physical exertion increased	Different priorities Missing company Psychological limitations Physical limitations	10	7	140 ↑	gardening, walking, shoulder physio exercise	pulmonary rehab exercise, walking, gardening
	female	yes	3	43 ↑	48 ↑	22 ↑	Time expenditure increased	Different priorities Missing company Psychological limitations Physical limitations	8	4	120 ↑	stairs, walking, short exercise	stairs, walking
	female	yes	4	54 ↓	30 ↑	30 ↓	Time expenditure reduced Family discouragement reduced	Psychological limitations Physical limitations	7	5	315 ↓	gardening, walking	gardening, walking
	female	yes	2	50 ↓	53 ↓	30 ↑	Physical exertion increased	Psychological limitations Physical limitations	6	7	140 ↑	physiotherapy shoulder exercise, walking	physiotherapy shoulder exercise, walking
	female	yes	1	45 ↓	43 ↑	27 ↓	Family discouragement reduced Physical exertion increased	Different priorities Missing company Psychological limitations Physical limitations	8	7	150 ↑	trial of YouTube exercise	walking
	male	no	1	41 ↓	61 ↑	29 ↓	Time expenditure reduced Family discouragement reduced	Different priorities Psychological limitations Physical limitations	7	8	105 ~	gardening, walking, YouTube exercises for knee	gardening, walking, YouTube exercises for knee

Note.

SF-12 – The Short Form Health Survey;

↑ - increase in score between Phase 1 and part 2 of Phase 2;

↓ - decrease in score between Phase 1 and part 2 of Phase 2;

~ - no change.

Variables (score range)	Gender	Living alone	Number of health conditions	Change on SF-12 Composite scores		Change on Exercise Barriers Scale		Exercise barrier (qualitative results)	Physical activity		Change in physical activity		
				Physical (24 – 57)	Mental (19 – 61)	Phase 1 total (14-56)	Subscale changed over time	Barrier identified at Phase 1 and/or 2	Importance (1-10)	Confidence (1-10)	Walking (min/week)	Activity at Phase 2 part 1	Activity at Phase 2 part 2
<b>Active participants</b>	female	no	1	38 ↑	54 ↑	23 ~	No change	Different priorities Physical limitations	10	7.5	140 ↑	walking, cheerleading	walking, cheerleading, short strength
	female	yes	4	19 ↓	50 ↓	31 ↓	Physical exertion reduced Facility obstacles reduced	Different priorities Missing company Physical limitations	10	8	210 ↓	tai chi, stairs, walking	tai chi, yoga, stairs, walking
	female	no	0	61 ↓	44 ↑	14 ↑	Physical exertion increased	Missing company	10	5	210 ↑	walking	walking
	female	yes	1	49 ↑	51 0	28 ↓	Physical exertion reduced	Different priorities Psychological limitations	10	10	225 ↑	yoga, walking	walking, exercise on vibrating machine
	female	yes	2	46 ↓	52 ↓	20 ↑	Exercise milieu increased	Physical limitations	9	9	100 ↓	exercise, gardening	none (unwell)
	female	yes	2	53 ↓	42 ↑	19 ↑	Facility obstacles increased	Missing company	10	10	100 ↑	walking, aerobic online	walking, aerobic online
	female	yes	1	34 ↑	36 0	31 ↑	Physical exertion increased	Physical limitations Psychological limitations	10	9	315 ↑	exercise, walking, gardening	walking, gardening
	female	no	0	34 ↑	27 ↑	38 ↓	Physical exertion reduced Facility obstacles remains high	Missing company Psychological limitations	10	8	150 ↑	walking, skipping	walking, skipping
<p><i>Note.</i>  SF-12 – The Short Form Health Survey;  ↑ - increase in score between Phase 1 and part2 of Phase 2;  ↓ - decrease in score between Phase 1 and part2 of Phase 2;  ~ - no change.</p>													



**Appendix 6.4** Ethical approvals following first submission and after requesting amendments to the research process



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**School of  
Applied Sciences**

Direct line: 0207 815 5465  
E-mail: [civaic@lsbu.ac.uk](mailto:civaic@lsbu.ac.uk)  
Ref: ETH1920-0063

Thursday 30<sup>th</sup> January 2020

Dear Zsofia,

**RE: "Getting the old limbs going": Exploring the emotional and cognitive benefits of exercise and the barriers to participation in older adults**

Thank you for submitting your application.

I am pleased to inform you that full Chair's Approval has been given by Dr. Claudia Civaic on behalf of the School of Applied Sciences.

I wish you every success with your research.

Yours sincerely,



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**Become what you want to be**

Direct line: 0207 815 5465  
civaic@lsbu.ac.uk  
Ref: ETH1920-0142

Wednesday 1<sup>st</sup> April 2020

Dear Zsofia,

**RE: "Getting the old limbs going": Exploring the emotional and cognitive benefits of exercise and the barriers to participation in older adults**

Thank you for submitting your application.

I am pleased to inform you that full Chair's Approval has been given by Dr. Claudia Civai on behalf of the School of Applied Sciences.

I wish you every success with your research.

Yours sincerely,



**Become what you want to be**

## Appendix 6.5 Participant Information sheet



Information Sheet

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### Understanding the barriers and motivation to exercise in older adults

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. If you have any questions regarding the investigation please feel free to ask, and we will do our best to explain and provide any further information you may require.

#### Why is this study taking place?

The aim of this study is to understand what makes it easy or difficult for older adults to participate in different types of leisure activities available in the community (especially physically active programmes). This study will investigate an effective design of a tailored approach, which might support older adults to join to exercise programmes.

#### Why have I been invited to participate?

You are invited to participate because you are aged over 65 and you reported that you think you don't do enough physical activity. We would like to know more about your experiences, views, preferences of different types of leisure activities and about any barriers which may stop you from being more physically active. This information may help us in future improve current services to engage older adults in exercise. We have invited in total 20 people of both genders to participate.

#### Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part, you are still free to withdraw your participation during the interview without giving a reason by informing the researcher. You are also free to not reply to a given question. After participation, you can withdraw from the study up to 8 weeks following the first interview by contacting the research team and your data will be destroyed. After this the data will be anonymous and it will not be possible to know which data belongs to which participant.

#### What will happen if I take part?

This study involves taking part in an interview (45-60 minutes) and you will be also asked to fill in a battery of questionnaires (15 min). The interview will be audio-recorded and it will take place one-on-one either at the London South Bank University where a meeting room will be arranged or at a public place you prefer and easily accessible to you (for example community hall, library, coffee shop, etc). In case it is not possible, you will be contacted by telephone on a date and time you previously agreed to be called. At the end of the interview you will be given information about exercise programs in your borough, the interviewer will ask you to choose a program in which you might be interested. The information about how to access this program and contact details of the organization will be given to you in paper or by email. Finally, if you give consent, you will be also contacted via telephone two weeks and eight weeks after the interview on a certain day and time according to your preference (or alternatively via email). You will be asked some follow-up questions regarding the same topic. This will also be audio-recorded and it will take approximately 15 minutes. If you cannot respond to the first call, we will make no more than 5 attempts to get in touch with you.

#### What are the possible disadvantages of taking part?

This study was reviewed by the London South Bank Research Ethics Committee to ensure that potential risks are limited. In the case of any discomfort, you are free to withdraw from the interview at any time and you are free not to answer any of the questions or not to fill in any part of the questionnaire.

#### Possible benefits to participation

Your opinions are very important and valuable in order to provide understanding of barriers to physical activity. By understanding these issues, the study will provide some guidance on how to support inactive people to be more physically active. The study will also highlight areas for improvement in the current exercise programmes and services. The results will inform practitioners who recommend physical activity for older adults how they can motivate people to start an exercise programme.

#### Will the data collected in this study be kept confidential?

All the information collected about you and other participants will be kept strictly confidential (subject to legal limitations). Data generated by the study must be retained in accordance with the University's Code of Practice. All anonymised data generated in the course of the research must be kept securely in paper or electronic form for a period of 10 years after the completion of a research project. Your signed informed consents will be kept electronically for 5 years under double-lock conditions. Your confidentiality will be protected at all times. The data you provide will be stored (after it has been anonymized) in a specialist data center and it may be used for future research.

#### What should I do if I want to take part?

If you wish to participate you will be asked to contact with the researcher via telephone or email and to sign and return a consent form and then to take part in an interview.

#### What will happen to the results of the research study?

All information gathered will be anonymised, and some quotes will then be used in publications including reports and scientific articles and they might be disseminated to key public, scientific and professional stakeholders via presentations and leaflets. The results will also be part of a doctoral dissertation at London South Bank University.

#### Who is organising the research and who has reviewed the study?

This study has been conducted by Zsofia Szekeres, PhD student researcher of the School of Applied Sciences at LSBU. The research has been approved by the University Research Ethics Committee of London South Bank University.

#### Contact for Further Information

If you have any questions regarding this project, please contact a member of the research team.

If you have any concerns about the way in which the study has been conducted, please contact the Ethics Committee of London South Bank University ([sasethics@lsbu.ac.uk](mailto:sasethics@lsbu.ac.uk)) or the Head of Department ([steve.hunter@lsbu.ac.uk](mailto:steve.hunter@lsbu.ac.uk)).

Thank you very much for taking the time to read this information sheet!

Miss Zsofia Szekeres      [Email: szekerez@lsbu.ac.uk](mailto:szekerez@lsbu.ac.uk)

London South Bank University, 23/01/2020

<b>Supervisory team:</b>	<b>University Research Ethics Committee:</b>
Dr Rita de Oliveira      Email: <a href="mailto:r.oliveira@lsbu.ac.uk">r.oliveira@lsbu.ac.uk</a>	Email: <a href="mailto:sasethics@lsbu.ac.uk">sasethics@lsbu.ac.uk</a>
	<b>Head of Department of Human Sciences:</b>
Dr Lisa Zaidell      Email: <a href="mailto:zaidell2@lsbu.ac.uk">zaidell2@lsbu.ac.uk</a>	Email: <a href="mailto:steve.hunter@lsbu.ac.uk">steve.hunter@lsbu.ac.uk</a>
Dr Katya Mileva      Email: <a href="mailto:milevakn@lsbu.ac.uk">milevakn@lsbu.ac.uk</a>	

## Appendix 6.6 Informed Consent form



### Consent Form

**Full title of Project:** Understanding the barriers and motivation to exercise in older adults

**Ethics approval registration Number:** ETH1920-0063

**Name:** Zsofia Szekeres, **Researcher Position:** PhD student

**Contact details of Researcher:** szekerez@lsbu.ac.uk

Taking part (please tick the box that applies)	Yes	No
I confirm that I have read and understand the information sheet and/or the investigator has explained the above study. I have had the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw as it has been explained on the Information sheet.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>	<input type="checkbox"/>

Use of my information (please tick the box that applies)	Yes	No
I understand my personal details such as phone number and address will not be revealed to people outside the project.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my anonymised data/words may be quoted in publications, reports, posters, web pages, and other research outputs.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the data I provide to be stored (after it has been anonymised) in a specialist data centre and I understand it may be used for future research.	<input type="checkbox"/>	<input type="checkbox"/>
I agree for the interview to be audio-recorded. The audio-record will be transcribed anonymously and the original recording destroyed. The anonymised data will be kept indefinitely.	<input type="checkbox"/>	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications.	<input type="checkbox"/>	<input type="checkbox"/>

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Researcher

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

**Project contact details for further information:**

Project Supervisor: Dr Rita de Oliveira

Email: [r.oliveira@lsbu.ac.uk](mailto:r.oliveira@lsbu.ac.uk)

Phone: 020 7815 7959

University Research Ethics Committee:

Email: [sasethics@lsbu.ac.uk](mailto:sasethics@lsbu.ac.uk)

# CHAPTER SEVEN

## General Discussion

In this thesis, we explored the factors of engagement and adherence to community-based group exercise programmes and the impact of the programmes on emotional well-being and cognitive function in older adults living in London. Here we summarise the main findings and discuss what works for whom and in what circumstances through a critical realist lens by identifying the context-mechanisms and outcomes of exercise adherence in older adults.

### 7.1 Summary of findings

Chapter 2 synthesised the current evidence on community-based group exercise programmes in older adults. It analysed the impact of those programmes on cognitive function and emotional well-being and the factors of adherence using the socio-ecological framework of health behaviour (McLeroy et al., 1988). There were three main findings. First, the literature reaffirmed the positive effects of exercise participation on emotional well-being and this was strongly supported both by qualitative and quantitative studies reviewed. On the other hand, only a limited amount of studies reported on the impact of exercise on aspects of cognitive function. Second, community-based group exercise programmes showed high adherence rates as found in previous studies (Chapter 2 and 3; Farrance et al., 2016; Franco et al., 2015). However, the evidence was scarce concerning factors that prevented drop-out in the long term or influenced exercise uptake in inactive older adults. Third, the qualitative evidence demonstrated that adherence is influenced by factors from multiple levels of the socio-ecological model (see Table 7.1). However, most of these factors have not been investigated in the quantitative studies, and little is known about the factors that influence the participation of inactive older adults. Therefore in the following chapters, our actions based on these learning points were to understand influences of adherence and uptake in community-based exercise programmes (Chapter 3 and 4); to understand the effects of exercise on cognitive function (Chapter 5) and to focus on the barriers to participation in inactive older adults (Chapter 6).

**Table 7.1** Factors that influence adherence on the levels of the socio-ecological model

<b>Levels</b>	<b>Findings from qualitative studies</b>
Intrapersonal	Motivation, perceived benefits and history of exercise facilitated adherence and uptake of exercise
Interpersonal	Social support from the group members and the instructor facilitated adherence and improved emotional well-being
Organisational and Environmental	Appealing programme design that enables social interactions, affordability and convenience, were found to have a positive influence on adherence

In Chapters 3 and 4 we aimed to understand the multi-level factors of adherence in several types of community-based group exercise programmes by conducting focus groups with the exercise participants and interviews with their instructors. This helped identify the context and mechanisms which influenced the long-term adherence of older adults in the programmes. The perspectives of older adults and their instructors were aligned. The instructors had an accurate understanding of the needs and preferences of older adults and purposefully targeted those aspects to motivate the participants and improve their health and function. A well-designed exercise programme and a compassionate teaching style were key during the sessions. But both skill development and socialising seemed to sustain the long-term engagement of older adults in exercise. Another important finding from Chapters 3 and 4 was the recognition of benefits to cognitive function and emotional well-being, which also contributed to continued adherence.

In Chapter 5, we examined more closely whether the type of exercise influenced cognitive function and/or emotional well-being in previously inactive older adults. We conducted a randomised control trial to contrast Indoor cycling with Cheerleading because of their different cognitive demands. The exercise programmes had equivalent interpersonal- and organisational-level features. The findings demonstrated the positive impact of exercise programmes on emotional well-being, cognitive function, and cardiovascular stress reactivity to cognitive and physical tasks. Cheerleading, which was more cognitively challenging, also produced superior improvements in executive function and emotional resilience than Indoor cycling.

In Chapter 6, we examined more closely the factors that could influence exercise uptake in older adults. The participants were either long-term inactive or had recently become inactive due to Government restrictions (i.e., Spring lockdown in March 2020 during the Covid-19 pandemic). The temporary closure of community-based exercise programmes provided a unique opportunity to understand the impact of their absence on exercise engagement. The application of mixed methods helped us explore the patterns of physical activity in these unique



circumstances. The quantitative results showed that both previously active and inactive participants reduced the amount of time they spent walking at the beginning of lockdown but increased it when some restrictions were lifted 8 weeks later. We found that having a sense of purpose was a key source of motivation to exercise. It was influenced by both the belief in the importance of exercise and the affective valence participants assigned to exercise. Active participants valued the physical and social benefits of exercise and the enjoyment they gained from it. However, by missing the social context of exercise during lockdown the sense of purpose in exercise was lost. Inactive participants could not find a sense of purpose in exercise due to lack of interest, mobility problems, loss of confidence, pain, or ill-health. However, all participants found purpose in walking and outdoor activities as a response to the lockdown restrictions.

Engagement in exercise is one of the important strategies that promote healthy ageing by providing social interactions and improving emotional wellbeing. Also, sustained engagement is paramount to realise the benefits of exercise. Throughout the Chapters of this thesis, we identified important determinants of engagement on multiple ecological levels. Based on our findings, we developed a set of recommendations to improve the current provision of community-based exercise programmes. Providing enablers on multiple socio-ecological levels and emphasising the importance of physical activity and its benefits on physical health and emotional well-being regardless of age or health status, could support inactive older adults to *get the old limbs going*.

## **7.2 Theoretical Contributions**

This thesis identifies important mechanisms that facilitate the engagement of older adults in exercise and develop their motivation for exercise. First, motivation was often rooted in external factors (not intrapersonal factors). Behaviour change theories focus on motivation primarily at the intrapersonal level with little consideration for external factors that might influence motivation (Davis et al., 2015). Our findings, however, highlight how social, organisational and environmental factors can lead individuals to uptake and adhere to exercise, even if their motivation to do so remains extrinsic. Second, we found that exercise behaviour was often the precursor of motivation to exercise. Well-established motivation theories consider behaviour as a consequence of motivation (Ryan & Deci, 2000a), intention or attitudes (Ajzen, 1985), but our results point to a bidirectional link between exercise behaviour and motivation. While the motivation to exercise leads to exercise behaviour, it is also the case that

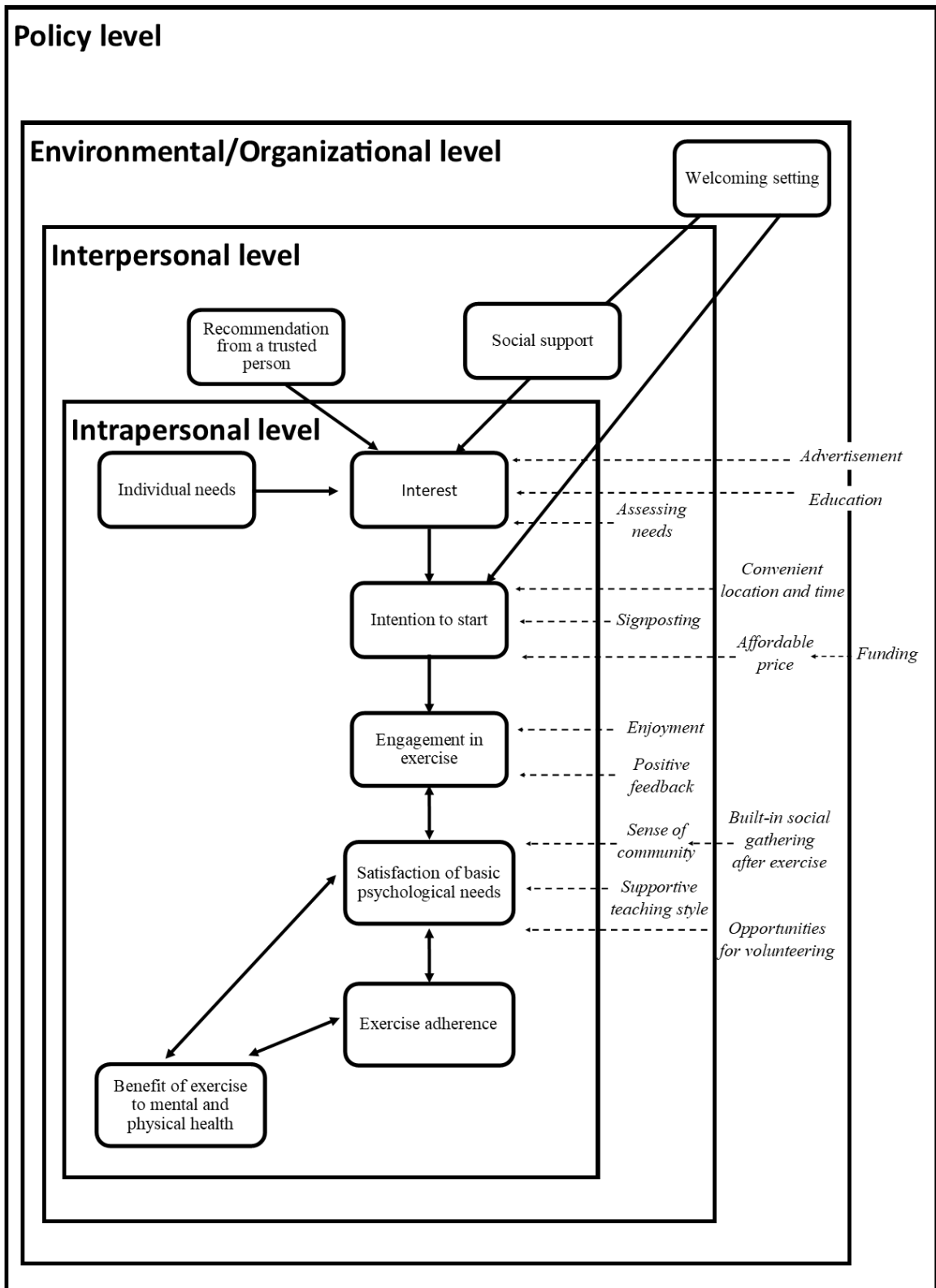


exercise behaviour leads to motivation. For example, in older adults who reported poor attitudes and little intention to exercise, the experience of exercising in a particular context promoted continued adherence. Our findings suggest that the mechanism through which exercise behaviour influences motivation (and continued adherence) is enjoyment and the perceived benefits of exercise.

Therefore we propose a model whereby interpersonal, environmental and organisational factors create positive possibilities for older adults to exercise. Once they experience exercise, motivation develops from a combination of extrinsic and intrinsic factors. Previously the socio-ecological model was combined with the self-determination theory (e.g., Gut et al., 2020; Zhang & Solmon, 2013), although most of these studies only focused on daily life physical activity (not exercise participation) and did not explain the different mechanism that links the external factors to the development of motivation. Here we propose a model that integrates the socio-ecological model with the self-determination theory but also separates uptake from adherence and highlights the bidirectional influence between behaviour and motivation (Figure 7.1).

Figure 7.1 is an integrated model that combines socio-ecological and motivational factors based on the self-determination theory. Once the intention to exercise has developed, exercise engagement/uptake is most likely to happen within a supportive socio-ecological context that enables and supports older adults to feel safe, is affordable and convenient, and meets their interests. These circumstances minimise the effort to find a valued activity and maximise the chances that inactive older adults will try out an engaging activity. In the next phase, if this ‘matching/valued activity’ provides perceived benefits, such as enjoyment or immediate physical benefits, and if they feel welcomed and included in the group, these could reduce the likelihood of drop-outs and provide a source for adherence. In line with the self-determination theory, we found that inactive individuals often show more than one type of motivational regulation that drives their behaviour in the early stage of engagement. Therefore, their engagement in exercise might be regulated from different sources, and the type of regulation can progress along the continuum from external, introjected, identified and integrated regulation (Ryan & Deci, 2017). The crucial mechanism in the second phase is the satisfaction of basic psychological needs. If the context of exercise (including both social and physical environment) supports the needs for autonomy, relatedness and competence, the likelihood of long-term adherence increases.

# ENABLERS



**Figure 7.1** Integrated process model of the development of motivation towards exercise

Overall, the satisfaction of basic psychological needs during exercise participation benefits emotional well-being (Ryan & Deci, 2017) and facilitates older adults to find an added purpose to exercise. Finding an added purpose determines the development of a more autonomous form of motivation and leads to the integrated regulation of the behaviour. In the long term, perhaps the main process that builds intrinsic motivation for older adults is recognising the benefits of exercise.

This integrated model is based on the findings of a comprehensive literature review and a series of four studies reported in the previous chapters, and offers a process map that can be considered in intervention planning. One of its strengths is that it adds to the theoretical understanding of exercise engagement of older adults by mapping out key factors that could bring about change in the behaviour. The model has similarities to the ‘behavioural system’ introduced by Michie et al. (2011) in the way that intrapersonal or external factors have equal priorities by default. In fact, if someone has no ‘Motivation’ to exercise, strong external facilitators are needed to increase ‘Opportunity’ and ‘Capability’ of the individual in order to help them engage in the ‘Behaviour’. The model shares similarities with the Behaviour Change Wheel (Michie et al., 2011) in its key strength by recognising the importance of the contextual factors to understand behaviour and design effective interventions. Our research might fill some of the gaps in relation to older adults’ exercise behaviour because it identifies key facilitators on the interpersonal, environmental and organizational levels that could facilitate or predict exercise adherence.

There are a number of limitations to the proposed model. Firstly, although the model is based on comprehensive evidence, it has not yet been tested, unlike previous integrated models (Michie et al., 2011; Hagger & Chatzisarantis, 2014). The second limitation is related to testing and research design. Due to its high complexity, it is challenging (though not impossible) to effectively test the different predictors and investigate the causal relationships that are at play. Only complex field-based research design that corporates multiple external intervention components could reliably test the model and this research would strongly depend on several stakeholders. As suggested by Hagger and Chatzisarantis (2014), the intervention components should be independently manipulated using factorial design to examine their effects on exercise engagement and to identify potential mediators. Third, due to the complexity of the model it might prove difficult to apply it to intervention design. Although, the key facilitators mapped on the interpersonal and environmental/organizational level and the proposed recommendations (Table 7.2) could provide a starting point for framing the intervention.

To sum up, we found that if an individual has no intention to exercise, that is determined primarily by intrapersonal factors. Strong interpersonal facilitators are necessary to ‘unlock’ amotivation in inactive older adults. Positive influences in the environment, organisations, and policy level also shape intention and, most importantly, enable inactive older adults to find a valued activity that meets their interests and abilities. We propose that future research turns their attention to the interpersonal, environmental and organisational factors which can be the key to engaging inactive older adults in community exercise. Or in the words of Mace (1977): “ask not what’s inside your head, but what your head’s inside of” (Mace, 1977, p. 43).

### **7.3 Methodological contributions**

The critical realist approach guided the selection of appropriate methods that could help us understand the interplay between factors that impact exercise engagement in older adults to find out ‘what works for whom’.

#### *7.3.1 Participants and the research setting*

We focused on community-based exercise programmes because they report high adherence rates, benefits for emotional well-being and physical health (Chapter 2; Farrance et al., 2016; Franco et al., 2015). They are also becoming more commonly used for the provision of physical activity opportunities for older adults. We aimed to understand how these programmes work, for whom and in what circumstances. Most of the research was done in partnership with an exercise provider for older adults, facilitating our access to various exercise programmes in different communities. This increased the ecological validity of the research because, while the programmes were varied in type, they were similar in their set-up commitment to rules and culture. This helped us understand whether the type of exercise matters in terms of the impact of cognitive function, emotional well-being or adherence in older adults (Chapter 2, 3 and 5). It also allowed us to find the key multi-level factors beneficial to adherence across exercise programmes. An important contribution to the thesis was that we gave voice to active and inactive older adults and exercise instructors. Using multiple perspectives allowed us to gain an in-depth understanding of the factors that limit or facilitate older adults’ engagement in group-based exercise programmes and the influence of instructors on those factors. To our knowledge, only one recent study (Dillon et al., 2020) included both the exercise instructors’ and the older adults’ perspectives. By synthesising the perspectives of older adults and the instructors, we could see patterns emerge that helped us answer the research questions. In

addition, none of the studies used clinical populations which means that participation was decided upon by the older adults and not as the result of a medical referral. This means that our results and recommendations are applicable to independently living older adults.

### *7.3.2 Mixed methods and multi-disciplinary measures*

The critical realist perspective guided our use of different methods to understand reality's complex and stratified nature. We chose methods to answer different research questions while the consistency in the philosophical perspectives throughout the thesis provided reliability to the findings. To date, research on the influences of exercise in healthy ageing has been dominated by quantitative studies (Chapter 2). However, such an approach precludes gaining an in-depth understanding of older adults' subjective experiences, perceptions, and discourse. By using qualitative and mixed methodologies and a theoretically integrated approach (Hagger, 2009), we could further understand the research questions. The main benefit of mixed methods is that the strength of both methods can be combined (Moran et al., 2011). Chapter 2 synthesised quantitative and qualitative research studies in the systematic review leading to a more comprehensive picture of the previous evidence. In Chapters 3 and 4, triangulating different qualitative data sources offered more validity and completeness to our findings. In Chapter 5, the quantitative methods provided useful information regarding the type of exercise of their benefits. Finally, in Chapter 6, combining qualitative and quantitative data generated new insights into the experiences of older adults.

## **7.4 Methodological limitations and implications for future research**

Notwithstanding the contributions of this research, several limitations have to be considered. First, a self-selection bias may limit the findings of this research as older adults voluntarily applied to participate in the research. Therefore they may have had a more favourable view of exercise or be more aware of the benefits and importance of physical activity for older adults (Hernán et al., 2004). Future research might consider using gatekeepers such as healthcare professionals to identify highly sedentary individuals and refer them to the research. Second, physical activity was self-reported. Objective physical activity measures such as accelerometers are more accurate in assessing physical activity levels (Murphy, 2009), especially in smaller cohorts over time. Self-reported measurements may underestimate or overestimate physical activity levels in older adults (Golubic et al., 2014) but resources and practical constraints made the use of accelerometers impossible. However, self-reported

measures of physical activity have been frequently used in previous research (Koeneman et al., 2011) and provide a valid estimate regarding physical activity guidelines (Sattler et al., 2020). Finally, the population studied is not representative of the general population regarding ethnicity and education level. London's population is diverse, with around 27% of older adults from Black, Asian and Minority Ethnic communities. However, while diverse, the participants across the thesis did not sufficiently represent London's diversity. We invited older adults from several culturally specific community clubs but did not directly engage with these communities, nor did we use strategies to recruit more diverse populations. However, it is important to do so in future to ensure that research is equitable and representative.

### **7.5 Suggestions for further research**

The findings of this thesis lead to further suggestions in the current state of research in older adults' engagement in exercise. Some of these have been acknowledged in the section above (7.4). To move this research domain further, some aspects regarding research designs, research on subpopulations of older adults, and bridging the gap between practice and research could improve the research's relevance, quality, and practical impact. We suggest that future research investigate whether the proposed recommendations and motivational aspects of community-based exercise programmes could effectively improve engagement and long-term adherence in older adults. Mixed-method programme evaluation strategies could evaluate exercise programmes in relation to participants' motivation and enjoyment in exercise. This research could include several types of community-based exercise programmes delivered in different formats (individually or in groups) and different settings (outdoor or indoor). It is insightful to assess the determinants of long-term adherence qualitatively and quantitatively. Research may want to carefully assess participants' prior experience in exercise and baseline needs and interests. An interesting secondary aim of this research might include measurements of perceived stress, mood and cognitive function to investigate the impact of different types of exercises on older adults' mental health. Using a control group that engages in other (non-exercise) leisure activities could tease apart the specific benefits of exercise.

Perhaps the most crucial area of research in terms of practical implication is investigating how inactive older adults can be supported to engage in exercise. One approach might be to signpost them to exercise. The proposed questionnaire used in Chapter 6 might be useful to assess participants' needs and interests and the application of the questionnaire as a signposting tool could be tested in future research. For effective signposting, it is important to provide clear

and reliable information on the intensity of exercise programmes. Further research could assess the intensity and complexity of community-based exercise programmes to develop a rating scale and provide information for inactive older adults. It might help them choose a programme that meets their skills and fitness level. Finally, using participatory and joined-up approaches could bridge the gap between research and practice. Co-designing interventions might be an effective way to assess the needs and interests of inactive older adults from minority ethnic groups in the UK. At the same time, the collaboration between community organisations, exercise providers and universities is an effective strategy to take this field of research forward. This joined-up approach could identify key challenges and research questions on all levels of the socio-ecological model and find solutions together that facilitate engagement in physical activity.

The components of the proposed model and the recommendations could be integrated in a complex community-based physical activity intervention and a pilot study could test the feasibility of the intervention. A longitudinal mixed-method research design with several follow-up measures and qualitative process evaluation would be needed to reliably test the impact of the intervention on intention, motivation, adherence to exercise and physical function in sedentary and insufficiently active older adults. An example of hypothesis from the model could be that social support and signposting based on the needs and interest could predict engagement in exercise. Collaboration between third sector organizations, exercise providers, healthcare professionals and researchers could refine the components of the intervention and evaluate its effectiveness after a successful pilot phase. In the future, it could also help designing an effective online platform where stakeholders offer their services, make referrals, track attendance as well as older adults themselves are able to self-refer, learn about research findings related to healthy ageing and safely connect with each other.

## **7.6 Practical recommendations**

The results of this thesis provide a basis for practical recommendations to training organisations, instructors, social and healthcare professionals, sports development and Public Health departments providing older adults' services. Overall, we suggest that enjoyment and the maintenance of physical function should be targeted in all recommendations and interventions because these are the benefits of exercise most highly valued by older adults. Exercise recommendations and interventions at each socio-ecological level should be tailored specifically to older adults. Supporting older adults to find a valued activity that suits their

needs and preferences should be the focus of these strategies. Inactive older adults should be intensively supported by their social and physical context to implement more physical activity in their lives. They should also be made aware that they might have to engage in exercise first to build their motivation. The complex interaction of direct and indirect influences of the socio-ecological context can create a ‘motivational atmosphere’ that facilitates engagement and adherence in older adults. A welcoming and inclusive setting should be promoted by targeted actions from the instructors and the organisations to provide an environment where older adults feel at ease. Individual attention, non-judgemental communication style and tailored exercises should be provided by supporting professionals to facilitate a sense of competence and physical skill development. By synthesising the findings we also listed recommendations concerning the motivational atmosphere in community-based exercise programmes in Table 7.2. In future practice, exercise providers could offer instructors continuous professional development courses and refer to these aspects as a guide to improve their programmes and facilitate long-term adherence of older adults. These recommendations can be applied to different programmes and services provided by organisations and professionals who work with older adults in the health, fitness and social sectors. Most importantly, the government has the capability to lead on positive messaging that is specific to the adult population and to create policies and funding that facilitate the engagement of older adults.

**Table 7.2** List of strategies on the interpersonal, organizational, environmental and policy levels that can improve exercise uptake. The second column highlights the enablers and the targeted motivational aspect, while the third column indicates the number of the chapter(s) where the evidence was found that provided the basis of the recommendation.

Strategies	Targeted motivational aspects and the enabler(s)	Chapters
<b>A) Strategies to increase uptake on the Policy, Environmental and Organisational levels</b> <b>Aim: Raise awareness, increase interest and minimise practical constraints by putting enablers in place.</b>		
Government to promote positive messaging and advertise information about physical activity in older adults. Provide guidance on types, intensity and amount of exercise required for mental and physical wellbeing, and strategies for incorporating exercise around daily priorities.	Intention to start Convenient time	2, 3, 6
The Government should be aware that older adults are not sufficiently physically active at home (even if they try). So there should be incentives for older adults to go outside for physical activity.	Interest and intention to start Incentives	6
Promotion of the benefits of outdoor physical activity can encourage older adults to improve their physical activity.	Interest Raise awareness Advertisement	2, 3, 6



To use effective advertisements, such as word-by-mouth, and recommendations from TV, radio, campaigns (prompts in the environment).	Interest Raise awareness Advertisement	2, 3
Open, safe, and well-maintained infrastructure can enable older adults to walk more and do physical activity and exercise outdoors. Therefore, safe walking paths in parks with benches at regular intervals and hygiene facilities should be made available.	Engagement in physical activity Convenient location	3, 6
Provide funding for prolonged periods to allow community organisations to sustain their offer on various group-based exercise classes in leisure centres, community centres and parks and at affordable prices.	Intention to start Convenient location and affordable price	3
The portfolio of existing exercises for older adults can be improved and the sessions must be offered cheaply or for free, with regular “taster” sessions.	Intention to start Convenient location and affordable price	3, 6
Improve interest and increase perceived need for physical activity through recommendations from trusted people (healthcare professionals or friends and family members).	Interpersonal level	
Recommendations should include information on the benefits of exercise for all ages and levels of mobility, especially concerning benefits to mobility and emotional well-being.	Recommendation from a trusted person Interest	3, 4, 6
Older adults can be advised that exercise has the potential to break the monotony of the day. They can be educated about establishing a routine of physical activity by using, at first, outdoor activities such as walking or gardening.	Recommendation from a trusted person Interest	6
Advice for active lifestyle and exercise from health professionals should include simple practical recommendations and if possible, opportunities for group-based exercise.	Recommendation from a trusted person Intention to start	3, 6
Older adults can be advised that finding a neighbour, friend or family member with whom they can exercise or go on regular walks can help them take up exercise by providing accountability.	Social support Intention to start	6
“Exercise befriending” can be provided over the phone or in-person where active older adults encourage inactive peers to do physical activity and help them join an exercise group.	Social support Intention to start	3, 6
Representation of different ethnicities within an organization and in the exercise group is key to help newcomers feel they can fit into the group. Diversity should be promoted in advertisements of the exercise programmes, promotional materials should be translated to different languages and specific ethnic groups should be targeted by inviting them to the programmes.	Welcoming setting Advertisements Intention to start	2, 3, 4
<b>B) Strategies to increase uptake on the Interpersonal level</b>		
<b>Aim: Support older adults to find a valued exercise</b>		
General Practitioners and Physiotherapists to provide reassurance to take up exercise and to give clear and tailored advice about the intensity and type of exercise that is suitable for individuals with long-term health conditions or health concerns. Regular positive feedback should be also given by the exercise professionals to facilitate a sense of achievement, build their self-esteem and motivation.	Recommendation from a trusted person Engagement in exercise Positive feedback	3, 6
To tailor exercise to older individuals, the following should be taken into consideration: individuals’ exercise experience; attitude towards exercise at present and intention to exercise uptake; specific needs; perceived challenges; limitations in physical function; and skills to overcome those challenges.	Recommendation from a trusted person Intention to exercise Assessing needs	3, 6

Professionals to support older adults to establish personal goals related to their health and physical function. Professionals to assess older adults' interests and priorities in daily life, and signpost them to local activities that meet their interests. For example, if they are interested in volunteering, encourage them to find a volunteer role linked to physical activity or if they like gardening, signpost them to a gardening club.	Recommendation from a trusted person/Social support Engagement to exercise Signposting	3, 6
In inactive older adults who have no history of organised social or active leisure activities: first, introduce them to social activities and later to group-based exercise activities to ensure a level of comfort in the transition from inactivity to group exercise. Those who consider joining a programme could be linked with a long-term participant as a "buddy" who could recommend the exercise and introduce them to the group.	Social support Engagement to exercise Signposting	3, 6
Older adults who like socialising can be signposted to team sports or group-based exercises which include an element of social gathering.	Social support Engagement to exercise Signposting	3, 6
<b>C) Strategies to improve adherence on the Organizational level</b>		
<b>Aim: Provide a safe, welcoming and enjoyable atmosphere</b>		
During breaks such as holidays (or a pandemic), organisations should endeavour to facilitate the contact between older adults who were previously engaged in group exercise as a way to re-engage the whole group back into the sessions.	Sense of community Social support Relatedness	6
Organisations and instructors should create a relaxed setting for the classes where participants can feel welcome, safe, oriented and relaxed so that they enjoy the early experience of exercise.	Supporting surrounding Orientation Competence	2, 3, 4
Interventions should target enjoyment and social aspects as well as improving physical function because older adults tend to appreciate these aspects when they attend exercise programmes. For example, arranging a time and space for socialising immediately before or after the exercise session.	Supporting surrounding Social element of the session Relatedness	2, 3, 4, 6
Improving the labelling and the description of exercise programmes could help inactive older adults find a type of exercise that is most likely to suit their physical abilities and give them confidence from the start. For example, a rating system can be implemented for exercise classes from one to five where one would be exercise appropriate for people with mobility problems such as chair or fall prevention exercise and five would be appropriate for people with a high level of fitness and coordination.	Supporting surrounding Orientation Competence	2, 3, 4
Purposefully build a sense of community, for instance by having a group t-shirt, a badge, a charity fundraiser, or group challenges.	Supporting surrounding Sense of community Relatedness	3, 4
<b>D) Strategies to improve adherence on the Interpersonal level</b>		
<b>Aim: Facilitate the development of physical skills by encouragement and tailored exercises</b>		
Instructors should encourage participants to report life circumstances affecting their attendance such that the instructor can follow up with non-attenders and facilitate their re-integration	Individual attention from the instructor Autonomy	3, 4
Exercise professionals working with older adults should continue tailoring exercise tasks to individual needs and physical abilities to improve confidence and provide a positive experience during exercise.	Instructor's approach Teaching style (individual attention) Competence	3, 4
Instructors should communicate in an encouraging, non-judgmental style, offer exercise choices and allow participants to set the right level of intensity for themselves.	Instructor's approach Encouragement and support Autonomy	2, 3, 4



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