Enhancing the conceptualisation, design, and development of evidence-based physical activity interventions for older adults: A mixed methods investigation.

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Abstract

Enhancing the conceptualisation, design, and development of evidence-based physical activity interventions for older adults: A mixed methods investigation.

Andrew James Powell

To reduce the implementation of intuition-based 'common-sense' physical activity (PA) interventions for older adults, and support the implementation of theory- and evidence-based interventions, there is a need for research that (a) seeks further understanding on how different interventions influence older adults' PA behaviour and their key components and characteristics, and (b) attempts to identify strategies and procedures that can enable or enhance the translation of scientific evidence and theory to real-world PA intervention practice. This PhD by Publication aimed to detail and synthesise the findings of five pieces of research that addressed the above research needs, published in five peer-reviewed articles. The five pieces of research encompassed a descriptive study (study 1), two qualitative studies (study 2 and study 4), a narrative literature review (study 3), and an experiential reflection (reflective paper). The findings of studies 2, 3, and 4 together highlighted the potentially important influence of several elements of PA interventions on older adults' PA behaviour: (a) social support, (b) system factors, and (c) therapeutic alliance. Furthermore, study 1 and the reflective paper highlighted the usefulness of two different practical strategies to close the evidence-practice gap in the PA intervention field: (a) behaviour change framework application, and (b) co-creative research. The findings demonstrated practical implications pertaining to the optimisation of local PA services, and informing wider national recommendations on actionable strategies that public health organisations can use to refine their PA interventions. The findings have been distilled into an original schematic model for application by public health practitioners to guide the real-world conceptualisation, design, and development of evidence-based PA interventions for older adults. The model offers a broad and holistic perspective of PA interventions, which goes beyond the traditional person-centred philosophy normally associated with them. The information supplied by this thesis can contribute to real-world public health practitioners basing their decision-making and actions relating to PA interventions for older adults on theory, evidence, and structured logic rather than intuition. This in turn can lead to the increased prevalence of evidence-based PA interventions rather than those based on common-sense.

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Abbreviations

AAP: Active Ageing Pathway

AJP: Andrew James Powell

AP: Andrew Powell

BCT: Behaviour change technique

BCTTv1: Behaviour Change Technique Taxonomy version 1

BCW: Behaviour Change Wheel

COM-B: Capability, Opportunity, Motivation, Behaviour

GP: General Practitioner

IAPT: Improving Access to Psychological Therapies

LWD: LiveWell Dorset

NHS: National Health Service

PA: Physical activity

SCT: Social Cognitive Theory

SDT: Self-Determination Theory

SN: Samuel Nyman

ST: Sarah Thomas

TDF: Theoretical Domains Framework

TTM: Transtheoretical Model of Change

U3A: University of the Third Age

UK: United Kingdom

WHO: World Health Organisation

List of Peer-Reviewed Articles

Study 1: Powell, A.J. and Thomas, S. 2023. Reverse coding of a common-sense physical activity intervention for older adults using elements of the Behaviour Change Wheel framework. *Health Promotion Practice*, 24 (1), 121-132.

Study 2: Powell, A.J. and Thomas, S. 2021. How the LiveWell Dorset lifestyle behaviour change service influences older adults' physical activity behaviour: A generic qualitative study. *Public Health in Practice*, 2, 100164.

Reflective paper: Powell, A.J. and Coward, C. 2022. Attempting to close the evidence-practice gap in physical activity intervention research: Strategies and outcomes of a co-creative qualitative study. *The Qualitative Report*, 27 (7), 1415-1425.

Study 3: Powell, A.J. 2021. Therapeutic alliance and its potential application to physical activity interventions for older adults: A narrative review. *Journal of Aging and Physical Activity*, 30(4), 1-5.

Study 4: Powell, A.J. and Nyman, S.R. 2022. An exploration of system factors influencing older adults' initial engagement with physical activity interventions. *Open Public Health Journal*, 15, e187494452212191.

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Declaration

I declare that this thesis has been composed solely by myself, and that it has not been submitted, in whole or in part, in any previous application for a degree. All work presented is my own. As a PhD by Publication, I confirm that the contribution of other individuals to this work is explicitly and accurately stated within the thesis.

Andrew James Powell

11/10/2023

Chapter 1. Introduction

Thesis aims

This PhD by Publication aims to contribute new knowledge to aid the future conceptualisation, design, and development of effective, evidence-based physical activity interventions for older adults. Five pieces of research, published in five peer-reviewed articles, will be detailed in this thesis, and their integrated findings presented.

Physical activity terminology

For the purposes of this thesis, the term *physical activity* (PA) refers to body movement, achieved through the contraction of skeletal muscles, that raises energy expenditure above the resting metabolic rate (Thivel et al., 2018; Tremblay et al., 2017). PA is characterised by factors such as context, modality, frequency, and duration (Thivel et al., 2018). It can be further distinguished by its intensity, which denotes the rate of energy it demands and its resultant disturbance to metabolic homeostasis. To be termed *moderate intensity*, PA must raise energy expenditure three to six times above the resting metabolic rate, while to be termed *vigorous intensity*, it must raise it more than six times above (MacIntosh et al., 2021). Individuals are said to be *physically active* when they attain the amounts of PA recommended for their age group by public health guidelines, and thus are considered *physically inactive* when they fail to do so (Thivel et al., 2018). The term *physical activity behaviour* encompasses an individual's actions, words, and manifestations of thoughts and emotions that relate to the performance of PA (Downs et al., 2013). A *physical activity intervention* is an organised combination of independent or interacting components and strategies that are designed to promote changes in PA behaviour and increases in PA levels among individuals or entire populations (Clarke et al., 2019).

Older adult terminology

Classifications of old age are generally based around three factors: (a) chronology, (b) changes in social role (e.g. changes in economic productivity brought about by retirement), and (c) changes in functional capabilities. These all vary across time and culture, and perhaps consequently there is no general agreement on the age at which an individual can be termed an *older adult* (Kowal & Dowd, 2001; Nyman, 2018). Though the World Health Organisation (WHO) classifies an older adult as ≥ 65 years (World Health Organisation, 2020), a review of how the label was conceptualised and operationalised across 17 PA-related studies found that there was no consistency in its definition, with the lower age boundary ranging from 50 to 65 years. Furthermore, it was observed that very few studies provided a rationale for the lower age boundary they used

(Lawrence & Singleton, 2017). For the sake of clarity, in this thesis, the older adult term is used generally to denote an individual aged ≥ 55 years. This primarily reflects the classification used by the funder of the research that inspired this thesis, and to account for the chronological, functional, and social aspects of the term.

Physical activity and healthy ageing

WHO defines healthy ageing as an individual developing and preserving the functional capability to be and do what they value to enable wellbeing in older age (Rudnicka et al., 2020). Vast evidence indicates that regular participation in PA is crucial to the process of healthy ageing through delivering a multitude of preventative health and quality of life benefits for individuals as they age, and that physical inactivity is a significant risk factor for the development of age-related ill health and long-term disease (Booth, 2011). This was confirmed in a recent umbrella review of 24 systematic reviews and meta-analyses of longitudinal observational studies investigating the relationship between PA and health outcomes in older adults. The review found that physically active individuals are at a reduced risk of all-cause and cardiovascular mortality, prostate and breast cancer, falls and fractures, depression, and cognitive decline. They also experience better quality of life, improved cognitive functioning, healthier ageing trajectories, and lower levels of functional limitation and disability in activities of daily living (Cunningham et al., 2020). The most recent guidelines published by WHO advise that to gain these benefits, older adults should perform at least 150-300 minutes of moderate intensity aerobic PA, or at least 75-150 minutes of vigorous intensity aerobic PA, per week. Muscle-strengthening and balance-enhancing activities, involving all major muscle groups and performed at moderate intensity or greater, are also recommended on at least two to three days per week (World Health Organization, 2020). However, in England at present, only 61% of adults aged 55-74 years, and 39% of adults aged ≥ 75 years, are achieving these moderate intensity PA standards (Sport England, 2021). This is not a new concern though; increasing the PA levels of older adults is a long-standing public health policy priority in the United Kingdom (UK), to both increase health-related quality of life, and to reduce the economic and societal costs associated with physical inactivity, such as increased National Health Service expenditure, and losses in economic productivity caused by ill health, disability, and premature death (Dallmeyer et al., 2017). In 2014, Public Health England published 'Everybody Active, Every Day', a national PA framework designed as a 'rallying cry' to encourage professionals, providers, and commissioners in all sectors to support the embedding of PA into everyday life. The document highlighted that people have a notable tendency towards declines in PA as they reach older age, and that reversing this trend was of utmost importance (Public Health England, 2014). More recently, in 2021, sport and activity-focused non-

departmental government body Sport England launched the 'Uniting the Movement' strategy, a 10-year investment and promotion plan to tackle inequalities and barriers to ensure that PA becomes a normal, beneficial, and sustained part of life for everyone regardless of background, gender, socioeconomic status, geographic location, and age. Within this strategy, PA is extoled as a means to address many of society's current challenges, support healthy ageing, and create more inclusive and connected communities where people live happier, healthier, and more fulfilling lives throughout the entire life course (Sport England, 2021a).

Barriers to physical activity participation in older adults

Much research has focused on identifying the complex array of elements that act to deter, hinder, or prevent individuals from participating in PA as they age (Devereux-Fitzgerald et al., 2018). For instance, an umbrella review conducted by Olanrewaju et al. (2016) that synthesised the findings of nine qualitative reviews examining the barriers and facilitators of older adults' PA participation, and a subsequent systematic review of 49 qualitative studies conducted by Spiteri et al. (2019), both found that the following individual, psychosocial, and environmental-level factors act as barriers to PA in older adults: physical limitations resulting from past and present health conditions and/or injuries; fear of exacerbating past and present health conditions and/or injuries or causing new ones; fear of experiencing negative physical symptoms; lack of knowledge on the benefits of PA; lack of practical knowledge and perceived skill and/or capability to engage in PA; negative previous experiences of PA; lack of social support to encourage participation; lack of motivation; fatigue; embarrassment and negative body image; competing cultural and family norms, roles, and expectations; time availability and competing obligations; cost and affordability of activities; accessibility, safety and proximity of facilities; and lack of awareness of PA opportunities. Due to the low numbers of older adults in England currently achieving the recommended levels of PA, there is a demand for individually targeted interventions that can circumvent these barriers and facilitate sustained positive changes in older adults' PA behaviour.

Physical activity interventions for older adults

PA interventions for older adults have been widely implemented and studied. They generally adopt behavioural and social approaches that aim to provide individuals with skills, knowledge, and experiences that support PA behaviour change, and involve the creation of community-based social and organisational environments that enable this change to take place (Devereaux-Fitzgerald et al., 2016; Heath et al., 2012; Taylor et al., 2021). PA interventions often involve intersectoral collaboration regarding their planning, promotion, and coordination. Consequently, health, local authority, third sector, and

private sector organisations and personnel are typically involved in their delivery, operation, and management (Heath et al., 2012). PA interventions can take various forms, with great heterogeneity observed across those implemented so far. For instance, they can incorporate various modes of PA, and be concentrated on PA instruction and active participation, or more focused on health coaching and counselling. They can also be delivered in one-to-one or group formats; in-person at locations such as leisure centres, community centres, health facilities, parks, and other outdoor public spaces; or remotely via online video, email, or telephone (Devereaux-Fitzgerald et al., 2016; Heath et al., 2012; Taylor et al., 2021). In a systematic review and meta-synthesis that examined 14 qualitative studies of older adults' experiences of PA interventions, Devereaux-Fitzgerald et al. (2016) proposed that the potential appeal of PA interventions for older adults appears to hinge on people's perception of the enjoyment that can be gained through participation, and the perceived physical and psychosocial value and benefits on offer.

The effectiveness of physical activity interventions for older adults

Research on the effectiveness of PA interventions for older adults has generally displayed positive outcomes. For instance, despite challenges in synthesising evidence from heterogeneous studies using mainly randomised controlled trial designs, a review of 19 systematic reviews reported the general effectiveness of multi-modal and multi-component PA interventions for increasing the self-reported and objectively measured PA levels of community-dwelling older adults (Zubala et al., 2017). The umbrella review examined the effectiveness of one-to-one and group-based interventions incorporating numerous modes of PA, which were implemented across a range of community settings; delivered both face-to-face and remotely by a range of health and PA professionals; based on lifestyle counselling, health education, and training elements as well as PA instruction; and most commonly of a 3-12-month duration. Positive effects on the PA levels of older adults of small to moderate sizes were generally reported across interventions, though effects on maintenance beyond 12 months remained unclear due to a lack of longitudinal studies. Similarly positive findings were reported in the most recent umbrella review on the subject. Taylor et al. (2021) examined 39 systematic reviews and meta-analyses covering a similar range of intervention types and settings, and found that 77% reported overall positive findings.

Key components and characteristics of physical activity interventions

In their umbrella review, Zubala et al. (2017) also attempted to determine the nature and characteristics of the most effective interventions they examined. It was found that tailoring to participants' needs was a particularly important element of effective PA

interventions. Furthermore, effective interventions typically utilised strategies of a motivational (e.g. to enhance desire and readiness to change behaviour), cognitive (e.g. to increase awareness and understanding of behaviour) and/or behavioural (e.g. to directly influence behaviour) nature. However, the authors concluded that in general there was uncertainty around the most effective intervention characteristics and components, as rarely were any consistently associated with positive or negative outcomes. For instance, the following intervention factors all produced mixed results: setting, mode (e.g. group or individual), professional background of intervention deliverer/s, frequency of contact, type of PA, and the use of specific behaviour change techniques (Zubala et al., 2017). Reflecting similar ambiguity, Olanrewaju et al. (2016) synthesised 17 systematic reviews to identify 'interventions effective for increasing the PA levels of community dwelling older adults', and concluded that 'many interventions', incorporating cognitive and behavioural components, appeared to be effective. More specific conclusions were not possible. Thus, there appears to be no firm consensus or recommendations on what constitutes the key elements of interventions to promote changes in older adults' PA levels.

Theory-based physical activity interventions

However, evidence has demonstrated that PA interventions that are developed in accordance with behaviour change theory appear to be more effective at influencing the PA behaviour of adults across all age groups than non-theory-based interventions (Gourlan et al., 2016). Different behaviour change theories posit cause-effect relationships to predict health-related behaviours such as PA, and provide accumulated knowledge of their psychological mechanisms of action and moderators of change (Davis et al., 2015; Janevic & Connell, 2018). They tend to focus on cognitive variables such as beliefs, attitudes, and values along with the factors that influence them, and assume that individuals are 'rational' decision-makers with regards to their health behaviours. The value of a theory-driven approach to intervention development therefore lies in its supposed utility in aiding the identification of the key antecedents of behaviour, which can then be targeted and manipulated to influence change (Janevic & Connell, 2018). Namely, broader theoretical concepts can be used to inform the selection of the behaviour change techniques (BCT) that an intervention will utilise (Morgan & Tan, 2018). BCTs are the active, observable, irreducible, and replicable 'ingredients' of an intervention that directly exist to influence behaviour (Michie et al., 2014). A meta-analysis conducted by Gourlan et al. (2016) synthesised 82 studies that had evaluated the efficacy of theory-based PA interventions, which involved 19357 participants aged ≥ 18 years. It was found that individuals who had participated in theory-based PA interventions experienced greater increases in self-reported or objectively measured PA

levels than individuals who had either participated in a PA intervention that was not theory based, or who had received no intervention. A difference equivalent to a small effect size (d = .31) was reported.

Common-sense physical activity interventions for older adults

Perhaps due to the uncertainty that exists regarding the most important characteristics and components of PA interventions for older adults, and despite the evidence suggesting that theory-based PA interventions are more effective (Gourlan et al., 2016; Michie et al, 2011), real-world public health practice frequently sees the implementation of 'common-sense' PA interventions (Glasgow & Emmons, 2007; Hansen et al., 2017). Common-sense interventions are said to overlook or neglect the connections between research evidence, behaviour change theories, and intervention components, strategies, and objectives. Instead, they favour a less systematic approach, with a tendency to utilise intuitive, 'off-the-shelf', 'down-to-earth' methods (Hansen at al, 2017; Michie at al., 2009). While often pragmatic and locally contextualised, there are concerns that these types of interventions have under-developed rationales for achieving outcomes, due to not drawing upon theory or evidence to underpin the behaviour change strategies they adopt. Furthermore, even when apparently successful at an anecdotal level, they can be difficult to define, and their mechanisms of action and outcomes subsequently hard to explain and measure (Michie et al., 2009; Watkins et al., 2016). This makes their evaluation and potential larger scale implementation in novel settings challenging; each new intervention effectively occurs in relative isolation, not contributing to the evidence base on what 'works' and what doesn't (Michie at al., 2009).

The evidence-practice gap

A general inability or failure of public health practitioners to translate scientific knowledge to practice could also underlie the frequent implementation of common-sense PA interventions. Public health practitioners sometimes lack the requisite skills in seeking and interpreting research evidence and complex behaviour change theory to feel competent and confident in applying it to their practice (Glasgow & Emmons, 2007; Hansen et al., 2017). Practitioners can also be reluctant to apply the findings from studies that pertain to different populations or contexts, or that observe slightly different outcome measures to those of interest, as they do not see the relevance or translatability of the information to their own specific settings, objectives, and local concerns (Glasgow & Emmons, 2007; Mercer et al., 2007). It has also been asserted that much PA research adopts a researcher-centric perspective, and that the research methodologies and designs used in studies do not always yield information and findings that are valuable or usable by practitioners (Glasgow & Emmons, 2007).

Research problem statement

To reduce the implementation of common-sense PA interventions and support the implementation of those based on theory and evidence, it is therefore imperative that researchers (a) seek further understanding on how different interventions influence older adults' PA behaviour and their key components and characteristics, and (b) attempt to identify strategies and procedures that can enable or enhance the translation of scientific evidence and theory to PA intervention practice. This PhD will contribute new knowledge to support this effort. New, clear, and more concise information could (a) help the common-sense PA interventions already in existence to enhance their connection to empirical theory and evidence, and (b) underpin the future conceptualisation and development of novel evidence-based interventions that are effective and implementable at scale by public health practitioners and commissioners.

Thesis context

In 2017, motivated by the need to, "learn and understand more about how we should support inactive older adults into activity… learn what approaches work and why, but also, importantly, what is less effective or doesn't work" (Sport England, 2016, p.7), Sport England launched the Active Ageing Fund. Ten million pounds was awarded across 20 innovative and experimental projects in England focused on reducing the number of inactive older adults. Through these projects, Sport England aimed to gain an understanding, and build an evidence base, on how to support people to become more active as they age (Sport England, 2016). One recipient of funding was Active Dorset, a public health organisation based in South-West England, responsible for creating the conditions for local people to choose an active lifestyle through participation in PA. Their project, which ran from 2018 to 2022, involved organising the various local PA services to which older adults already had access into one streamlined system, to provide them with a straightforward pathway to gain the knowledge, skills, and opportunities to enable them to feel more confident in being regularly physically active (Active Dorset, 2020). Active Dorset's original intention was for the Dorset PA pathway to operate through local health care professionals identifying inactive older adults during routine clinical appointments and inviting them to attend Active Dorset-led group wellbeing-themed events, at which the individuals would then be encouraged to sign up to the LiveWell Dorset lifestyle behaviour change support service. However, over the course of the project, a combination of management and strategic changes within Active Dorset, and the COVID-19 pandemic, meant the pathway and its functionality changed numerous times, and thus cannot be depicted as a stable, uniform entity. Nonetheless, Active Dorset provided funding to Bournemouth University for the student (AJP) to conduct

research on their behalf, exploring how different components of the pathway influence older adults' PA behaviour, with the findings fed back to Sport England to inform their Active Ageing Fund-derived evidence base on the approaches, ideas, and actions that public health organisations can utilise to help the older adults they work with to become more active. This PhD thesis revolves around five pieces of research born out of this work, which all asked questions seeking new knowledge to address the problems of common-sense interventions and their precipitating factors.

The student's positionality

At the heart of this thesis is the desire of AJP to produce research evidence that is relevant, understandable, adoptable, and implementable by real-world public health professionals and practitioners. This desire is predicated on the belief that PA intervention research shouldn't be conducted as an end in itself, without immediate application to practice (Green, 2008). This is compatible with the pragmatism worldview. Researchers who engage in pragmatism focus on the consequences and outcomes of their enquiry, and are concerned about solutions to problems (Creswell, 2007; Patton, 1990). In practice, they, "will use multiple methods of data collection to best answer the research question, will focus on the practical implications of the research, and will emphasize the importance of conducting research that best addresses the research problem" (Creswell, 2007, p.23). In the process, pragmatic researchers often reject the traditional philosophical dualism of objectivity and subjectivity, and typically adopt an abductive approach that moves back and forth between deduction and induction (Kaushik & Walsh, 2019).

Thesis outline

This thesis is divided into nine chapters. Following on from this introductory chapter, Chapter 2 provides context to the five pieces of research, and the process that gave rise to them. Their aims, and the thread running through them, are explained, and methods outlined. Chapters 3-7 present the five pieces of research as published in five peer-reviewed articles, with a short commentary on each highlighting and reflecting on the main findings. Chapter 8 integrates and discusses the findings of the five pieces of research and their relationship to wider literature, presents their implications for future practice and research, and considers the strengths and limitations inherent in the overall body of work. Chapter 9 concludes the thesis.

Chapter 2. Methods

Overview of research

The five pieces of research detailed in this thesis span mixed methods. Though a perfect definition of mixed methods research does not exist, in adherence with the pragmatism philosophy, it generally entails an approach to enquiry that is open to multiple ontological, epistemological, and methodological perspectives, positions, and standpoints (Johnson et al., 2007). Therefore, it can incorporate qualitative and quantitative methods, and both evaluative and reflective tools and techniques, to solve the research problem of interest (Dan, 2017; Johnson et al., 2007; Lopez-Fernandez & Molina-Azorin, 2011; McKenney & Reeves, 2014; Teddlie & Tashakkori, 2011). Consequently, the five pieces of research in this thesis encompass (a) a descriptive study, (b) two qualitative studies, (c) a narrative literature review, and (d) an experiential reflection.

In following Bournemouth University's research ethics code of practice, ethical approval was obtained for the two qualitative studies. A formal ethics review was not required for the other three pieces of research, as they did not contain any formal investigation of human participants, and because the data would not be reused or subsequently represented in another format. All research was completed, and the publishing articles written and submitted for publication, between 2018 and 2022. AJP conceived and completed all major work relating to each piece of research, drafted and submitted each article, and managed any article revisions. Contributions of other individuals are noted in the separate chapters for each piece of research. Table 1 provides a summary of the five pieces of research and the broader research questions they ask in relation to the problems of common-sense interventions and their precipitating factors. Figure 1 contains their full titles, and graphically depicts their linkage with one another and the timeframe in which each was completed. What now follows is greater detail on the rationale and thread running through the five pieces of research, along with a more in-depth description of the methods used across them.

Table 1. Summary of research.

Research Piece	Methodology	Aims	Broader Research Question
Study 1	Descriptive study	To detail and examine a systematic procedure used to apply a theoretical behaviour change framework to reverse code the Dorset PA pathway	Can retrospective behaviour change framework application procedures aid the development of existing common-sense PA interventions for older adults into theory-linked ones?
Study 2	Qualitative study	To explore how the LiveWell Dorset intervention influences older adults' PA behaviour	What are the important characteristics and components of PA interventions for older adults?
Reflective paper	Experiential reflection	To detail and examine the methodological process and strategies used to underpin research co-creation during study 2	Can co-creative research approaches aid the translatability of scientific evidence to real-world PA intervention practice?
Study 3	Narrative literature review	To review the potential relevance of the therapeutic alliance concept to PA interventions for older adults	Is therapeutic alliance an important component of PA interventions for older adults?
Study 4	Qualitative study	To explore the system factors influencing older adults' initial engagement with PA interventions	What are the important system-related characteristics and components of PA interventions for older adults?

November 2018 - June 2019

Study 1. Reverse coding
of a common-sense
physical activity
intervention for older
adults using elements of
the Behaviour Change
Wheel framework

February 2020 - October 2020

Study 2. How the
LiveWell Dorset lifestyle
behaviour change service
influences older adults'
physical activity
behaviour: A generic
qualitative study

March 2021 - August 2021

Reflective paper.
Attempting to close the
evidence-practice gap in
physical activity
intervention research:
Strategies and outcomes
of a co-creative
qualitative study

May 2021 - September 2021

Study 3. Therapeutic
alliance and its potential
application to physical
activity interventions for
older adults: A narrative
review

January 2022 - June 2022

Study 4. An exploration of
system factors influencing
older adults' initial
engagement with physical
activity interventions

Figure 1. Linkage of research and timeframes.

Study 1

A behaviour change framework is a tool typically applied to guide the systematic design, development, and characterisation of an intervention in accordance with behaviour change theory (Michie et al, 2011). It thus represents a direct instrument for translating theory to real-world PA intervention practice. Typically, a behaviour change framework is applied at the inception of the intervention design process. However, of relevance to common-sense interventions, retrospective application is also possible. A relatively new

approach, this involves 'reverse coding' an existing intervention, to deconstruct and characterise its content and its links to behaviour change theory. This process can provide an understanding of the intervention's theoretical underpinning, putative mechanisms of action, and strategies it uses to influence behaviour (French et al., 2012; Watkins et al., 2016). In turn, this knowledge can guide future evaluation, aid comparisons with other interventions, and highlight any aspects of the intervention that may be missing or in need of refinement (Watkins et al., 2016). With these purposes in mind, the initial piece of work for the Active Dorset-funded research project involved retrospectively applying a theoretical behaviour change framework to characterise the content of the original Dorset PA pathway, and its links to behaviour change theory. This came in response to the perceived lack of explicitly stated theoretical basis of much of the Dorset PA pathway's content. The primary practical objective of this work was to gain an initial understanding of the Dorset PA pathway, and the important components that seek to influence and support individuals to change their PA behaviour, in terms of specific BCTs, interpersonal approaches, and service design. It was also intended that the knowledge gained from this work would subsequently underpin further research exploring different aspects of the pathway, through highlighting its key elements, and providing granular information on different components. Study 1, a descriptive study, detailed this procedure, and appraised its usefulness for achieving its objectives. The purpose of a descriptive study is to systematically describe and illuminate a phenomena, process, or event that is newly emerging or about which little is known, to generate information that can serve as the basis for further enquiry (Dulock, 1993).

A well-established framework, the Behaviour Change Wheel (BCW), was applied to the Dorset PA pathway. The BCW was chosen due to its comprehensiveness; it integrates and synthesizes 19 other existing frameworks of behaviour change that were initially identified in a systematic literature review into one unified model for developing interventions (Michie et al., 2011; Michie et al., 2014). The review, conducted by Michie et al. (2011), evaluated the usefulness of the 19 frameworks in terms of their ability to be applied to any type of intervention, the coherence of the different categories they used to denote the determinants of behaviour to a specific entity, and their links to an overarching theoretical model of behaviour. It was found that none met all three criteria, but that there were overlaps between frameworks. The BCW was thus developed as a synthesis of the different frameworks. Its aim was to overcome their limitations and provide a comprehensive, theory- and evidence-based tool to allow users to prospectively design and develop interventions based on an analysis of the nature of the behaviour being targeted, and the mechanisms needed to influence it (Michie et al., 2011). The BCW offers a pragmatic step-by-step method based on eight steps that fall under three-stages, as displayed in figure 2. Since its inception, considerable research

has described and confirmed the usefulness of the BCW in aiding the design and development of many interventions targeting various health-related behaviours, including tobacco use, safe-sex behaviours, and PA (Kolodko et al., 2021).
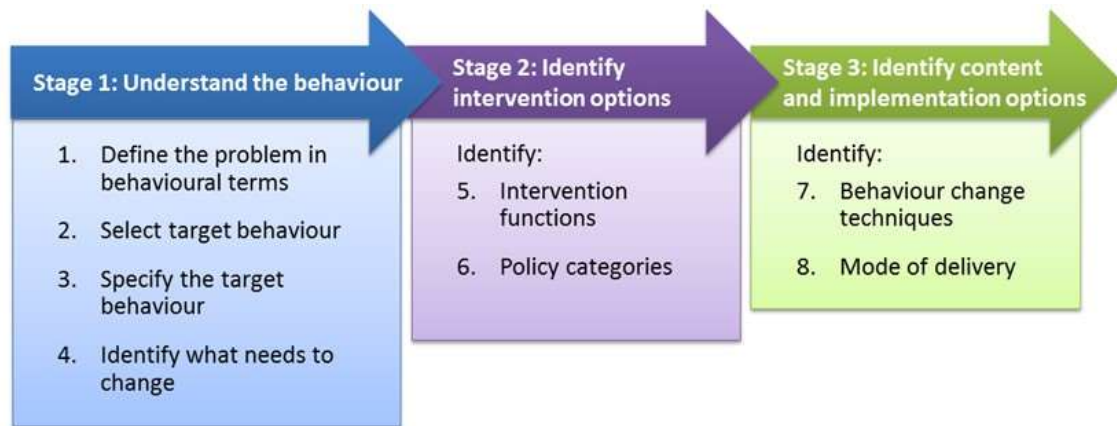

Figure 2. The steps of the Behaviour Change Wheel for designing behaviour change interventions (Michie et al., 2014).

As the steps of the BCW are intended to be cycled between back-and-forth, as opposed to rigidly followed (Michie et al., 2016), its flexibility enables adaptation for retrospective application. However, only a small number of studies have so far detailed different procedures for retrospectively applying elements of the BCW framework to reverse code existing interventions. Therefore, a two-step procedure, drawing from previous work (Bourne et al., 2020; McHugh et al., 2018; Pearson et al., 2020; Steinmo et al., 2015; Watkins et al., 2016), was devised for use with the Dorset PA pathway. The first step of the procedure involved deconstructing the pathway's content, through identifying its active components and determining their rationale for inclusion. In the second step, the BCTs and theoretical functions corresponding to these components were linked, to characterise and make explicit the associations between the pathway's content and behaviour change theory. Due to the subjective nature of certain aspects of retrospective behaviour change framework application, care was taken to ensure a 'trustworthy' procedure was carried out. Trustworthiness is a term used to assess and denote the methodological quality and transparency of research-related processes that don't utilise quantifiable measurement and numerical referents to establish traditional scientific rigor (Adler, 2022). For instance, the overall procedure was initially derived from other procedures that had previously been utilised successfully in comparable projects, to ensure it was accurate and appropriate for its intended purpose (Shenton, 2004). Furthermore, in the first step, various strategies were used to deconstruct the Dorset PA pathway, including in-person observations, face-to-face discussions, and viewing of standard operating procedures documents, to enable a comprehensive and verifiable

understanding of its content (Adler, 2022; Carter et al., 2014). In the second step, two researchers were involved in the labelling of BCTs, to ensure accuracy and consistency, and add breadth of expertise to the process (Adler, 2022; Carter et al. 2014). Both researchers also undertook online training in BCT coding prior to beginning the BCT labelling process, to maximise their technical abilities (Shenton, 2004). Finally, as much data as possible resulting from the overall procedure were captured in table form, to provide a transparent record and depiction of decision-making logic (Adler, 2022).

Study 2 and study 4

Guided by the information gained through the retrospective application of the BCW, a qualitative study was conducted that explored how the LiveWell Dorset (LWD) behaviour change service influences older adults' PA behaviour (study 2). Due to being an integral part of the Dorset PA pathway, Active Dorset wished to gain a greater understanding of LWD's role in supporting older adults to become more active. In turn, the findings of study 2 supported the rationale to conduct a second qualitative study that aimed to explore the system-related factors influencing older adults' initial engagement with PA interventions (study 4). System factors are elements of interventions pertaining to their social, physical, and operational contexts. These include the operating procedures, policies, actions, and communications of the organisations and professionals involved in their delivery, as well as the environmental-level characteristics and components (Duah-Owusu White et al., 2020).

Typical considerations when choosing an appropriate research methodology often include the epistemological beliefs, scientific interests, and methodological preferences of the researcher; the relevance of the methodology to the target audience; and the preferences of the target scientific journal (Creswell, 2007; Harper, 2011). However, according to Harper (2011), the choice should be a pragmatic one, based largely on the research question. Otherwise, "'restricting oneself to any single paradigm or way of knowing can result in a limitation to the range of knowledge and the depth of understanding that can be applied to a given problem situation" (Higgs & Titchen, 1995, p.136). The open-ended and exploratory aims of both studies, as well as the desire to gain detailed information pertaining to people's subjective attitudes, opinions, views, beliefs, and experiences, led to the decision to adopt a qualitative methodology (Harper, 2011; Percy et al., 2015). Due to the uncertainty that exists on the most important components and characteristics of PA interventions for older adults, seeking to test hypotheses, the approach typically synonymous with quantitative research, did not seem appropriate. Rather, the studies were approached with an open mind, and the intentions of illuminating people's perspectives and developing rich descriptions of processes and phenomena to aid conceptual definition and clarification (Harper, 2011). This reflected

both the aims of the Active Dorset-funded research project and the requirements of the scientific evidence base.

There are various forms of qualitative enquiry that can be used by researchers, with each having a particular focus and use in asking different kinds of research question, and each taking a certain angle of interpretation (Harper, 2011; Kholomeydik, 2012). For instance, ethnography seeks to develop an understanding of a specific cultural context based on things such as the beliefs, behaviours, perceptions, social customs, and use of language of its members (Kholomeydik, 2012; Percy et al., 2015; Teherani et al., 2015). Grounded theory focuses on the meanings people use to construct their realities, with the aim of developing theory explaining the process under investigation that is 'grounded' in these meanings (Percy et al., 2015; Teherani et al., 2015). Phenomenology explores the essence of a phenomenon through the perspectives of those who have experienced it, to understand the meanings they ascribe to it, and the internal subjective structures of those meanings (Teherani et al., 2015). In this instance, the focus of both studies was outward, on investigating people's attitudes, beliefs, subjective opinions, and reflections on their experiences of things in the external world, as opposed to inward, on the organisation and structure of their cognitive processes, or the subjective meaning of their experiences (Percy et al., 2015). Furthermore, there was no desire to develop new theory regarding people's experiences. Therefore, it was decided that a 'generic' qualitative methodology would be used. Generic qualitative research, "simply seeks to understand a phenomenon, a process, or the perspectives and worldviews of the people involved" (Merriam, 1998, p.11), and focuses on descriptions of people's experiences (Patton, 1990). It emphasises people's feelings and perceptions as opposed to the 'meanings' that may underlie them (Bellamy et al., 2016). According to Percy et al. (2015, p.79), "researchers considering any study of people's subjective 'take' on actual external happenings and events should consider generic qualitative enquiry". Perhaps because of its outward focus, generic qualitative research is not guided by a particular epistemology or explicit set of philosophic assumptions (Caelli et al., 2003). Instead, it is said to borrow 'textures' and 'overtones' at theoretical and epistemological levels without claiming allegiance to any single one (Kahlke, 2014). Kennedy (2016) states that generic qualitative research is well suited for researchers with a lens of pragmatism. As stated by Caelli et al. (2003, p.5), "a researcher's motives for engaging with a particular study topic are never a naïve choice", and thus, "the researcher's motives, presuppositions, and personal history leads him or her toward, and subsequently shapes, a particular inquiry".

The sub-genre of generic qualitative research known as qualitative descriptive research was selected as the specific methodology for the studies. Qualitative descriptive research, "is typically directed toward discovering the who, what, and where

of experiences" (Sandelowski, 2000, p.338), and seeks to provide an accurate accounting of events that other observers would agree is accurate. Thus, it entails low-inference interpretation (Sandelowski, 2000; Sandelowski, 2010). This differs from the other noted sub-genre of generic qualitative research, interpretative description, in that it does not require that researchers move as far away from or into their data during interpretation by reading into, between, or over the words contained (Bradshaw et al., 2017; Sandelowski, 2000; Sandelowski, 2010). Therefore, qualitative descriptive research could be said to draw from the principles of naturalistic enquiry, due to its commitment to studying and presenting phenomena in their most natural form (Bradshaw et al., 2017; Sandelowski, 2000). Qualitative descriptive research also seeks to present a comprehensive summary of facts in everyday language, as opposed to re-presenting them in other terms, such as a conceptual or highly abstract framework or system. For the above reasons, it is, "especially amenable to obtaining straight and largely unadorned answers to questions of special relevance to practitioners and policy makers" (Sandelowski, 2000, p.337).

In both studies, individual telephone interviews were conducted. It was believed that individual interviews would result in detailed and vivid individual accounts from participants (Gill et al., 2008; Milena et al., 2008). Individual interviews were chosen as opposed to focus groups as they are generally said to produce more breadth and depth of detail, and offer greater insight into a participant's personal feelings, thoughts, and perspectives through being more likely to elicit discussion of sensitive topics (Guest et al., 2017). Furthermore, it is often stated that focus groups should include homogenous participants, as similarity facilitates positive group dynamics and enables participants to feel comfortable contributing to discussions and elaborating their views (Kholomeydik, 2012). However, it was felt that participants in these studies could potentially vary too much across variables such as education-level, social background, and health-status to feel fully confident sharing their views with each other. Individual interviews are also said to be a more efficient and economical method of data collection than focus groups, an important consideration given that all research must be conducted within limited timelines and constrained resources, and that qualitative research methodologies are generally more time and resource consuming (Marshall et al., 2013). A study conducted by Guest et al. (2017) that statistically compared the ability of individual interviews and focus groups to generate unique items of data and sensitive disclosures across 350 participants, found that individual interviews require less researcher time, numbers of participants, and numbers of researchers to generate similar amounts of data as focus groups. As generic qualitative research methodologies such as qualitative descriptive research focus on external events and issues, they rarely use unstructured data collection methods (Percy et al., 2015). Therefore, the individual interviews were semi-

structured. Topic guides were used to ensure questions pertaining to areas of key interest were covered, not necessarily in the same order, while still allowing for the emergence of unprompted content and for participants to talk about and elaborate on any other connected areas when they felt inclined to do so (Swain, 2018). Granular-level information on the different components of the LWD service gained through the retrospective application of the BCW partly guided the development of the interview topic guide in study 2.

In both studies, individuals aged ≥ 55 years were eligible to participate, and were recruited via emails sent by gatekeepers to members of local community groups with a primary interest in health-related research, and via Facebook advertisements. A gatekeeper-based recruitment strategy was deployed due to a combination of the need to adhere to Active Dorset's legal and data protection procedures, along with the previous assertion that the trust and credibility that gatekeepers often hold with potential participants can help to facilitate their engagement and involvement with research (Namageyo-Funa et al., 2014). Participants were therefore selected using a homogenous convenience sampling strategy; the choice of participants was based on their proximity and/or accessibility to the research, on an ad hoc basis, as opposed to utilizing a probability-based process of random selection. However, it was constrained with respect to one or more sociodemographic factors, in this case age (Jager et al., 2017). Homogenous convenience sampling is affordable, efficient, and simple to implement, and produces samples with clearer generalisability than 'pure' convenience samples that don't constrain the sample frame (Etikan et al., 2016; Jager et al., 2017).

Resource constraints placed a realistic upper limit on the number of interviews that could be conducted for both studies, a factor present in the design of all qualitative research that is unable to draw upon unlimited funding (Marshall et al., 2013). According to Patton (2002, p.242), "there are no rules for sample size in qualitative enquiry". However, generating adequate data to reach data saturation is an often-cited goal and guiding principle (Braun & Clarke, 2021; Marshall et al., 2013). Data saturation is commonly defined as 'information redundancy', the point in a qualitative study at which no further data is required, as the data already collected successfully captures the depth, diversity, and nuances of the subject under investigation, and thus provides a sufficient level of understanding (Hennink & Kaiser, 2022; Marshall et al., 2013). Data saturation is said to denote the credibility (e.g. congruence with reality) of the data collected, a key element of trustworthiness in qualitative research (Hennink & Kaiser, 2022; Marshall et al., 2013; Shenton, 2004). Though some scholars argue that data saturation should be seen as, "an ongoing, cumulative judgement that [the researcher] makes, and perhaps never completes, rather than something that can be pinpointed at a specific juncture" (Saunders et al., 2018, p.1901), it is more commonly viewed as a discretely occurring

'event' that indicates some form of definiteness (Saunders et al., 2018). Upon this latter conceptualisation, data saturation is broadly operationalised as a point reached during data analysis whereby replication of insight is occurring, and no new information can be yielded from the data, indicating that the researcher has 'heard it all' (Braun and Clarke, 2021; Morse, 1995). The implication of this is that data saturation cannot be determined before data collection and at least some analysis have taken place (Braun & Clarke, 2021), making it impractical to estimate or justify qualitative sample sizes before a study commences with a degree of certainty when data saturation is the goal. Furthermore, it is argued that there are numerous intra-study factors that can influence the number of interviews needed to achieve saturation, such as researcher experience, interview quality, and the experiential diversity of participants (Braun & Clarke, 2021; Marshall et al., 2013). This is all reflected in the fact that, "there are no published guidelines or tests of adequacy for estimating the sample size required to reach saturation equivalent to those formulas used in quantitative research" (Morse, 1995, p.147). However, one commonly accepted method of sample size estimation is to cite the recommendations of other qualitative methodologists (Marshall et al., 2013), who seek to answer the question, ""Given x analyst(s) qualities, y analytic strategy, and z objective(s), what is the fewest number of interviews needed to have a solid understanding of a given phenomenon?" (Guest et al., 2006, p. 77). Adopting this approach, and in line with resource availability, a sample size of 12 interviews was selected for both studies, predicated on the evidence-based assertion by Guest et al. (2006) that this should be an adequate number to achieve data saturation. Guest et al. arrived at this recommendation using data from a study involving 60 individual interviews. They systematically documented the variability and degree of data saturation over the course of data analysis, and found that saturation occurred after the initial 12 interviews had been analysed, with signs of saturation even present after six interviews. Guest et al. concluded that their findings would be generalisable to other qualitative studies with at least a certain degree of structure, which seek to understand common perceptions, on clearly defined topics, among relatively homogenous sets of individuals. Subsequent research studies have supported this recommendation, reporting the achievement of data saturation in samples ranging from seven to 12 interviews in qualitative investigations meeting these criteria (Ando et al., 2014; Constantinou et al., 2017; Francis et al, 2010).

In generic qualitative research approaches such as qualitative descriptive research, thematic analysis is often the preferred data analysis technique (Bellamy et al., 2016). The objective of thematic analysis is to search for and identify common threads and patterns that extend across a set of interviews to provide a detailed and nuanced account of the data (Vaismoradi et al., 2013; Braun & Clarke, 2006), with, "no mandate to re-present the data in any other terms but their own" (Sandelowski, 2000,

p.338). One of the main appeals of thematic analysis is its adaptability. Unlike other methods of qualitative data analysis such as conversation analysis or narrative analysis, thematic analysis is not tied to a theoretical position or framework (Braun & Clarke, 2006; Clarke & Braun, 2018). This makes it particularly compatible with generic qualitative studies that themselves are not guided by a particular epistemology, and require a fluid, yet complex, account of data. When conducting thematic analysis, it is possible to identify patterns, or 'themes', within the data either inductively or deductively (Braun and Clarke, 2006; Fereday & Muir-Cochrane, 2006). An inductive approach seeks to identify a posteriori themes that are purely linked to the data generated, to provide the richest possible overall description of data from the 'bottom up' (Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006). Conversely, a deductive approach is driven by a priori themes from the 'top down', which are derived typically from research aims, research questions, and interview topic guides. The deductive approach is thus guided by some form of pre-existing knowledge, and ensures a detailed analysis of any aspects of the data pre-determined to be important (Braun and Clarke, 2006; Fereday & Muir-Cochrane, 2006; Swain, 2018). The choice between inductive and deductive should be based on the research question, as well as the objectives of the research (Braun and Clarke, 2006). In both studies, a hybrid approach to thematic analysis that incorporated both inductive and deductive processes was used to analyse interview data, largely based on the work of Swain (2018). According to Swain (2018), this type of approach is flexible while still being systematic, rigorous, and transparent, and is particularly suitable for relatively small qualitative studies where data sets are not overly extensive or complicated. In this case, a hybrid approach allowed pre-determined areas of interest, based on practical information, literature, and the priorities of Active Dorset, to be carried into the analysis, whilst being able to seek 'new' information and ideas from the data (Mihas & Odum, 2019). Maintaining consistency with the work of Guest et al. (2006) and the assertion that data saturation should be viewed as occurring at, "the point in [data analysis] when new information produces little or no change to the codebook" (Guest et al. 2006, p.65), the operational definition used to guide the detection of data saturation during analysis was the point during the reading and coding of interview transcripts at which no new a posteriori subthemes emerged from the data.

To ensure trustworthiness in both studies, as well as seeking data saturation, numerous other measures were taken. For instance, well recognised and established methods were adopted to ensure appropriateness, with the previously detailed evidence drawn upon to inform design aspects such as sample size selection, data analysis procedures, and data collection strategies and techniques (Shenton, 2004). The studies were also subject to peer scrutiny from non-involved academic colleagues during the design phase, on matters such as interview topic guide content and recruitment

processes. Gaining fresh perspectives from individuals detached from the studies was intended to facilitate the challenging of assumptions, and potentially prompt the optimisation of methods, or strengthening of the understanding of the rationale behind their selection (Adler, 2022; Shenton, 2004). The gatekeeper-based recruitment strategy along with convenience sampling ensured an appropriate level of researcher-participant separateness for the studies, while negating any chances of researcher influence on participant selection (Dodgson, 2019; Krefting, 1991; Shenton, 2004). To enhance the likelihood of collecting honest and accurate data from willing individuals during interviews, participants were required to volunteer, and were provided with the chance to withdraw their involvement up until the point when their data was anonymised during analysis. Furthermore, participants were encouraged to be frank during interviews. To establish trust and rapport, they were assured that there were no incorrect answers to questions asked, and that they were free to decline to answer any question (Shenton, 2004). Also, interviewing techniques such as open-ended questioning, summarising, and clarification were used to facilitate evoking and openness (Brobeck et al., 2014). Researcher independence from any PA intervention or service was also made clear to participants prior to interviews (Shenton, 2004). Recordings of all interviews were listened to the day after they had been conducted, and reflective notes made detailing impressions of the data collected, the effectiveness of data collection techniques, and any intuitive signs of data saturation. The intention was to promote 'progressive subjectivity', the ongoing evaluation and scrutiny of a study as it develops for possible methodological flaws and gaps (Bradshaw et al., 2017; Kholomeydik, 2012; Shenton, 2004). As there is a risk in qualitative research of unconscious cognitive errors prompting researchers to 'find what they set out to find' based on their pre-existing characteristics, assumptions, and interests (Dodgson, 2019), reflective notes were also made pertaining to the nature of researcher-participant interactions. The purpose was to monitor for any signs of researcher bias or influence during interviews, and ensure that findings were arising from the ideas and experiences of the participants, rather than the researcher's reactions, preferences, or beliefs (Dodgson, 2019; Shenton, 2004). For a similar reason, themes and subthemes, and the strength and accuracy of the interpretations underpinning them, were critically discussed and evaluated in research team debrief sessions following analysis of the interviews. The goal of these sessions was to scrutinise and provide a sounding board for the testing of ideas, and identify any researcher biases that might underly them (Bradshaw et al., 2017; Shenton, 2004). Finally, in the reporting of the studies, step-by-step methodological descriptions were provided, to enable repeatability, and for readers to make judgements on the extent to which quality research practices had been followed. The findings were also examined and discussed in relation to the existing evidence base, to assess and demonstrate their

congruence with past studies and existing theory, and thus their plausibility (Shenton, 2004).

Reflective paper

One way that researchers can potentially aid the translatability of research evidence to real-world public health practice is through working actively with the practitioners and organisations that run PA interventions and share a common interest in the relevant health or behavioural outcomes and processes, to engage in co-creative research that takes place in their actual circumstances of practice (Glasgow & Emmons, 2007; Green, 2008; Mercer et al., 2007). In co-creative research, non-academic stakeholders are involved as full and equal partners in the research process, with the intention that they will be the eventual beneficiaries and end-users of the research (van Dijk-de Vries et al., 2020). The stakeholders' needs guide the research, and they are consulted and placed at the centre of tasks such as the identification and development of research questions, the selection of the most appropriate research methodologies, and decisions pertaining to how to analyse data and present findings in the most helpful ways (Green, 2008; Mercer et al., 2007). With these points in mind, an unstructured co-creative research approach was taken for study 2, in collaboration with Active Dorset. The desired outcome was to deliver evidence to Active Dorset regarding the LWD service that reflected as closely as possible their actual circumstances of practice, and consequently feedback and findings that were more relevant, understandable, and actionable to them, and available to use immediately for solving real-world problems (Camden et al., 2015; Green, 2008). The reflective paper contained an experiential reflection on this co-creative research process, and contemplated its outcomes. An experientially based reflective paper centres on detailing an individual's thoughts, insights, and observations relating to an incident, process, or initiative with strong contemporary relevance, along with what was learned, in an analytical and critical manner. The overarching aim is to stimulate thought, interest, and awareness in the reader about the subject in question, and a desire to reflect on their own related experiences (Mowat & Jopling, 2020). Though the reflective paper did not entail an empirical study of a formal co-creative process, it did contain an informal ethnographic element (e.g. the desire to describe and convey naturalistic observations), as it pertained to extensive real-world 'participatory interactions' between AJP and three members of Active Dorset staff involved in study 2 (Leslie et al., 2013; Swain & King, 2022). The interactions took place over the course of approximately six months, in the form of face-to-face meetings, telephone conversations, and emails. A formal co-creative study was beyond the scope and resources of the Active Dorset-funded research project, and so experiential reflection based upon these interactions

was considered practical and appropriate for addressing an identified gap in the evidence base regarding co-creative research processes and strategies.

Study 3

The findings of study 2 also supported the rationale to conduct study 3, a literature review investigating the idea that the strength, quality, and collaborative nature of the professional-client relationship, a concept drawn from the field of psychotherapy and known as therapeutic alliance, may be a vital and foundational element of effective PA interventions for older adults. The standard classification of 'literature review' entails three broad varieties: (a) qualitative systematic review, (b) quantitative systematic review, and (c) narrative review (Green et al., 2006). All seek to synthesize and integrate previous findings and perspectives to potentially provide a power that no single study offers, and each is an appropriate methodological tool for certain situations and answering certain types of research question (Snyder, 2019). In this instance, a preliminary literature search was initially performed in accordance with the step-by-step literature review guidelines of Green et al. (2006), to overview the topic at hand and help refine the objectives of the review to be conducted. Due to therapeutic alliance being established as a stand-alone concept in the psychotherapy field backed by extensive literature (Horvath & Luborsky, 1993), the search strategy contained terms only directly relating to it, rather than incorporating wider, seemingly associated terms and thereby attempting to reduce the concept to related parts or constructs. The search identified no previous studies that had investigated therapeutic alliance in relation to PA interventions for older adults, suggesting an omission or deficiency in the evidence base (Torraco, 2005). Therefore, the decision was made to conduct a narrative literature review. A narrative review presents a non-systematic summation of evidence, which is particularly suitable when the aim of research is to identify, overview, or evaluate the state of knowledge on a novel issue or topic, on which related evidence is interdisciplinary and/or disparate in nature (Gregory and Denniss, 2018; Snyder, 2019). A narrative review tends to offer a broad perspective on a topic that accounts for theory, context, and history (Green et al., 2006).

As the purpose of the review was to critically overview the knowledge base, potentially re-conceptualise and/or create novel preliminary conceptualisations, and expand on the theoretical foundation of the specific topic as it develops (Snyder, 2019; Torraco, 2005), an integrative approach was adopted based on the work of Torraco (2005). An integrative narrative review entails a less structured and more creative collection and analysis of data, as the aim is not to cover every article published on a topic, but rather to combine insights from different fields or traditions in an original and critical way, and use logic and clear conceptual reasoning as a basis for arguments and

explanations (Snyder, 2019). Literature is therefore synthesised, assessed, and critiqued in a manner that supports the emergence of new theoretical frameworks and perspectives, rather than in accordance with a particular standard or guideline (Green et al., 2006; Snyder, 2019; Torraco, 2005). Consequently, methods such as search strategies can be difficult to articulate and report, due to the subjective nature of literature selection and the extraction of information (Green et al., 2006).

Chapter 3. Study 1 Article

Title

Reverse coding of a common-sense physical activity intervention for older adults using elements of the Behaviour Change Wheel framework.

Summary

This descriptive study detailed the procedure used to retrospectively apply the BCW framework to reverse code the Dorset PA pathway, and appraised its usefulness in achieving its objectives.

Contributions

Dr Sarah Thomas (research adviser to AJP, Bournemouth University) contributed to the design of the procedure, assisted with conducting the procedure, and proof-read and commented on the first draft of the article.

Main findings

The procedure was demonstrated to be clear, systematic, and replicable, and provided a detailed characterization of the Dorset PA pathway's content and its links to behaviour change theory. The procedure demonstrated practical applications for identifying theoretically under-served areas and gaps in the Dorset PA pathway's content, and informing its future evaluation.

Implications

The findings support and build upon the small amount of previous research detailing the usefulness of reverse coding procedures as a tool for developing common-sense PA interventions into behaviour change theory-linked ones, and enhancing their connection to empirical evidence.

Reverse Coding of a Common-Sense Physical Activity Intervention for Older Adults Using Elements of the Behaviour Change Wheel Framework

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"Common-sense" physical activity (PA) interventions for older adults may be more effective if developed in accordance with behavior change theory. One way to achieve this is through retrospectively applying a theoretical behavior change framework to "reverse code" an existing intervention and guide its ongoing development. This study aimed to detail a clear and systematic procedure that applied elements of the Behaviour Change Wheel (BCW) framework to reverse code the Active Ageing Pathway (AAP) intervention. The objectives of the procedure were to characterize the content of the AAP and its links to behavior change theory. The content of the AAP was first deconstructed through the examination of "standard operating procedures" documents, in-person observation, and a series of face-to-face discussions with AAP management. Then, the behavior change techniques (BCT) and BCW intervention functions associated with the AAP's content were identified and coded using the BCT Taxonomy version 1. Forty-one active components were identified within the AAP, which involved numerous professionals, and pertained to a diverse and interlinked range of factors, across various modes of delivery. The components were classified under 20 separate BCT labels, which related to eight of the nine BCW intervention functions. These outcomes were demonstrated to have practical applications for identifying gaps in intervention content as well as for guiding future intervention evaluation. This study supports previous work detailing the usefulness of reverse coding procedures as a tool for developing common-sense interventions, and is the first to do so in the context of a PA intervention for older adults.

Keywords: physical activity/exercise; behavior change; community intervention; program planning and evaluation; behavior change theory; theory

> **BACKGROUND**

Physical inactivity is a significant risk factor for the development of age-related ill health and long-term disease (Booth et al., 2011), and there is a wealth of evidence suggesting that participating in regular physical activity (PA) provides a multitude of preventive health

and quality of life benefits for individuals as they reach middle-age and beyond (Paterson et al., 2007; Taylor et al., 2004). Although World Health Organization guidelines recommend that over 55s perform at least 150 minutes of moderate-intensity PA per week to obtain these benefits (World Health Organization, 2010), at present only 46% of such individuals in the United Kingdom are doing so (British Heart Foundation, 2015). Thus, increasing the PA levels of older adults has become a priority for public health interventions in the United Kingdom, to promote healthy aging and reduce the risk of preventable health conditions developing (Public Health England, 2014).

With uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels (Zubala et al., 2017), real-world public health practice often sees the implementation of "common-sense" PA interventions, which adopt "off-the-shelf" strategies. Although pragmatic and locally contextualized, there are concerns that these types of interventions have underdeveloped rationales for achieving outcomes, as they often do not consider the theory or evidence underpinning the behavior change strategies they adopt (Hansen et al., 2017; Michie et al., 2011). Furthermore, even when they are seemingly successful at an anecdotal level, they can be difficult to define, and their mechanisms of action and outcomes are subsequently hard to explain and measure (Watkins et al., 2016). This makes their evaluation, and potential implementation on a larger scale, and in novel settings, challenging.

These difficulties, along with the assertion that PA interventions for older adults are more likely to be effective in the long term if they are developed in accordance with behavior change theory (Hansen et al., 2017; Olanrewaju et al., 2016), have led to increasing support for a systematic, theory-driven approach to their design. One way this can be achieved is through the application of a behavior change framework, to support the detailed design, development, and characterization of an intervention, in terms of its content, theoretical rationale, and putative mechanisms of action (French et al., 2012; Steinmo et al., 2015).

Typically, the application of a behavior change framework occurs from the inception of the intervention design process. However, a more pragmatic approach with existing common-sense interventions is to use one retrospectively, to "reverse code" an intervention. Here, the objective is to systematically deconstruct the intervention to characterize its content and links to behavior change theory. This process can provide an understanding of the intervention's theoretical underpinning and the strategies it uses to target behavior, which, in turn, can guide future evaluation and aid comparisons with other interventions. Furthermore, it can enable the identification of elements of the intervention that may need refining (Watkins et al., 2016).

A well-established behavior change framework that can be used to reverse-code existing interventions is the Behaviour Change Wheel (BCW). The BCW integrates and synthesizes 19 other existing frameworks of behavior change into one unified model for developing interventions (Michie et al., 2014). The BCW comprises three layers (Figure 1). At its core is the Capability, Opportunity, Motivation, Behaviour (COM-B) model, which recognizes that changing behavior results from changing one or more components of psychological and/or physical capability, social and/or physical opportunity, and automatic and reflective motivation. The next layer is the Theoretical Domains Framework (TDF), which subdivides the components of the COM-B model and links them to 14 domains to provide a finer level of understanding. Surrounding the COM-B model and TDF is a layer of nine intervention functions. These are categories of mechanism, linked to the different COM-B components and TDF domains, by which an intervention can activate the theoretical pathways to influence behavior. Finally, there is a taxonomy of 93 behavior change techniques (BCT) associated with the BCW, which are the active components of an intervention that directly target behavior, and that link to the different intervention functions to ensure they are delivered (Michie et al., 2014; Smits et al., 2018).

As a relatively new approach, only a small number of studies have so far detailed and appraised different procedures for applying elements of the BCW framework to reverse code existing interventions, and none have done so in the context of a PA intervention for older adults. Steinmo et al. (2015) were the first to outline their process for identifying the BCTs and linked intervention functions of a "six steps of sepsis treatment" hospital implementation intervention, and mapping them to the TDF domains and corresponding COM-B conditions. They aimed to characterize the intervention's content and potential theoretical mechanisms of action, and reported that their results provided a sound platform for intervention improvement and replication. Watkins et al. (2016) applied the COM-B model and identified the BCTs used in an asthma management intervention to examine the theoretical rationale behind its content, and were able to conclude that the intervention's content had a sound theoretical underpinning. McHugh et al. (2018) identified the BCTs and linked intervention functions to characterize a multilevel implementation strategy for a fall prevention program, and reported that the process was useful for describing the intervention's components and highlighting gaps that can be addressed to maximize
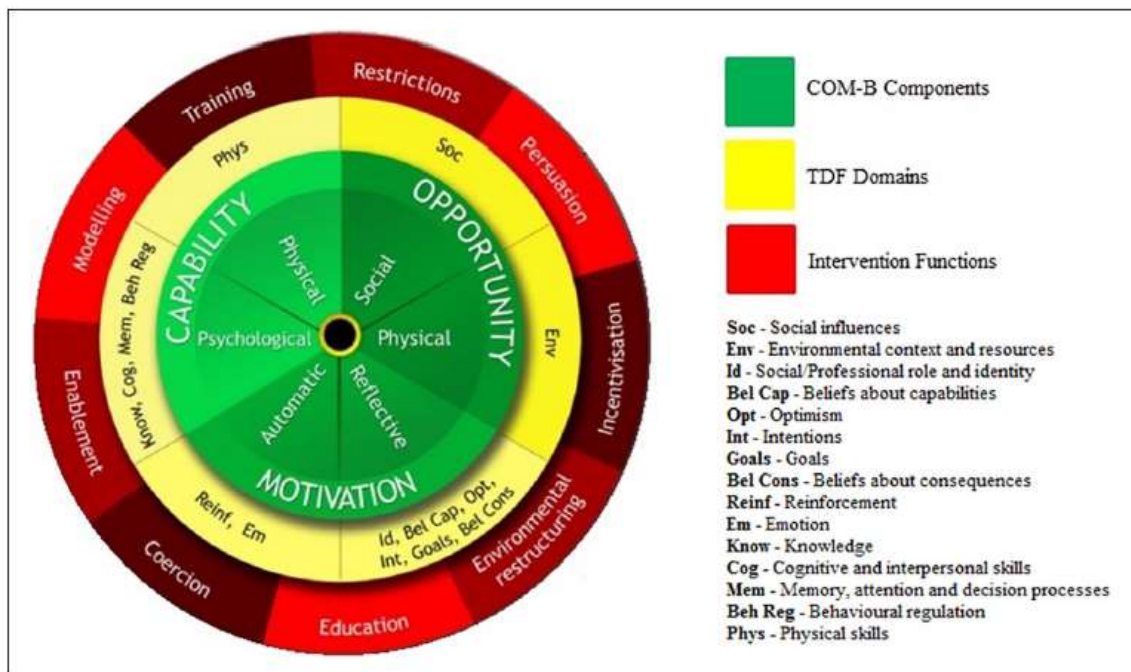
FIGURE 1 Behaviour Change Wheel (Michie et al., 2014; Smits et al., 2018).
Note. This figure depicts the three layers of the Behaviour Change Wheel.

effectiveness. Bourne et al. (2020) outlined a process that involved identifying the BCTs associated with an exercise intervention for individuals at risk of Type 2 diabetes and mapping them against the TDF. They concluded that their results increased the transparency of intervention content and enabled the targeted mechanisms of action to be identified, which could support future intervention improvements. Most recently, Pearson et al. (2020) identified the BCTs in a fibromyalgia self-management intervention and reported that their work provided an in-depth understanding of the intervention's actions.

Purpose

To add to the above evidence, the aim of this study is to detail a procedure that was used to apply elements of the BCW to reverse code an existing common-sense PA intervention for older adults. The objective of the procedure was to characterize the content of the intervention along with its links to behavior change theory, through deconstructing the intervention and identifying the associated BCTs and their related BCW intervention functions.

▶ METHOD

The Intervention

The intervention reverse coded in this study was the Active Ageing Pathway (AAP), located in Dorset, South-West England. Originally implemented by local public health agency Active Dorset in March 2018, the AAP exists to provide individuals aged 55 and above with the knowledge, skills, and opportunities that will enable them to feel more confident in being regularly physically active and more able to embed this behavior into their everyday lives.

The AAP was initially developed by Active Dorset in response to Dorset's 2015 "Sustainability and Transformation Plan" (Our Dorset, 2018), which highlighted anticipated population growth among the oldest people in the area with corresponding increases in long-term conditions, fragmentation, and variation in the quality of local health and care services, and the likelihood of future funding shortfalls. The aim of the AAP was therefore to bring together the different PA services in Dorset into one streamlined, standardized system, to

deliver optimal behavioral and preventive health and wellbeing outcomes. Furthermore, the AAP sought to incorporate the relevant local National Health Service (NHS) and local authority organizations as "referrers" into this system, to deliver more efficient and effective partnership working and increased economic sustainability. The AAP is expected to grow and develop in the future to link up with community and workplace organizations and populations.

The AAP currently operates by engaging local secondary care clinicians and health care professionals to identify inactive individuals aged 55 and above during routine clinical appointments as part of their standard patient treatment pathways. Individuals are then invited to attend group "Wellbeing Events" run by Active Dorset. These last for 3 hours, and aim to educate attendees on the benefits of becoming more active, and showcase the PA options available locally, ranging from gym-based exercise referral schemes and organized walking clubs to tai-chi classes. Following attendance at a Wellbeing Event, individuals are then invited by Active Dorset to sign up to the LiveWell Dorset (LWD) integrated lifestyle service. Here, they can receive 6 weeks of behavior change coaching support online and via telephone from a specially trained "Wellness Coach," to help them to meet the Government's recommended guidelines for PA, and then maintain this lifestyle change.

As part of a Sport England-funded project, Active Dorset wished to find out about the elements of the AAP that influence and support individuals to change their PA behavior, in terms of specific BCTs, interpersonal approaches, and service pathway design. The reverse coding of the AAP was the first part of that work, and it was hoped that the outcomes would underpin further project work to evaluate the AAP, as well as guide the future optimization of its content.

Procedure

Drawing upon previous work (Bourne et al., 2020; McHugh et al., 2018; Pearson et al., 2020; Steinmo et al., 2015; Watkins et al., 2016), a two-step procedure was followed to reverse code the AAP.

Step 1—Deconstructing Intervention Content. In order to characterize the AAP's content, its active components, along with an understanding of their rationale for inclusion in the AAP, were deconstructed by the lead author (AJP) through the examination of "standard operating procedures" documents provided by Active Dorset, in-person observation of Wellbeing Events, and a series of face-to-face discussions with Active Dorset management. Components of the AAP were identified

on the basis of being observable, replicable, and irreducible, and explicitly linking to both the target behavior and the target population of the AAP (Michie et al., 2014). The standard operating procedures documents supplied by Active Dorset contained detailed intervention scripts and content descriptions. AJP read and re-read the documents and took notes on them. Observations of Wellbeing Events were carried out on three separate occasions. AJP made detailed field notes on the content of the events while in attendance. Face-to-face discussions with Active Dorset management mainly served to clarify the information that had been gained from the standard operating procedures documents and observation of Wellbeing Events. AJP also took notes during these meetings.

Step 2—Linking Intervention Content to Behavior Change Theory. Once all intervention components had been identified, their associated BCTs and related intervention functions were then coded by AJP, to characterize the links of the AAP's content to behavior change theory. Using the BCT Taxonomy version 1 (Michie et al., 2014), each AAP component was checked against BCT definitions and labeled with the BCT/s deemed most representative of its perceived purpose within the AAP. Once all BCT labels had been assigned, each AAP component was then categorized with the BCW intervention function/s corresponding to its BCT label/s (Michie et al., 2014). All BCT labels were checked by the co-author (ST), with disagreements on any labels resolved by discussion and consensus. This measure was taken due to the recognition that labeling of BCTs can be subjectively influenced by both the richness of content description and varying broadness of BCT definitions (Smits et al., 2018). Both authors had undertaken online training in BCT coding prior to starting the labeling process.

▶ RESULTS

A summary of the deconstructed AAP with its composite components and their rationale, BCT labels, and corresponding intervention functions is shown in Table 1.

Step 1—Deconstructing Intervention Content

Forty-one active components were identified within the AAP. The 41 components pertained to a diverse and interlinked range of factors, across face-to-face, group, telephone, and online contexts, and involved numerous professionals, including clinicians and health care professionals, fitness instructors, and behavior change

TABLE 1
**Summary of AAP Components and Their Rationale, BCT Labels, and
Corresponding Intervention Functions (Michie et al., 2014)**

Intervention component	Rationale for component	BCT/s	Intervention function/s
Clinician/health professional conveys information about AAP to individual	To facilitate awareness of AAP	Social support (unspecified)	Enablement
Clinician/health professional conveys information about Wellbeing Event to individual	To facilitate awareness of Wellbeing Event	Social support (unspecified)	Enablement
Clinician/health professional conveys information on benefits of physical activity to individual	To facilitate knowledge on benefits of physical activity	Information about health consequences	Education Persuasion
Clinician/health professional provides leaflet about Wellbeing Event to individual	To facilitate awareness of Wellbeing Event	Social support (unspecified)	Enablement
Clinician/health professional conveys information about Wellbeing Event sign-up process to individual	To facilitate registration for Wellbeing Event	Social support (unspecified)	Enablement
Simple web-based sign-up process provided for individual to register to attend next Wellbeing Event	To facilitate registration for Wellbeing Event	Adding objects to the environment	Enablement Environmental restructuring
Clinician/health professional provides help to individual to complete online Wellbeing Event registration, or completes it for them, if required	To facilitate registration for Wellbeing Event	Social support (practical)	Enablement
Clinician/health professional sends reminder leaflet to individual 1 month prior to next Wellbeing Event	To facilitate registration for Wellbeing Event	Prompts/cues Social support (practical)	Education Enablement Environmental restructuring
Registration website provides information and details on Wellbeing Event for individual	To facilitate awareness of Wellbeing Event	Social support (unspecified)	Enablement
Registration website offers option for individual to bring guests to Wellbeing Event	To facilitate registration and attendance of Wellbeing Event	Adding objects to the environment Social support (emotional)	Enablement Environmental restructuring
Wellbeing Event held at venue with 'favorable' characteristics: • Venue is local landmark/well-known • Venue is nonmedical • Venue is modern and pleasant • Venue has plentiful parking • Venue has good public transport links • Venue is in easy-to-access central location	To facilitate attendance of Wellbeing Event	Restructuring the physical environment	Enablement Environmental restructuring
Wellbeing Event scheduled during off-peak daylight hours	To facilitate attendance of Wellbeing Event	Restructuring the physical environment	Enablement Environmental restructuring

(continued)

TABLE 1 (CONTINUED)

Intervention component	Rationale for component	BCT/s	Intervention function/s
Wellbeing Event free to attend	To facilitate attendance of Wellbeing Event	Restructuring the physical environment	Enablement Environmental restructuring
Wellbeing Event contains scheduled time for "coffee and mingling" where group is encouraged to interact and share experiences with one another	To facilitate awareness of others' behavior to allow comparison with own	Social comparison Social support (unspecified)	Enablement Persuasion
Wellbeing Event contains exhibition area with stalls advertising local physical activity services and providing opportunities to register	To facilitate awareness of local physical activity opportunities	Adding objects to the environment Social support (practical) Social support (unspecified)	Enablement Environmental restructuring
Fitness instructor presents information about general well-being and health benefits of physical activity to group	To facilitate knowledge on wellbeing	Credible source Information about health consequences	Education Persuasion
Fitness instructor instructs group to perform 3-minute "movement" session to convey how physical activity positively affects feelings of wellbeing	To facilitate awareness of feelings generated by physical activity	Demonstration of the behavior Monitoring of emotional consequences	Enablement Modeling Training
Fitness instructor presents technical information about physical activity (e.g., frequency, duration, intensity, mode) and safety/risk considerations to group	To facilitate knowledge on how to effectively perform physical activity	Instruction on how to perform a behavior Social support (unspecified)	Enablement Training
Fitness instructor presents simple examples of how people can get started with physical activity at home on their own to group	To facilitate knowledge on practical ways to perform physical activity	Instruction on how to perform a behavior	Training
Fitness instructor interactively discusses common barriers and facilitators of physical activity with group	To facilitate analysis of factors influencing behavior and strategies to overcome them	Problem-solving	Enablement
Fitness instructor provides written materials and leaflets about physical activity to group	To facilitate knowledge on physical activity	Social support (unspecified)	Enablement
Representatives from stalls advertising local physical activity services make "pitches" to group about their offerings, including details on how to register	To facilitate registration for local physical activity opportunities	Social support (unspecified)	Enablement
Wellness Coach presents information about LiveWell Dorset service to group	To facilitate awareness of LiveWell Dorset service	Social support (unspecified)	Enablement

TABLE 1 (CONTINUED)

Intervention component	Rationale for component	BCT/s	Intervention function/s
Wellness Coach presents information about benefits of behavior change coaching to group	To facilitate knowledge on benefits of coaching	Information about health consequences	Education Persuasion
Wellness Coach presents information about LiveWell Dorset service registration processes to group	To facilitate registration for LiveWell Dorset service	Social support (unspecified)	Enablement
Wellness Coach provides cards with information on how to register with LiveWell Dorset service to group	To facilitate registration for LiveWell Dorset service	Social support (unspecified)	Enablement
Wellness Coach provides opportunity for group to provide personal details in order to receive a "registration call-back" from LiveWell Dorset service	To facilitate registration for LiveWell Dorset service	Adding objects to the environment Social support (practical)	Enablement Environmental restructuring
Simple telephone and web-based chat facilities provided for individual to enquire about Live Well Dorset service	To facilitate registration for LiveWell Dorset service	Adding objects to the environment Social support (unspecified)	Enablement Environmental restructuring
Simple telephone and web-based sign-up processes provided for individual to register with LiveWell Dorset service	To facilitate registration for LiveWell Dorset service	Adding objects to the environment	Enablement Environmental restructuring
Wellness Advisor conducts introductory LiveWell Dorset assessment with individual via telephone (and follow-up assessments at 3, 6, and 12 months after introductory assessment), completing and discussing current lifestyle and physical activity habits questionnaires with individual	To monitor and provide evaluative feedback on behavior	Feedback on behavior	Education Coercion Incentivization Persuasion Training
Wellness Advisor discusses benefits of physical activity with individual	To facilitate knowledge on benefits of physical activity	Information about health consequences	Education Persuasion
Wellness Advisor introduces web-based "local activity finder" tool to individual to help identify suitable physical activity opportunities to access	To facilitate awareness of local physical activity opportunities	Adding objects to the environment	Enablement Environmental restructuring
Wellness Advisor explores likely pros and cons with individual of accessing behavior change coaching	To facilitate consideration of possible positive benefits and outcomes of coaching	Comparative imagining of future outcomes Pros and cons	Enablement
Wellness Coach conducts weekly 20-minute coaching session with individual via telephone for 6 weeks	To provide general support for behavior	Social support (unspecified)	Enablement

TABLE 1 (CONTINUED)

Intervention component	Rationale for component	BCT/s	Intervention function/s
Wellness Coach sets physical activity goals with individual over course of 6 weeks	To facilitate setting of goals in terms of behaviors to be achieved	Goal setting (behavior)	Enablement
Wellness Coach reviews physical activity goals with individual over course of 6 weeks	To facilitate reviewing of goals and consideration of modifications if necessary	Review behavior goal(s)	Enablement
Wellness Coach sets and reviews physical activity action plans with individual over course of 6 weeks	To facilitate detailed planning of behavior	Action planning	Enablement
Wellness Coach explores problems and challenges to becoming more physically active with individual over course of 6 weeks	To facilitate analysis of factors influencing behavior and strategies to overcome them	Problem-solving	Enablement
Wellness Coach discusses progress with individual over course of 6 weeks	To monitor and provide informative and evaluative feedback on behavior	Feedback on behavior	Coercion Education Incentivization Persuasion Training
Wellness Coach uses web-based 'physical activity tracker' tool with individual to record activities in between coaching sessions over course of 6 weeks	To facilitate monitoring and recording of behavior	Adding objects to the environment Self-monitoring of behavior	Coercion Education Enablement Environmental restructuring Incentivization Training
Wellness Coach explores likely pros and cons with individual at end of 6-week behavior change coaching course of accessing another 6-week round of coaching	To facilitate consideration of possible positive benefits and outcomes of coaching	Comparative imagining of future outcomes Pros and cons	Enablement

Note. AAP = Active Ageing Pathway; BCT = behavior change technique.

coaches. In summary, the content of the AAP was tailored toward making individuals aware of the AAP and then facilitating them to attend a Wellbeing Event to learn about the benefits of PA and local opportunities available to them, and to then join the LWD service to receive tailored behavioral support to increase their PA levels while accessing these opportunities. Identified AAP components appeared to focus on either supporting participants' uptake and progression through the AAP (e.g., providing a simple web-based Wellbeing Event registration process, holding Wellbeing Events at "favorable" venues and times of day) or directly influencing individuals' PA behavior (e.g., exploring the problems and challenges to becoming more active, conveying information about the health benefits of PA).

Step 2—Linking Intervention Content to Behavior Change Theory

The 41 components of the AAP were classified under 20 separate BCT labels, which in turn corresponded to eight of the nine BCW intervention functions. The most common BCTs were *social support (unspecified), adding objects to the environment, information about health consequences, social support (practical),* and *restructuring the physical environment.* The most common intervention

TABLE 2
Summary of BCTs and Corresponding Intervention Functions Linked to the Content of the AAP (Michie et al., 2014)

BCT	Corresponding intervention function/s
Social support (unspecified)	Enablement
Adding objects to the environment	Enablement; environmental restructuring
Information about health consequences	Education; persuasion
Social support (practical)	Enablement
Restructuring the physical environment	Enablement; environmental restructuring
Comparative imagining of future outcomes	Enablement
Instruction on how to perform a behavior	Training
Feedback on behavior	Coercion; education; incentivization; persuasion; training
Problem-solving	Enablement
Pros and cons	Enablement
Action planning	Enablement
Credible source	Persuasion
Demonstration of the behavior	Modeling
Goal setting (behavior)	Enablement
Monitoring of emotional consequences	Enablement
Prompts/cues	Education; environmental restructuring
Review behavior goal(s)	Enablement
Self-monitoring of behavior	Coercion; education; enablement; incentivization; training
Social comparison	Persuasion
Social support (emotional)	Enablement

Note. AAP = Active Ageing Pathway; BCT = behavior change techniques.

functions were *enablement, environmental restructuring, education, persuasion,* and *training.* The intervention function that did not relate to any AAP components was *restriction,* while only one AAP component related to the *modeling* function. Therefore, to summarize, the AAP largely attempted to modify the physical or social context, use communication to stimulate action, and increase participants' skills, knowledge, understanding, capability, and opportunity, to achieve its intended objectives (Michie et al., 2014). Table 2 provides an overall summary of the BCTs and corresponding intervention functions linked to the content of the AAP.

▶ DISCUSSION

This study has detailed a procedure that was used to apply elements of the BCW framework to reverse code the AAP, an existing common-sense PA intervention for older adults. The content of the AAP was deconstructed, before the associated BCTs and related intervention functions were identified.

The procedure achieved its first objective, which was to characterize the content of the AAP. Through its deconstruction, 41 active components were identified within the AAP, which involved numerous professionals,

and pertained to a diverse and interlinked range of factors, across face-to-face, group, telephone, and online modes of delivery. The AAP consisted of three elements, namely, making individuals aware of the pathway, facilitating their attendance at a Wellbeing Event, and subsequently joining the LWD service to receive direct behavioral support to increase their PA levels. Characterizing the AAP served to provide its operators Active Dorset with an in-depth breakdown of their intervention, arguably the first step toward them determining the specific elements that influence and support individuals to increase their PA levels through their Sport England-funded project. As initially intended, this information has subsequently been used by the authors to guide a qualitative research study focused specifically on participants' experiences of the LWD service. Relating this to previous work, McHugh et al. (2018) similarly reported that the reverse coding procedure they used to characterize a falls prevention intervention provided them with a detailed understanding of the intervention's content, which subsequently underpinned further research to explore its content and function in more depth and identify barriers to its success. Furthermore, Steinmo et al. (2015) stated that their procedure for characterizing a "six steps of sepsis treatment"

hospital implementation intervention allowed them to systematically describe the intervention in a common language, and that they planned to use their understanding of its content to guide the subsequent evaluation of health professionals' experiences of the intervention.

The current procedure also achieved its second objective, to characterize the links of the AAPs content to behavior change theory. The 41 active components of the AAP were classified under 20 separate BCT labels, which related to eight of the nine BCW intervention functions. The content of the AAP largely served to modify the physical or social context, use communication to stimulate action, and increase participants' skills, knowledge, understanding, capability, and opportunity, to influence PA behavior. Previous reviews on interventions to increase the PA levels of older adults have not found consistent evidence for the effectiveness of particular BCTs (Sansano-Nadal et al., 2019; Zubala et al., 2017). However, it has been concluded that effective PA interventions typically incorporate greater numbers of BCTs and utilize a blend of behavioral, motivational, and/or cognitive methods to influence PA behavior (McEwan et al., 2019; Zubala et al., 2017). Characterizing the AAP's links to behavior change theory confirmed to Active Dorset that the AAP appears to do this. Characterizing the AAP's links to behavior change theory also had practical value for Active Dorset, namely through highlighting that the *restriction* and *modeling* intervention functions were underserved by its content. That the *restriction* intervention function was not linked to the AAP was seen as understandable; it tends to link to strategies that use the external environment to limit people's behavior, whereas the focus of the AAP is on changing the way that people think, feel and react (Michie et al., 2014). However, the fact that only one AAP component linked to the *modeling* function was viewed as surprising, given that the purpose of this function (to provide a behavioral example for people to aspire to or imitate) is arguably crucial to the objectives of the AAP (Michie et al., 2014). This information, therefore, provided an indication that more content could potentially be added to the AAP serving the *modeling* function, focused on providing behavioral examples for participants to follow. Strategies subsequently considered for this purpose included adding extended fitness instructor-led PA sessions to Wellbeing Events and providing a web-based digital PA program for people to access at home. The practical usefulness of the current procedure again supports the findings of previous work. For instance, McHugh et al. (2018) reported that their aforementioned procedure helped to highlight gaps in

intervention content that could be refined to maximize its effectiveness. Similarly, Watkins et al. (2016), who examined the theoretical rationale behind the content of an asthma management intervention, found that their reverse coding procedure provided a foundation to support intervention improvement.

Limitations

Some limitations of the current study should be noted at this point. First, the content of the AAP was deconstructed through the examination of standard operating procedures documents, in-person observation of Wellbeing Events, and a series of face-to-face discussions with Active Dorset management. A more structured approach, such as conducting focus group interviews with both AAP participants and AAP professionals, may have provided more detailed and nuanced insights into the AAP's content. Furthermore, only the primary author was involved in deconstructing the AAP's content. Given the vast and dynamic nature of the AAP, and the number of actors and settings involved (McHugh et al., 2018), it is feasible that some components may have been missed. The involvement of at least one additional research team member in the deconstruction process might have helped to ensure that the most complete and accurate picture of the AAP's content emerged. However, these limitations were largely a reflection of resource constraints, and a pragmatic approach was taken. Funding and capacity are often factors that limit the application and transferability of behavior change theory to "real-world" interventions (Hansen et al., 2017). This study, therefore, highlights the importance of adapting and tailoring reverse coding procedures to the available resources, while still retaining a structured, systematic approach.

Implications for Research and Practice

PA interventions for older adults have become a priority public health focus in the United Kingdom as a means of promoting healthy aging and reducing the risk of preventable health conditions developing (Public Health England, 2014). However, with uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels (Zubala et al., 2017), common-sense PA interventions are often implemented, which adopt off-the-shelf strategies. It has been asserted that these interventions are more likely to be effective in the long term if they are developed in accordance with behavior change theory (Hansen et al., 2017; Olanrewaju et al., 2016), and one

way this can be achieved is through the retrospective application of a theoretical behavior change framework to "reverse code" an intervention and guide its ongoing development (French et al., 2012; Steinmo et al., 2015). The main implications of the current study are, therefore, that

- a clear, systematic, and replicable procedure for applying elements of the BCW framework to reverse code an existing common-sense PA intervention for older adults was demonstrated.
- the procedure provided a detailed characterization of the intervention's content and the links to behavior change theory, adding to the findings of previous research in the area.
- the procedure also demonstrated a practical application for identifying gaps in intervention content and guiding future intervention evaluation.

Common-sense PA interventions for older adults are thought to have underdeveloped rationales for achieving effectiveness, through not considering the theory or evidence underpinning the behavior change strategies they adopt (Hansen et al., 2017; Michie et al., 2011). It is often said to be difficult to define their content and mechanisms of action, and to measure and explain their outcomes, making them challenging to both evaluate and replicate in novel settings (Watkins et al., 2016). Therefore, procedures like the one demonstrated in this study arguably offer an important tool to overcome some of these problems, and a first step toward developing common-sense PA interventions into theory-linked ones that achieve the best possible outcomes.

Author Contributions

Ethics

In following Bournemouth University's research ethics code of practice, which states that, "Bournemouth University requires that all research (as defined in Section 5) is subject to appropriate ethical reflection, leading if necessary to formal approval," a formal ethics review was not required for this work as it did not contain any studies of human participants, and because the data would not be reused or represented in another format at a later date.

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Chapter 4. Study 2 Article

Title

How the LiveWell Dorset lifestyle behaviour change service influences older adults' physical activity behaviour: A generic qualitative study.

Summary

This qualitative study explored how the LWD service influences older adults' PA behaviour.

Contributions

Dr Sarah Thomas (research adviser to AJP, Bournemouth University) contributed to the design of the study, assisted with data analysis, and proof-read and commented on the first draft of the article.

Main findings

Several factors were identified that highlighted how the LWD service influences older adults' PA behaviour. These included using a broad range of promotional and behaviour change strategies to facilitate initial engagement, providing opportunities for service users to receive social support from both professionals and peers, and emphasising person-centredness and empathy in interactions with service users.

Implications

The findings support previous research and provide valuable additional evidence on the important characteristics and components of interventions that aim to influence the PA behaviour of older adults. The findings also support the need for future research into previously highlighted topics of interest such as the roles of system-related factors, and aspects of the client-professional relationship, on PA intervention engagement and outcomes.

Original Research

How the LiveWell Dorset lifestyle behaviour change service influences older adults' physical activity behaviour: A generic qualitative study

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ABSTRACT

Objectives: There is uncertainty around the most effective characteristics and components of interventions to increase older adults' physical activity (PA) levels. This study aimed to explore how LiveWell Dorset (LWD), a lifestyle behaviour change support service based in Dorset, South-West England, influences older adults' PA behaviour.

Study design: A qualitative study using a generic approach.

Methods: Semi-structured telephone interviews were held with 12 individuals aged 55 to 65 who had accessed LWD's support to increase their PA levels, to gather their views and experiences of the service. A thematic analysis of the interview data was conducted using a hybrid approach that incorporated both inductive and deductive processes. Additionally, interview content was coded for behaviour change techniques using the Behaviour Change Technique Taxonomy version 1.

Results: A number of key factors were identified that highlighted how the LWD service influences older adults' PA behaviour. These included using a broad range of promotional and behaviour change strategies to facilitate initial engagement, providing opportunities for service users to receive social support from both professionals and peers, and emphasising person-centredness and empathy in interactions with service users.

Conclusions: The findings provide valuable information regarding the needs and preferences of older adults when attempting to influence their PA behaviour, and on the reportedly helpful components of interventions that aim to do so. The findings also support the need for future research into previously highlighted topics of interest such as the roles of systemic and contextual factors and professional empathy on PA intervention engagement and outcomes.

1. Introduction

Physical inactivity is a significant risk factor for the development of age-related ill health and long-term disease [1]. There is a wealth of evidence suggesting that participating in regular physical activity (PA) provides a multitude of preventative health and quality of life benefits for individuals as they reach middle-age and beyond. The improvements in cardiorespiratory fitness, muscle strength, balance and mobility that result from PA participation are associated with a lower risk of cardiovascular disease, depression, falls, muscle and bone loss and cognitive decline in older adults, along with improved emotional, social, cognitive and physical functioning [2,3]. World Health Organisation guidelines recommend that to obtain these benefits, 55–64 year olds should perform at least 300 minutes of moderate intensity PA per week, and over 65s at least 150 minutes [4]. However, at present, only around 60%

of over 55s in the UK are considered physically active [5]. In response to this, increasing the PA levels of older adults has become a priority for public health interventions in the UK, in order to promote healthy ageing and reduce the risk of preventable health conditions developing [6].

Despite challenges in synthesising evidence from heterogeneous studies that used predominantly randomised controlled trial designs, the most recent umbrella systematic review confirmed the effectiveness of multi-modal and multi-component PA interventions for increasing the self-reported and objectively measured PA levels of community-dwelling older adults [7]. The interventions the review examined had been implemented across a range of community settings, delivered both face-to-face and remotely by a range of professionals (e.g. GPs, nurses, occupational therapists, fitness instructors, PA coaches), involved numerous modes of PA (e.g. walking, aquatic exercise, dance), and most

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commonly were of a three to 12 month duration. In particular, client-centred and personalised interventions involving tailored professional guidance and ongoing support were reported to lead to improved PA participation. However, the review concluded that there was general uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels, as rarely were any consistently associated with positive or negative outcomes. It is therefore imperative that research continues to explore how different interventions influence older adults' PA behaviour, and to attempt to identify their most important features.

The LiveWell Dorset (LWD) integrated lifestyle service, based in Dorset, South-West England, is an intervention that offers behaviour change support online and via telephone to adults in the Dorset area, with the aim of helping them to meet the Government's recommended guidelines for PA, to reach and maintain a healthy weight, to keep within the recommended limits for alcohol consumption and to stop smoking. As part of Dorset's 2016/17 Sustainability and Transformation Plan, the LWD service was developed by its operators Public Health Dorset to offer support across these four lifestyle behaviours, instead of the traditional single pathway approach, in order to maximise the efficiency, scale, reach and impact of behaviour change support in the area with minimal increased cost [8]. LWD's design followed consultation with local residents regarding their needs and views on existing services, and drew upon behaviour change literature. Consequently, the guiding principle that came to underpin the design of the LWD service was that identifying an individual's barriers to change and selecting the behaviour change techniques to overcome them would most likely lead to positive results [9]. The LWD service pathway is depicted in Fig. 1. Individuals can self-refer to LWD, and there is also a facility for health care professionals to refer their patients. Upon registration with LWD, individuals undergo an assessment, where a 'behavioural diagnosis' is made regarding the factors most influencing their behaviour, and the lifestyle area to focus on. Furthermore, a collaborative discussion is held regarding the level of support they require to move forward, based on the current behavioural barriers that are contributing to difficulties in making or sustaining change. For some individuals, a low level of telephone and email follow-up support and signposting is then provided by LWD for up to 12 months to facilitate the process of behaviour change
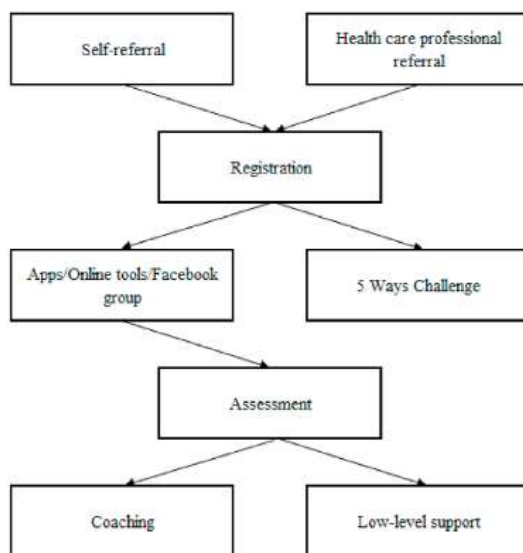

Fig. 1. LiveWell Dorset service pathway.

and the accessing of other local services. For others, four to six sessions of more intensive telephone coaching support is delivered. LWD also offers a wrap-around digital support interface consisting of a range of apps and online tools such as a local activity finder and a calorie calculator, as well as a private LWD Facebook group, which individuals can access once they have registered. LWD also launched the 'Five Ways Challenge' in 2020, an online programme developed to provide weekly group email support to help individuals to improve their wellbeing and cope during the COVID-19 pandemic by focusing on daily PA, as well as social connection, awareness, learning new skills and giving to others [8].

The aim of this study was to explore how the LWD service influences PA behaviour in older adults.

2. Methods

2.1. Study Design

A qualitative study involving semi-structured telephone interviews was conducted. Ethical approval was obtained from Bournemouth University (ref. 28034).

2.2. Participants and recruitment

Based on resource availability, the aim was to conduct 12 telephone interviews with a convenience sample of individuals aged 55 and over who had accessed LWD's support to increase their PA levels, to gather their views and experiences of the service.

Potential participants were identified via LWD, who acted as the recruitment gatekeeper. LWD posted an advertisement on the LWD Facebook page seeking individuals aged 55 and over who had accessed the support of the service to become more active and were willing to take part in a telephone interview. Those interested in participating were asked to fill out a web form to provide their email and telephone contact details along with permission for LWD to share these details with the study researcher (AJP) to enable contact to be made. LWD passed on the details of individuals who completed the form to AJP on a first come, first served basis, and AJP co-ordinated all further study activities. AJP called potential participants to explain the purpose of the study and answer any questions that they had. If they were willing to participate, a telephone interview was arranged for a date and time convenient to them.

2.3. Interview procedures

The telephone interviews were conducted by AJP. Participants were sent an information sheet and a copy of the consent form via email several days prior to the telephone interview. On the day of the interview, AJP answered any questions that participants had about either form, and explained the consent process. If they agreed to take part, their verbal consent was recorded prior to the start of the interview.

For the interviews, a generic qualitative approach was employed. Generic qualitative research seeks to discover and understand people's subjective opinions and reflections of things in the outer world [10]. It, "focuses on descriptions of what people experience" [11], "simply seeks to understand a phenomenon, a process, or the perspectives and worldviews of the people involved" [12], and emphasises people's perceptions and feelings rather than the 'meanings' that might underlie them [13].

A topic guide was used during interviews to ensure key areas of interest were covered, while still allowing for flexibility and the possibility to follow up on unprompted content. The process of developing the topic guide involved a series of face-to-face discussions between LWD and AJP about the LWD service and its operations, as well as the examination of LWD 'standard operating procedures' documents by AJP. As summarised in Table 1, the topic guide contained questions about the support

Table 1
Summary of the interview topic guide.

Topic Area
Previous lifestyle and physical activity habits
Previous barriers to physical activity
Source of initial awareness of LiveWell Dorset
Initial hopes/goals/expectations
Views about registration and assessment processes
Views about interventions and support received
Personal achievements/accomplishments/changes
Suggestions for improvements

that participants had accessed through LWD, how LWD had facilitated their initial engagement with the service, and the outcomes of their LWD experiences. Furthermore, to gain a rounded understanding of LWD's influence on PA behaviour, questions relating to participants' previous PA backgrounds were also included. The telephone interviews were audio-recorded using a digital audio-recorder directly connected to the telephone and transcribed verbatim.

2.4. Analysis

A thematic analysis was conducted by AJP [14], using a hybrid approach that incorporated both inductive and deductive processes [15]. Before initial familiarisation with the interview transcripts took place, a priori codes were first added to a codebook in Microsoft Word [16], largely drawn from the original interview topic guide. Then, following familiarisation, important patterns and common threads were searched for in the interview data, at which point emerging posteriori codes were added to the codebook. Once all codes had been added, they were discussed in a debrief session with the co-author (ST). The list of a priori and posteriori codes were then merged into themes, which were subsequently vetted by ST. Illustrative quotations relating to each theme were then indexed and collated, ready for summarising, reporting and interpretation.

Furthermore, to provide an additional layer of information on how LWD influences PA behaviour, the interview content was coded by AJP for behaviour change techniques (BCTs) using the BCT Taxonomy version 1 (BCTTv1) [17,18]. BCTs were coded if they pertained to components of LWD that attempted to facilitate participants' progression through the service or influence their PA behaviour. Using the BCTTv1, BCTs were identified within participants' narratives on the basis of being observable, replicable and irreducible. All BCT labels were checked by ST, with disagreements on any labels resolved by discussion and consensus. Both authors had undertaken online training in BCT coding prior to the labelling process.

3. Results

3.1. Overview

In total, telephone interviews with 12 individuals aged 55 to 65 who had previously accessed LWD for support with increasing their PA levels were conducted. Nine participants were female and three were male (Table 2). Interview durations ranged from 40 to 60 minutes (mean 48 [SD 5.5] minutes). All individuals who had volunteered to participate in the study were interviewed, and study recruitment ended once the target of 12 completed telephone interviews had been reached.

3.2. Qualitative themes

Six themes were identified: previous physical activity behaviours and associated barriers; outcomes and impact of LiveWell Dorset experience; finding out about LiveWell Dorset; initial engagement with LiveWell Dorset; specific LiveWell Dorset support; and general LiveWell Dorset approach.

Table 2
Participant demographics.

Participant	Sex	Age	Ethnicity	Employment Status
1	Male	65	White	Retired
2	Female	Missing	Missing	Working part time
3	Male	64	White	Working full time
4	Male	64	White	Working part time
5	Female	60	White	Working part time
6	Female	58	White	Working part time
7	Female	55	Missing	Working part time
8	Female	55	White	Working part time
9	Female	Missing	Missing	Working part time
10	Female	63	White	Unable to work
11	Female	57	White	Working full time
12	Female	65	White	Retired

3.3. Previous physical activity behaviours and associated barriers

Reflecting back to the time immediately prior to their involvement with the LWD service, most participants reported that their PA levels had been well below the recommended 150 minutes of moderate intensity PA per week. Participants cited a number of barriers to PA participation that they had been facing, including long-term physical health conditions and injuries, mental health problems resulting from negative life circumstances such as bereavement and relocation, a lack of motivation to exercise alone, concerns about the health risks posed by exercise following an extended period of sedentarism, and limited time and energy due to work commitments:

> It was awful. I would leave in the morning at six thirty, work in a high-pressure job, often I would say at least a 60-h week. And you come back...let's say seven o'clock at night, and I'm going again at half past six in the morning, do I really want to go have a work out at the gym or do I want to go home? And so I tried to combat that by swimming, a kilometre, every lunch time at work... but actually some days I found myself falling asleep in my office, you know, the physical exertion was just too much. [Participant 4]

3.4. Outcomes and impact of LiveWell Dorset experience

The majority of participants reported that LWD influenced them to make positive changes to their PA behaviour:

> So I've done loads of walking. I've done lots of YouTube exercise videos, I've done strength workouts, yoga, pilates, abs, all sorts of fitness. [Participant 7]

Participants also showed evidence of a newfound ability to problem solve and self-manage their PA behaviour as a result of LWD's support:

> I do my [online] classes on the Tuesday evening and the Thursday evening. And in the morning I get up in the morning and I just put my gym kit on and I work in that gym kit so that I'm ready to go. And if I don't feel like it, just logging in and occasionally not turning the camera on straightaway and taking the first few steps. There's never been a night where I haven't done the full class. [Participant 8]

In addition to changes relating to their PA behaviour, participants also frequently spoke about weight loss as an outcome of their experience with LWD, as well as improved physical and mental health.

3.5. Finding out about LiveWell Dorset

Participants reported first becoming aware of the LWD service through a number of different channels. For some, the source was a health care professional:

[The nurse] said right, here's LiveWell Dorset, phone these people up, they will offer you some support. They gave me a card that said call these people, and I did. It was only a brief conversation as I recall. [Participant 1]

Others reported finding out about LWD via Facebook, emails they received from their employer or the local Council, friends and community outreach events:

The first [event] I saw [LiveWell Dorset] at was in [my local] library. It was like an exhibition of health, and LiveWell Dorset had a stand there and loads of leaflets, and some very friendly people that you were able to talk with and talk about the service. And I found it really quite informative. They were, you know, they were knowledgeable. They were very enthusiastic. [Participant 4]

A number of participants did state that they felt LWD relied too much on online promotion, which might not always be the most effective means of reaching older adults. A number of additional promotional strategies were suggested, including advertising in community venues such as supermarkets and libraries, and involving past service-users as volunteer LWD 'champions'. Aside from talking about *how* they found out about LWD, a number of participants also alluded to the timing, and *when* they found out about the service as being important to their subsequent engagement:

I had been thinking for a long, long time about joining slimming clubs, and they put leaflets through the door and I would look at it and think about it and not do anything about it. So when it's suggested to you that [LiveWell Dorset] might help and [the physiotherapist] actually gave me a card to do something about it. It just caught me at the right time. A positive time to do it. [Participant 5]

3.6. Initial engagement with LiveWell Dorset

Having become aware of LWD, participants identified a number of characteristics that initially made them want to engage with the service. For some, it was simply the name that they found appealing, and its association with wellbeing:

I mean, LiveWell is a great title for what they do. You know, you don't need a psychology degree to work out LiveWell is about living better. It's great in that respect. [Participant 2]

The local nature of the LWD service also appealed to some participants:

It's good to know that there is something specific to Dorset that, yes, it's nice to know that there is specific help out there for anyone in Dorset that need it. It's just nice to know… It gives you a better feeling towards your community, knowing that there are others out there that want to use that service, that want to improve their lives. [Participant 7]

Participants described registering to join LWD online or via telephone. Regardless of the mode, participants appreciated the straightforward, quick and flexible nature of the registration process. Some participants nonetheless mentioned the vulnerability they felt when taking the steps to register with LWD:

It is daunting, it's really daunting. I think for anyone taking that first step, it's such a big thing. It's a really big thing. At the time I was actually feeling quite depressed as well. I was reaching out at a time when I felt vulnerable. [Participant 2]

Following registration, most participants reported undergoing some form of lifestyle assessment with a LWD Wellness Advisor via telephone, which often had a motivational effect:

I think I felt hopeful [following the assessment], which would have been the first time in a long while. She made me feel that there was something out there that could help me, whereas I'd been telling myself this was it, this is what I had and I had to put up with it and, you know, just get on with life as is. [Participant 10]

As well as the free costs of the LWD service, a desire to repay the support and interest that LWD had shown them during their initial assessment also provided an incentive to move forward for some participants:

It would be like, if you didn't [move forward from the assessment], it would be throwing it back at them. And if you can't be prepared to help yourself, then why should somebody else. [Participant 5]

3.7. Specific LiveWell Dorset support

Participants accessed varying types and levels of LWD support. Following initial engagement with LWD, three received full coaching, three completed the Five Ways Challenge, three received low-level support in the form of follow-up phone calls or emails after their introductory assessment, and three did not receive any further intervention following their registration. All participants had access to the private LWD Facebook group and the array of online tools and apps.

Those participants who received coaching liked the self-directed nature of the coaching process:

She didn't tell me what to do… She drew it out of me… So I was very open from the very moment and she was very like that counsellor in not telling me what to do, but in leading me, in guiding me. [Participant 8]

Coaching participants also appreciated the practical solutions and suggestions that were frequently offered by their LWD Wellness Coach:

She made it very much about her going away and coming back with some ideas for me as well. She came back with some links for me for doing exercises at home to cover the low cost. She told me about two outdoor gyms that are near me… My trainers weren't supporting me properly, and she said, go and buy yourself a new pair of trainers. [Participant 8]

Participants who completed the Five Ways Challenge all felt that the structured nature of the programme had provided them with a sense of focus and routine:

So it really just gave me a structure and a template to work towards of ideas and advice. But somehow by following a set programme… It's almost like you're being monitored. You're not being monitored but following a set programme makes all the difference [Participant 7]

They also found that the weekly action planning worksheets that were supplied helped to support commitment and reflection:

These sheets that you could print out… It was like a diary for me to fill in to show that I've actually achieved something each day, rather than just, you know, drifted and watched Netflix films… but also it makes you think in a positive way… I look back every now and again, and it's a little reminder of everything I've done. [Participant 7]

Participants also found that the weekly Five Ways Challenge emails they received were helpful for providing ideas and trustworthy links to content:

[The Five Ways Challenge emails] gave you information and ideas, you know? It was a lot easier because they were there. Whereas if you try and find [resources and information] by yourself and online, you can't always sort of get the right thing. Or you might have to pay for them. And they were there and I just have to click on each one and start… So that was, that's really useful. [Participant 7]

They also liked the personalised nature of the emails, and the fact

that they referred to the achievements of others involved in the programme:

But the fact that there were lots of us doing it and different people were doing it. That was quite a nice feeling. I knew other people were having a go at different things. You know, they said, I don't know how many thousand people were doing it, and I thought, yeah, people are latching onto this. It's being part of something and doing it. Just knowing others were doing it. [Participant 12]

The majority of participants reported viewing and/or using the private LWD Facebook group in some form. The peer support on offer was something that a number of participants appreciated:

You couldn't pray for that level of support, you know? Bank that, you know, bottle it, it is just utter kindness. There's some real kindness in there. People really spurring each other on, and people are very open about what they're going through as well... It's a good group, really good group. [Participant 6]

Some gained a sense of accountability and accomplishment from posting their own achievements and challenges for others in the group to see:

I felt emboldened to actually post, why is it that I've gone up a dress size, and how on earth am I going to lose that? And I received some very encouraging responses. I think the fact that things are out there in the media as it were, it, it feels a bit more like a commitment. But by recording it, it endows it with a sense of accountability. It gives us that commitment, accountability, intent. [Participant 9]

Participants also reported that they took inspiration from reading about the PA accomplishments of others in the Facebook group:

I have to say other people inspired me on Facebook. They were happy. They showed that they were happy in themselves and, also, you know, they have the self-confidence to put themselves out there to show, show that they were pleased with their progress in what they did and what we could achieve... And it sort of inspired me to think. [Participant 7]

Furthermore, some reported finding it rewarding to support others in improving their lifestyles:

I have tried to chivvy people along. So I might go on and put something funny or pose a question. I've done that three or four times. Where people have had a particularly arduous journey, I want to congratulate people. But it just makes me feel part of that part of a community. It's a very real community. [Participant 6]

A number of participants reported the usefulness of certain online tools and apps in aiding changes in their PA behaviour, such as the 'Active Ten' app, which automatically records brisk walking when the phone is placed in the pocket:

The Active Ten app, which I picked up and had been using ever since... It just charts or logs as you walk. You have got to walk fairly briskly to jog it into action. And every ten minutes that you walk briskly, it rewards you with a shower of bunting and what have you, filling a challenge cup and it will chart up through the day how many of these cups you fill... Well I will deliberately set out to walk more briskly... It makes such a big difference... It's reinforcement. [Participant 10]

3.8. General LiveWell Dorset approach

Regardless of the type of support accessed, a number of general characteristics of LWD's approach to influencing PA behaviour consistently attracted positive comments from participants. For instance, LWD's self-directed approach was often appreciated:

I think most people would like to feel that they're doing it for themselves, even though they're being gently nudged in the right direction. I think that's what LiveWell Dorset is trying to do, which is great. It's not bossing people about and saying, for your health, you need to do this and this and this, it's gently nudging people in the right direction. And then they feel they're making the decisions themselves. [Participant 12]

Also appreciated was LWD's empathy and kindness:

They treat you like you're human, that you have feelings and that you are important. It's not like going to the doctors and you just get brushed off with a prescription, come back and see me in six weeks. There was a sort of a tough mother love there, but it was kindness and understanding and empathy. That made me feel comfortable. [Participant 10]

LWD's non-judgemental approach was also often positively noted by participants:

They're very non-judgmental. I think probably when you are trying to do something, achieve a healthy lifestyle goal... I guess a lot of people feel very judgmental of [their] own being, [their] own self. So you don't need anybody else to come along and judge you as well. You've done that quite enough already thank you very much. You've already made a judgment. You don't need somebody else to reinforce that in a sense. [Participant 9]

LWD's focus on 'small steps' and breaking larger behavioural goals down into smaller chunks was also frequently appreciated by participants:

It was absolutely achievable. And the fact that you could achieve it made you feel better. I think the fact that he just kept reminding us to just do little steps. Just do little steps. Don't worry about how far you're going. Just keep going forward. That's the most important thing. [Participant 11]

A number of participants also found encouragement to be a valuable and motivational element of LWD's approach:

The fact that there was somebody there just spurring me on, even though they didn't know me... They give you the little push to kind of say, yeah, it doesn't matter if you didn't do it today. Try again tomorrow kind of thing, rather than give up. So there was a lot in that. But there was somebody there and I think that's what has helped me tremendously. [Participant 12]

Others appreciated the flexibility and individual tailoring. Finally, LWD's approach of offering an 'open line' for communication was also frequently valued by participants for the sense of security it provided:

I think there was a phone number where if I was struggling at any time I could leave a message and they would get back to me. So they were always there in the background and knowing that I think helped as well. Just knowing that you have somebody... I just know having them there in the background was a comfort. [Participant 10]

3.9. Behaviour change techniques

Fifteen different BCTs were identified as being used by LWD to facilitate participants' progression through the service or to influence their PA behaviour. The most commonly identified BCTs were social support (unspecified) and adding objects to the environment. Table 3 provides an overall summary of the BCTs along with the components of the LWD service they related to. Definitions of the identified BCTs can be found in Supplement 1.

4. Discussion

Through gathering the views and experiences of individuals who had accessed LWD's support to increase their PA levels, it has been

Table 3

Summary of behaviour change technique labels with related LiveWell Dorset components.

LiveWell Dorset Component	Behaviour Change Technique/s
Clinician/health care professional conveys information about LiveWell Dorset to individual	Social support (unspecified)
Clinician/health care professional conveys information on benefits of physical activity to individual	Information about health consequences
Clinician/health care professional provides card with information on how to register with LiveWell Dorset to individual	Social support (unspecified)
LiveWell Dorset runs stall at local health exhibition advertising LiveWell Dorset service	Social support (unspecified)
Information about LiveWell Dorset conveyed to individual via email from employer/council	Social support (unspecified)
Simple telephone and web-based sign-up processes provided for individual to register with LiveWell Dorset	Adding objects to the environment
LiveWell Dorset free to access	Restructuring the physical environment
Wellness Advisor conducts introductory LiveWell Dorset assessment with individual via telephone, completing and discussing current lifestyle and physical activity habits questionnaires with individual	Feedback on behaviour
Web-based 'activity finder' tool introduced to individual to help identify suitable physical activity opportunities to access locally	Adding objects to the environment
Phone-based 'Active 10' app introduced to individual to aid monitoring of physical activity	Adding objects to the environment; Self-monitoring of behaviour
Open facility made available to individual to call or email LiveWell Dorset for support whenever required	Social support (unspecified)
Wellness Advisor conducts follow-up phone calls or sends follow-up emails to individual after introductory assessment	Social support (unspecified)
Wellness Coach provides general coaching support to individual via telephone	Social support (unspecified)
Wellness Coach provides practical support to individual during coaching	Social support (practical)
Wellness Coach sets physical activity goals with individual during coaching	Goal setting (behaviour)
Wellness Coach reviews physical activity goals with individual during coaching	Review behaviour goal(s)
Wellness Coach explores likely pros and cons with individual at end of 6 week coaching course of accessing another 6 week round of coaching	Comparative imagining of future outcomes
Wellness Coach provides Five Ways Challenge general communication and support to individual via email	Social support (unspecified)
Wellness Coach provides weekly Five Ways Challenge action template sheets for individual to plan activities	Adding objects to the environment; Action planning
Wellness Coach provides weekly Five Ways Challenge worksheets for individual to record and review performed activities	Adding objects to the environment; Self-monitoring of behaviour
Wellness Coach provides Five Ways Challenge information on available local and online activities to individual	Social support (unspecified)
Wellness Coach shares information about other's Five Ways Challenge achievements to individual	Social comparison; Vicarious consequences
Online LiveWell Dorset community provides general support to individual via Facebook group	Social support (unspecified)
Individual able to share accomplishments with others in online LiveWell Dorset community	Focus on past success
Online LiveWell Dorset community provides information about other's achievements to individual	Social comparison; Vicarious consequences
Individual able to provide support and encouragement based on their own experiences to others in online LiveWell Dorset community	Identity associated with changed behaviour

highlighted how the LWD service influences older adults' PA behaviour. This information is important, because with uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels, there exists a need for further evidence in this area [7].

4.1. Principal findings

Despite initially facing a range of barriers to PA participation, participants reported that they had achieved increases in their PA levels and an improved ability to problem-solve and self-manage their PA behaviours as a result of their time with LWD, as well as noting impacts in other areas of their lives such as improved physical and mental health, and weight loss. In terms of how LWD influenced these changes, a number of key factors appear relevant.

Participants reported that LWD deployed a broad range of useful behaviour change strategies across the different types of support offered in order to facilitate their progress. These included providing diary worksheets for participants to plan and record their weekly activities as part of the Five Ways Challenge, and conducting goal-setting exercises during coaching sessions. The variety of strategies was also reflected in the BCT coding, which identified 15 different BCTs as being used by LWD to facilitate participants' progression through the service or to influence their PA behaviour. This finding supports previous reviews of literature on beneficial intervention components to increase the PA levels of older adults, where it has been established that behavioural and cognitive-focused behaviour change strategies are important elements of successful PA interventions [19,20], and that effective interventions typically incorporate greater numbers of BCTs, and utilise a blend of behavioural, motivational and/or cognitive methods to influence PA behaviour [7,19,21].

Participants also reported that LWD's approach to promoting initial awareness of the service through various channels, focus on opportunistically targeting individuals at key points in their life, and offering of a straightforward, quick and flexible registration process, helped to facilitate their initial engagement. As alluded to above, PA interventions, and related research, typically place a large emphasis on the 'active ingredients' of interventions that positively influence older adults' PA behaviour, such as BCTs and underpinning theoretical models [7]. However, with initial engagement representing the entry-point of participation, this finding highlights the equal importance of designing PA interventions that are accessible, so that they are eventually able to go on to influence PA behaviour. Previous reviews have also underlined this notion. The importance of looking beyond the behavioural and cognitive aspects of PA promotion and considering whole system-oriented approaches and the systemic and contextual factors and processes that encourage older adults' engagement with PA interventions has been highlighted, along with the need for future research to explore this area in greater detail [7,19,20]. A total absence of PA interventions for older adults co-created with input from their intended end-users has also previously been noted [7]. Including the intended recipients as stakeholders in the intervention development process, which LWD's operators seemingly did when they carried out consultations with local residents when designing their service, may be one method to ensure the most accessible interventions.

Aside from specific behaviour change strategies, participants also frequently reported that the social support offered to them by LWD was helpful, which included the 'open line' of email or telephone communication provided. Participants also reported that the social support offered by other service users through LWD was appreciated, such as through the LWD Facebook group. This finding again supports previous reviews that have reported that social contact and support are particularly important facilitators of PA participation in ageing populations [7, 22–24]. In the most recent review, it was stated that emotional support from other people is linked with intrinsic motivation for PA, and consequently, participation in PA [22]. The review concluded that PA

interventions for older adults should specifically seek to provide social support for individuals, which LWD appears to do in a variety of ways.

Closely aligned to the notion of social support, participants also reported that LWD's person-centred approach was helpful. For instance, participants valued LWD's encouragement of their autonomy and self-accountability, and also felt that the support they offered was tailored to their needs. In addition to person-centredness, the empathy at the heart of LWD's approach was also frequently appreciated. Supporting previous research, person-centredness, and in particular, tailoring has been noted as an important element of effective PA interventions for older adults, with robust evidence backing its value [7]. However, the finding that participants valued the empathy they received is more novel, with this concept less extensively researched for its role in influencing PA behaviour, and a need for further enquiry previously highlighted [7]. Long-standing evidence in the field of psychotherapy suggests that the levels of empathy displayed by professionals strongly predict positive patient outcomes in psychology-based treatments. This suggests that it is important that the role of empathy is directly examined in relation to the outcomes of PA interventions for older adults, given that like psychotherapeutic interventions, they aim to enact some form of healthy, adaptive behaviour, centred on interactions between professional and service-user, or 'change agent' and 'change seeker' [25, 26].

4.2. Applications

With uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels, there is a need for research exploring how different interventions influence older adults' PA behaviour [7]. The findings of this study provide useful information on how one particular intervention, LWD, appears to do so. This information can now potentially contribute to the understanding of 'real-world' public health practitioners on the needs and preferences of older adults as they attempt to change their PA behaviour, and on how to develop the components of interventions that they will willingly engage with. To further this understanding, the current findings also provide additional rationale for future research into previously highlighted topics of interest, such as the role of systemic and contextual factors and processes in encouraging older adults' initial engagement with PA interventions, and the role of professional empathy in PA intervention outcomes.

4.3. Limitations

Some limitations of this study should be noted. Firstly, the sample size was small, comprised of older adults from a rural geographical region and relatively narrow age range, which arguably limits the generalisability of the findings. Relatedly, a further limitation was the self-selection of interview participants. This may have related in some way to the behaviours, attributes and opinions being investigated, as well as to pre-existing levels of positivity towards LWD. Pragmatic factors limited the methods that were used to recruit participants, but it is fair to say that additional insights might have been gained with a less self-selected sample. For instance, a purposive sample of individuals that had been referred to LWD but didn't engage, or who engaged but dropped out, may have yielded very different and relevant information. Finally, content saturation was not reached during data collection. Resource constraints on the number of interviews that could be conducted, and the heterogeneous nature of participants' LWD experiences likely contributed to this. However, as data analysis partly involved deductive processes, with a priori codes derived from the original interview topic guide, it could be argued that as the pre-determined issues of interest were adequately represented in the data, the lack of traditional content saturation was not detrimental [27].

5. Conclusions

In this qualitative study a number of factors have been identified highlighting how the LWD service influences PA behaviour in older adults. These include using a broad range of promotional and behaviour change strategies to facilitate initial engagement, providing individuals with opportunities to receive social support from both professionals and peers, and emphasising person-centredness and empathy. Despite the limitations of this study, its findings provide valuable information to public health practitioners on some of the potential needs and preferences of older adults when attempting to influence their PA behaviour, and on reportedly helpful components of interventions that aim to do so. The findings also provide additional rationale for future research into previously highlighted areas of interest such as the roles of systemic and contextual factors and professional empathy on PA intervention engagement and outcomes.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhip.2021.100164.

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Chapter 5. Reflective Paper Article

Title

Attempting to close the evidence-practice gap in physical activity intervention research: Strategies and outcomes of a co-creative qualitative study.

Summary

This experiential reflection detailed and examined the methodological process and strategies used to underpin research co-creation with Active Dorset during study 2, and their outcomes.

Contributions

Charlotte Coward (Deputy Chief Executive, Active Dorset) contributed a commentary to the reflection.

Main findings

A range of strategies were reported to facilitate co-creation in study 2, such as engaging Active Dorset in the identification of the research question and development of the research protocol, and involving them in participant recruitment. The co-creative research approach resulted in timely, relevant, understandable, and translatable research evidence for Active Dorset.

Implications

Contributing valuable reflective evidence on a relatively novel topic, the findings demonstrate how a co-creative research approach can help to address or sidestep some of the issues that commonly impede the transfer of scientific information in the PA intervention field. The findings also provide the rationale for more formal studies exploring how, when, and why co-creative research approaches are beneficial to this cause.

Attempting to Close the Evidence-Practice Gap in Physical Activity Intervention Research: Strategies and Outcomes of a Co-Creative Qualitative Study

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It is argued that a gap exists between research evidence and "real-world" physical activity (PA) intervention practice. One potential way to aid the translatability of evidence in this field is for researchers to work actively with the public health practitioners and organisations that run PA interventions to engage in co-creative research. This paper reports the process and strategies used to underpin research co-creation during a recent qualitative PA intervention study, and the outcomes of the co-creative approach from the perspective of the public health organisation involved in the research in terms of providing them with translatable evidence. A range of strategies were reported to facilitate co-creation in the study, such as engaging the public health organisation in the identification of the research question and development of the research protocol and involving them in participant recruitment. The co-creative research approach resulted in timely, relevant, and understandable research evidence for the organisation, which was translatable to their real-world PA intervention practice. The evidence provided them with clear actions and information to plan their future work and objectives. This paper demonstrates how a co-creative research approach can potentially help to close the evidence-practice gap in the PA intervention field.

Keywords: physical activity, older adults, generic qualitative research, research co-creation, partnership research, evidence translation, knowledge translation, stakeholder engagement

Introduction

Physical inactivity has been established as one of the primary causes of age-related and long-term ill health, and a wealth of evidence suggests that regular participation in physical activity (PA) provides health benefits such as improved cardiorespiratory fitness, muscle strength, mobility and balance, and is associated with a reduced risk of a host of diseases and conditions, including cardiovascular disease, cancer, diabetes, hypertension, stroke, obesity, osteoporosis, heart disease, dementia and depression (Booth et al., 2012; Warburton & Bredin, 2017, 2019). Consequently, World Health Organisation guidelines recommend that adults aged 18-64 years should perform at least 150-300 minutes of moderate-intensity PA or 75-150 minutes of vigorous-intensity PA per week, or a combination of the two, to obtain the preventative health benefits of PA (World Health Organisation, 2020). However, in the UK currently, only around 61% of adults are performing an average of 150 minutes or more of PA per week and are thus considered physically active (Sport England, 2021). Therefore, increasing population-level PA levels has become a priority for public health interventions in the UK, to reduce the risk of preventable health conditions developing and promote healthy ageing (Public Health England, 2014).

An umbrella review conducted by Rhodes et al. (2017), which synthesised evidence from 27 meta-analyses, reported that adult PA interventions consistently deliver PA changes in the small effect size range across a broad range of ages and focused participant groups ($d = 0.27$; SD $= 0.13$). However, despite this existence of evidence-based interventions, "real-world" public health practice often sees a failure to translate scientific knowledge, and the implementation of "common-sense" PA interventions that adopt "off-the-shelf" behaviour change strategies, rather than those based on empirical evidence (Hansen et al., 2017). While often pragmatic and locally contextualised, common-sense interventions generally have under-developed rationales for achieving outcomes and thus offer a smaller likelihood of achieving effectiveness (Hansen et al., 2017; Michie et al., 2011; Watkins et al., 2016). Enhancing the translation of scientific evidence in the PA intervention field is therefore an important priority. There are numerous reasons thought to be behind the empirical evidence-PA intervention practice translation gap. For instance, it has been asserted that public health practitioners may sometimes lack the requisite skills in seeking and interpreting research evidence to feel competent and confident in applying it to their practice. The information that appears in academic journals, while compact, is arguably abstract and difficult to readily apply without specialised training in the use of different models and theories of behaviour change and intervention development (Glasgow & Emmons, 2007; Hansen et al., 2017). It is also thought that practitioners can be reluctant to apply the findings from studies that pertain to different populations or contexts, or that observe slightly different outcome measures to those of interest. This is likely because they do not see the relevance or translatability of the information to their own specific settings, objectives and local concerns (Glasgow & Emmons, 2007; Mercer et al., 2007). Perhaps compounding these problems, there is an estimated average time lapse of nine years between the original research being conducted and its findings being incorporated into more practitioner-friendly guidelines and textbooks (Green, 2008). This could conceivably lead to research being perceived as out of date even when it is eventually presented in a more digestible format. It has also been asserted that much PA research adopts a researcher-centric perspective, and that the research methodologies and designs used in studies do not always yield information and findings that are valuable or usable by public health practitioners (Glasgow & Emmons, 2007). For instance, many intervention studies tend to be concerned with internal validity and evaluating whether the intervention works in the conditions under study, rather than considering external validity, and whether it will work in other contexts and settings (Glasgow & Emmons, 2007; Mercer et al., 2007).

Researchers therefore have a key role to play in aiding the translatability of research evidence to real-world PA intervention practice, through conducting research that attempts to address or overcome these problems. One way this can potentially be achieved is through working actively with the real-world public health practitioners and organisations that run PA interventions and share a common interest in the relevant health or behavioural outcomes and processes, to engage in co-creative research that takes place in their actual circumstances of practice (Glasgow & Emmons, 2007; Green, 2008; Mercer et al., 2007). In co-creative research, the non-academic stakeholders are involved as full and equal partners in all phases of the research process, with the intention that they will be the eventual beneficiaries and end-users of the research (van Dijk-de Vries et al., 2020). Therefore, rather than the research solely being driven by the interests or priorities of the researcher, the stakeholders' needs also guide it, and they are consulted and placed at the centre of tasks such as the identification and development of research questions, the selection of the most appropriate research methodologies, and decisions pertaining to how to analyse data and present findings in the most helpful ways (Green, 2008; Mercer et al., 2007).

Co-creative research is said to result in evidence that reflects as closely as possible the actual circumstances of practice for the practitioners and organisations involved, and

consequently, feedback and findings that are more relevant, understandable, and actionable to them and available to use immediately for solving real world problems (Camden et al., 2015; Green, 2008). Furthermore, a recent umbrella review that examined the outcomes and impacts reported in reviews of health-related research partnership literature (a categorisation that includes co-creative research) reported that partnership-based research can directly lead to systems change or action through influencing policymaking and improving community services and the health-related outcomes attached to them. The review also identified six categories of strategic focus that commonly overarch successful research partnership work: relationship between researchers and stakeholders, capacity building, support and resources, communication between researchers and stakeholders, stakeholder engagement in the planning of the research, stakeholder engagement in conducting the research, and stakeholder engagement in dissemination and application of the research. However, it was suggested that more studies are needed reporting the partnership-based processes and strategies that lead to positive outcomes in different contexts and circumstances, and exploring how and why partnership-based approaches, such as co-creative research, are perceived as beneficial or not by the stakeholders involved in them (Hoekstra et al., 2020). Further studies of this nature relating specifically to co-creative PA intervention research would help to build knowledge on the usefulness of the approach in this particular field.

This paper will report the process and strategies used to underpin research co-creation during a recent co-creative qualitative study conducted by the lead author that explored how a PA intervention influenced older adults' PA behaviour (Powell & Thomas, 2021). The paper will highlight the outcomes of the co-creative approach from the perspective of the public health organisation involved in the research, in terms of whether it provided them with evidence more relevant, understandable, and immediately translatable to their real-world PA intervention practice.

Co-Creative Research Strategies

Background to the Study

Active Dorset, a public health agency based in Dorset, southwest England, worked co-creatively with the lead author (AJP) on the study. Active Dorset is an organisation tasked with creating the conditions for local people to choose an active lifestyle through participation in sport and PA. In 2018, as part of a Sport England-funded project that aimed to gain an understanding of how to effectively support inactive older adults aged 55 and over to become more active, Active Dorset adopted a "systems change" approach to bring together the various PA services that older adults already have access to in the Dorset area into one streamlined system (Active Dorset, 2020). As part of the project's evaluation, Active Dorset wished to focus on an integral part of the Dorset PA system, the LiveWell Dorset (LWD) integrated lifestyle service. LWD is an intervention that offers a variety of levels of behaviour change support online and via telephone to adults across the whole of the Dorset area, with the aim of helping them to meet the government's recommended guidelines for PA, to reach and maintain a healthy weight, to stop smoking, and to keep within the recommended limits for alcohol consumption (Crowe et al., 2018). Active Dorset and AJP were initially introduced through a mutual networking contact, and thereafter began to discuss conducting a co-creative study together looking at the LWD service.

Research Question

Early discussions between AJP and Active Dorset revolved around ascertaining Active Dorset's general goal from conducting the study. In line with the original aims of their Sport England-funded project, this was established as to gain an understanding of the role the LWD service plays, as part of the Dorset PA system, in supporting older adults to become more active. This naturally led to the first formal step of the co-creative research process, formulating the research question. The research question serves to state the purpose of a study in the form of a question (Lipowski, 2008), and it is generally viewed as crucial in providing an initial point of orientation for an investigation. In this co-creative context, it was of importance as a means of setting the stage for the study to proceed in adherence with Active Dorset's objective and mitigating against any later drift from it (Bryman, 2007). Expanding further on their originally stated goal, Active Dorset articulated that they wished to find out about the elements of the LWD service that influence and support individuals to change their PA behaviour, in terms of behaviour change strategies, interpersonal approaches, and service pathway design. To encapsulate this breadth of enquiry and yet remain open-ended, the research question thus formulated was: "How does the LWD service influence older adults' PA behaviour?"

Research Methodology

Another key function of the research question is to guide subsequent decisions on the research methods that will be used to answer it. However, it is said that this connection between the research question and subsequent strategy to address it can sometimes be overlooked by researchers in favour of things such as their methodological preferences and capabilities and beliefs about what passes as acceptable knowledge, and thus, what is most likely to be published in academic journals (Bryman, 2007). In this study, the open-ended and exploratory yet specific nature of the research question formulated, as well as Active Dorset's stated desire to gain rich, detailed information pertaining to people's experiences of the LWD service as opposed to establishing any form of statistical causality, led to the shared decision to adopt a qualitative research strategy (Harper, 2011). The basic belief underpinning qualitative research is that there are many different views of reality, and that the world is subjective rather than objective (Dodgson, 2017). Qualitative research thus seeks to capture people's attitudes, opinions, and beliefs about an issue or experience (Percy et al., 2015).

Qualitative Approach

The next decision pertained to which qualitative research methodology to use. There are many that can be deployed, each with a specific focus for enquiry and subsequent interpretation. The choice of which one to use is again usually influenced by the nature of the research question being answered, as each type of qualitative research method answers a different type of question (Dodgson, 2007). For instance, grounded theory focuses on how individuals make sense of their social interactions and construct their realities, and thus aims to generate new theory regarding social processes. Phenomenology on the other hand seeks to understand the meaning that a particular topic has for an individual, or their "lived experience," and the aim is to therefore to understand people's subjective reality (Dodgson, 2007). In this study, considerations centred on the formulated research question and Active Dorset's original goal from the research led to AJP making the decision that a qualitative method focused on investigating people's subjective opinions and reflections on their experience of something external (the LWD service) would best serve their needs. Active Dorset had stated that there was no requirement to develop new theory regarding people's experiences or to discover any

deeper "internal" meaning behind them. Therefore, a generic qualitative approach was selected. Generic qualitative research "simply seeks to understand a phenomenon, a process, or the perspectives and worldviews of the people involved" (Merriam, 1998), and "focuses on descriptions of what people experience" (Patton, 1990). It emphasises people's feelings and perceptions as opposed to the "meanings" that may underlie them (Bellamy et al., 2016).

Procedures

Data collection in generic qualitative research generally seeks to draw out people's reports of something external to themselves in the real-world, as opposed to internal. It also aims to gain a broad range of opinions, reflections, and ideas. Therefore, it typically utilises methods such as interviews, questionnaires, and surveys (Bellamy et al., 2016). In this study, the shared decision was made to conduct one-to-one telephone interviews with individuals who had used LWD's support to increase their PA levels, so researchers could gather their views and experiences of the service. One-to-one interviews were chosen as opposed to focus groups or small group interviews because it was believed that they would result in more detailed and vivid individual accounts from participants (Milena et al., 2008), and thus provide Active Dorset with the level and depth of evidence that they desired. Furthermore, due to the increased flexibility, it was felt that conducting interviews via the telephone would provide the opportunity to interview participants across the whole Dorset area and thus potentially gain a wider geographical representation across the sample group, another of Active Dorset's wishes.

As generic qualitative research focuses on real external events and issues, it rarely uses unstructured data collection methods (Percy et al., 2015). Therefore, it was decided by AJP that the telephone interviews should be semi-structured, with the questions asked largely based on the prior knowledge of the topic being investigated (Bellamy et al., 2016). Thus, an interview topic guide was developed by AJP, the purpose of which was to ensure that the interview contained questions covering the areas of key interest to Active Dorset, while still allowing for flexibility and the possibility for unprompted content to emerge. The process of developing the topic guide involved a series of face-to-face discussions between Active Dorset and AJP about the LWD service and its operations, as well as the examination of LWD's "standard operating procedures." Once developed, the topic guide was subsequently vetted and approved by Active Dorset. It contained questions about the support that participants had accessed through LWD, how LWD had facilitated their initial engagement with the service, the outcomes of their LWD experiences, and their previous PA backgrounds.

Sampling

Generic qualitative research normally uses larger samples than other qualitative approaches in order to gain a wider representation of the population being studied, and thus a broader range of opinions and reflections (Bellamy et al., 2016; Percy et al., 2015). However, it is thought that a small, non-representative and well-informed sample can still provide rich information on a topic in this approach (Percy et al., 2015). In this study, resource availability largely dictated the shared decision to conduct twelve one-to-one telephone interviews with individuals who had accessed the LWD service. It was felt that with the likely heterogonous nature of people's LWD experiences and the use of an interview topic guide to ensure that the pre-determined issues of interest were covered, this sample would provide an information-rich, transparent, and fair representation of the target population for Active Dorset (Percy et al., 2015). Largely for these reasons, it was also determined that it would not be detrimental if content saturation was not reached during data collection, which is the point at which no new information is being generated through interviews (Saunders et al., 2018).

Recruitment

Following a discussion on the different options for participant recruitment, it was decided that Active Dorset would act as the recruitment gatekeeper for the study and be responsible for identifying interview participants. Active Dorset stated the importance of the study adhering to their own internal legal and data protection procedures, which the gatekeeper role would allow them to ensure. To recruit participants, Active Dorset arranged for an advertisement to be posted on the LWD Facebook page seeking individuals aged 55 and over who had accessed the support of the service to increase their PA levels and were willing to participate in a telephone interview. Those interested in participating were asked to complete a web form to provide their contact details and permission for Active Dorset to share these details with AJP to contact them. Active Dorset passed on the details of individuals who completed the form to AJP. AJP subsequently arranged the interviews and coordinated all further study activities, including conducting the interviews.

Data Analysis

The final decision centred on how to analyse the interviews in order to transform the data into the most usable form of evidence for Active Dorset. In generic qualitative research, thematic analysis is often the preferred data analysis technique (Bellamy et al., 2016). The objective of thematic analysis is to search for and identify common threads and patterns that extend across a set of interviews in order to provide a detailed and nuanced account of the data, something that Active Dorset desired (Braun & Clarke, 2006; Vaismoradi et al., 2013). Therefore, in this study, the decision was made by AJP to conduct a thematic analysis, using a hybrid approach that incorporated both inductive (bottom-up) and deductive (top-down) processes (Swain, 2018). The decision to conduct a hybrid approach allowed AJP to carry Active Dorset's pre-determined areas of interest into the analysis, whilst being able to seek "new" information and ideas from the data (Mihas & Odum, 2019). Before initial familiarisation with the interview transcripts took place, a priori codes were first deductively added to a codebook (Mihas & Odum, 2019), largely derived from the original interview topic guide. Then, after familiarisation, important patterns and threads were searched for in the interview data inductively, at which point emerging posteriori codes were added to the codebook. With all codes added to the codebook, the list of a priori and posteriori codes was reduced and merged into themes. Illustrative quotations relating to each theme were then collated, to enable summarising, interpretation, and reporting to Active Dorset.

Dissemination

The dissemination of research findings beyond scientific publication, to the key audience and in the appropriate format, is a fundamental aspect of partnership-based research. It is suggested that dissemination efforts should take into consideration the cultural reporting norms of the partnership organisation (Chen et al., 2010). In this study, a report of findings was written for Active Dorset by AJP, a dissemination format agreed to be suitable and desirable for them. Within the report, simple and non-academic language was used as much as possible, with aspects of the study such as the methodologies explained in sufficient technical depth to provide clarity but not confusion. Furthermore, the results were discussed with sufficient reference to related theory in order to add to (but not threaten) understanding. It was intended that these measures would enhance the likelihood of successful evidence transfer taking place (Chen et al., 2010).

Outcomes of the Co-Creative Research Approach

Active Dorset provided the following reflections on their participation in the co-creative qualitative research study, and on its outcomes in terms of providing them with evidence that was valuable and translatable to their real-world PA intervention practice:

> Active Dorset were awarded funding from Sport England to support 20,000 55- to 65-year-olds to become more physically active. Our approach was to use a whole system approach to support people to be active, engaging primary and secondary care services, as well as local authorities to target the right audience. We were required by Sport England to appoint an academic partner to help us to understand what works, and what does not work, to support behaviour change for our target groups. The research carried out on the client experience of the LWD PA pathway has been most useful. The research was conducted in detail, with a helpful report submitted.

> Some aspects of the co-creative research process that were particularly helpful to us were working together to decide on the focus of the study, working together to agree on the use of interviews and the number of people that would be interviewed, and being able to provide input on the interview topic guides so that we knew what topics would be covered.

> The report we received provided tangible real-world feedback that we could use to improve our work and make a difference to the lives of people living in Dorset, and their experience of using services like LWD. The report used specific context relating to the uniqueness of the LWD service, thus providing us with clear actions and opportunities to improve the service. We have an officer in our team who works very closely as part of the LWD team. This officer is responsible for supporting the improvement of the LWD PA pathway. We have a shared work plan for this officer with LWD which we review annually. The feedback and evidence gained from the research will help us to plan our work objectives with LWD and highlight specific actions we need to take or pieces of work we can do to improve the service.

Discussion

This paper has outlined the process and strategies used to underpin co-creation during a recent co-creative qualitative PA intervention study. It has also highlighted the outcomes of the co-creative research approach in terms of whether it resulted in relevant and translatable evidence for the public health organisation involved.

A range of strategies were reported as being used to underpin co-creation in the study. These included engaging the partnering public health organisation in the identification of the research question and the development of the research protocol, involving them in participant recruitment, and perhaps most importantly, considering and communicating with them constantly throughout the research process to ensure their needs were being met. These mainly relate to the following strategy subcategories put forward by Hoekstra et al. (2020) as commonly being used in successful partnership-based research: communication between researchers and stakeholders, stakeholder engagement in the planning of the research, and stakeholder engagement in conducting the research.

From the perspective of the partnering public health organisation, the co-creative research approach was well-received and helpful, and produced timely research evidence that was understandable and translatable to their real-world PA intervention practice. The evidence provided them with clear actions and opportunities to improve their service, and information that will allow them to plan their future work and objectives. These outcomes support the previous umbrella review findings of Hoekstra et al. (2020) on the overarching outcomes and impacts of partnership-based research approaches such as co-creative research. They reported that partnership-based research frequently provides the involved practitioners and organisations with better access to information that is relevant to their actual circumstances of practice, which can subsequently be used to improve community services and health-related outcomes.

Despite the existence of evidence-based interventions, real-world public health practice often sees the implementation of common-sense PA interventions that adopt "off-the-shelf" behaviour change strategies, rather than empirically-based ones. Common-sense interventions generally have under-developed rationales for achieving outcomes and thus offer a smaller likelihood of achieving effectiveness (Hansen et al., 2017). Numerous reasons are thought to be behind the evidence-practice gap in the PA field. These include public health practitioners lacking the requisite training in seeking and interpreting research evidence to feel competent and confident in applying it to their practice (Glasgow & Emmons, 2007; Hansen et al., 2017), their reluctance to apply findings from studies of different populations and settings to their own (Glasgow & Emmons, 2007; Mercer et al., 2007), and due to PA research often adopting a researcher-centric perspective and using methodologies that do not always yield valuable or usable information for them (Glasgow & Emmons, 2007). That the co-creative strategies reported in this paper produced evidence seemingly relevant, understandable, and actionable to the public health organisation involved, which they could apply quickly and directly to influence and improve the community PA intervention they operate, suggests that the strategies helped in some way to address or sidestep the issues that commonly impede the translation of scientific evidence in the PA intervention field. This paper therefore demonstrates the potential usefulness of co-creative research as a strategy to help close the evidence-practice gap here.

In response to this, it could be argued that as this paper focuses on the retrospectively self-reported processes, strategies, and outcomes of the co-creative research approach, its findings are therefore limited. However, studies reporting and evaluating partnership-based research approaches in general are scarce, and methodologies, tools, and classification systems that provide guidance and support for doing so in a more prospective and systematic manner still need to be developed (Hoekstra et al., 2020). Therefore, it is felt that this paper contributes valuable descriptive information on a topic that still appears to be in its infancy, along with its potential relevance to the PA intervention field in terms of offering a means to aid the translatability of research evidence to real-world PA intervention practice. Further, more in-depth studies should explore how, when, and why co-creative research approaches are beneficial to this cause and should also seek to develop objective classification systems for reporting and measuring their application and outcomes.

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Chapter 6. Study 3 Article

Title

Therapeutic alliance and its potential application to physical activity interventions for older adults: A narrative review.

Summary

This narrative review examined the potential relevance of the therapeutic alliance concept to PA interventions for older adults.

Contributions

None.

Main findings

Therapeutic alliance was demonstrated to be a potentially relevant, yet largely ignored and unexplored concept in the field of PA interventions for older adults. The typical focus on the motivational, cognitive, and behavioural strategies they use to influence behaviour was highlighted. The overlooking of therapeutic alliance was speculated to contribute to the uncertainty and general lack of foundational understanding on what constitutes the most effective components and characteristics of PA interventions.

Implications

The findings highlight therapeutic alliance as a potentially important component of PA interventions, and provide the rationale for follow-up research looking at its influence on older adults' PA behaviour.

Therapeutic Alliance and Its Potential Application to Physical Activity Interventions for Older Adults: A Narrative Review

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Increasing the physical activity (PA) levels of inactive older adults to promote healthy aging and to reduce preventable health conditions is a public health priority. However, there remains uncertainty on what constitutes the most important components and characteristics of effective PA interventions for older adults, and previous research has largely focused on the cognitive and behavioral strategies they adopt to increase uptake and adherence to PA. This narrative review puts forward the novel idea, with supporting evidence, that the strength, quality, and collaborative nature of the professional–client relationship, a concept drawn from the field of psychotherapy and known as therapeutic alliance, may be a vital and foundational element of effective PA interventions. This article will offer a new understanding, and a new direction of research to aid the future conceptualization, design, and development of interventions that aim to increase the PA levels of older adults.

Keywords: behavior change, common factors, intervention design, exercise

The purpose of this narrative review is to highlight the potential relevance of therapeutic alliance as a concept to aid the conceptualization, design, and development of effective interventions that aim to increase the physical activity (PA) levels of older adults. Therapeutic alliance has been established as a foundational element of effective treatments in the field of psychotherapy, and at its heart proposes that a positive and collaborative relationship between client and professional is essential for optimal outcomes regardless of the behavior or symptom being targeted (Fife et al., 2014). In the following sections, the current evidence regarding the effectiveness of PA interventions for older adults, and their notable components and characteristics, will be reviewed. Then, the therapeutic alliance concept and its traditional application in psychotherapy will be introduced and explained. The potential convergence of therapeutic alliance with PA interventions for older adults will then be explored, along with its possible future implications for PA intervention research and practice.

Physical Activity and Older Adults

Lack of PA is a major risk factor for the development of age-related ill health and long-term disease (Booth et al., 2011). There is an abundance of evidence suggesting that participating in regular PA provides preventative health and quality of life benefits for individuals as they reach middle age and beyond. Improvements in cardiorespiratory fitness, muscle strength, balance, and mobility have been found to result from PA participation, which are, in turn, associated with a lower risk of cardiovascular disease, depression, falls, muscle and bone loss, and cognitive decline in older adults, along with improved emotional, social, cognitive, and physical functioning (Cunningham et al., 2020; Paterson et al., 2007; Taylor et al., 2004). The World Health Organization guidelines recommend that to reap these benefits, 55–64 year olds should perform at least 300 min of moderate-intensity PA per week, and over 65s at least 150 min (World Health Organization, 2020). However, in the United Kingdom, recent figures have revealed that only around 60% of over 55s are considered physically active, based on self-reported levels of sporting, fitness, and leisure activity participation (Sport England, 2021). Consequently, increasing the PA levels of older adults has become a priority for public health interventions in the United Kingdom to reduce the risk of preventable health conditions developing and promote healthy aging (Public Health England, 2014).

Despite challenges in synthesizing evidence from heterogeneous studies using mainly randomized controlled trial designs, a recent umbrella systematic review reported the potential effectiveness of multimodal and multicomponent PA interventions for increasing the self-reported and objectively measured PA levels of community-dwelling older adults (Zubala et al., 2017). The review examined the effectiveness of interventions implemented across a range of community settings (e.g., homes, general practice); delivered both face-to-face and remotely by a range of professionals (e.g., general practitioners, nurses, occupational therapists, fitness instructors, PA coaches); incorporating lifestyle counseling, health education and training elements; involving numerous modes of PA (e.g., walking, aquatic exercise, dance); and most commonly of a 3–12 month duration. Generally, positive effects on the PA levels of older adults of small to moderate sizes were reported across interventions, although effects on maintenance beyond 12 months were unclear due to a lack of longitudinal studies.

It was also reported by Zubala et al. that effective interventions typically utilized strategies of a motivational (e.g., to enhance desire and readiness to change behavior, such as providing positive

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feedback); cognitive (e.g., to increase awareness and understanding of behavior, such as self-monitoring); and/or behavioral (e.g., to directly influence behavior, such as activity planning) nature in addition to health education and instruction-type components. However, the authors concluded that there was general uncertainty around the most effective intervention characteristics and components to increase older adults' PA levels, as rarely were any consistently associated with positive or negative outcomes (Zubala et al., 2017). Reflecting similar ambiguity, another umbrella review conducted by Olanrewaju et al. (2016), which looked at various aspects of PA in community-dwelling older adults, concluded that "many interventions," incorporating cognitive and behavioral components underpinned by theory appeared to be effective at promoting changes in older adults' PA levels. Thus, there appears to be no firm consensus or understanding on what constitutes the most important elements of effective PA interventions for older adults. Adding even more uncertainty, prior work conducted by French et al. (2014) suggested that many behavior change strategies that are effective at increasing the PA levels of younger adults may not be as effective for older adults, especially those that involve self-regulation (e.g., goal setting, receiving feedback). The reasons put forward for this were due to their achievement-based objectives being less acceptable to older adults who value meaning and positive emotion as outcomes of PA participation, and to older adults potentially finding them too cognitively complex.

Perhaps as a result of this uncertainty, real-world public health practice often adopts the implementation of "common-sense" PA interventions, which utilize "off-the-shelf" strategies (Hansen et al., 2017). While usually pragmatic and locally contextualized, there are concerns that these types of interventions have underdeveloped rationales for achieving outcomes, due to not considering the theory or evidence underpinning the behavior change strategies they adopt. Furthermore, even when apparently successful at an anecdotal level, they can be difficult to define, and their mechanisms of action and outcomes subsequently hard to explain and measure (Watkins et al., 2016). This makes their evaluation and potential larger scale implementation in novel settings challenging. It is therefore imperative that researchers continue to seek further understanding on how different interventions influence older adults' PA behavior and to attempt to identify their most important components and characteristics. This knowledge could, in turn, contribute to the development of novel, effective, and evidence-based interventions that are implementable at scale by practitioners and commissioners.

Therapeutic Alliance

In the field of psychotherapy, the concept of therapeutic alliance has become one of the most intense subjects of research and established as a key factor that contributes to treatment effectiveness (Flückiger et al., 2012; Horvath et al., 2011). Although no concise definition exists, the term therapeutic alliance essentially refers to the quality, strength, and nature of the collaborative relationship between therapist and client. It is thought to be characterized by three processes: mutual agreement on target treatment outcomes, consensus on a defined set of tasks or processes to achieve them, and the formation of a positive emotional bond (Baier et al., 2020; Flückiger et al., 2012; Horvath et al., 2011). The strength of the therapeutic alliance can be measured using a number of validated tools, with four measures most commonly used in related research: California Psychotherapy Alliance Scale, Helping Alliance Questionnaires, Vanderbilt Psychotherapy Process Scale, and Working Alliance Inventory (Horvath et al., 2011). Since an initial meta-analysis by

Horvath and Symonds (1991), the correlation between psychotherapeutic treatment outcomes and therapeutic alliance has been examined meta-analytically numerous times (Flückiger et al., 2012; Horvath & Bedi, 2002; Horvath et al., 2011; Martin et al., 2000). The most recent meta-analysis, conducted by Flückiger et al. (2018), supported previous findings in reporting a robust positive association between alliance and outcomes equivalent to a medium effect size ($d = 0.579$), which was stable across different treatment modalities (e.g., cognitive behavioral therapy, psychodynamic therapy, counseling); patient disorders (e.g., anxiety, depression, posttraumatic stress disorder); alliance measures (e.g., Helping Alliance Questionnaires, California Psychotherapy Alliance Scale, Vanderbilt Psychotherapy Process Scale); treatment outcome measures (e.g., Beck Depression Inventory, Social Phobia Scale); and countries. Furthermore, a recent systematic review has suggested that therapeutic alliance may be an independent mediator of therapeutic change, and thus a possible underlying mechanism of psychotherapy response (Baier et al., 2020).

The concept of therapeutic alliance arguably dates back to the ideas of Sigmund Freud on the important roles in psychotherapy of unconscious interpersonal projection of unresolved conflict (transference), and the patient's conscious attachment to the therapist (Flückiger et al., 2012). The work of Carl Rogers and the humanistic psychotherapy movement in relation to person-centered therapy was the first to highlight the importance of the facilitative conditions offered by the therapist through rigorous empirical investigation (Flückiger et al., 2012; Horvath et al., 2011). Edward Bordin amalgamated these ideas, as well as others, to propose the importance of what he termed the "working" alliance. Bordin emphasized that agreement on goals and tasks, and the bond formed, constituted the vital core of the collaborative relationship between client and therapist (Bordin, 1979). His concept is what the modern definitions of therapeutic alliance are largely based upon.

It is thought that the importance of therapeutic alliance lies in its role in facilitating a client's trust in the therapist who they are working with, which enables them to embrace and participate fully in their treatment (Sturgiss et al., 2016). Rather than a stable entity or "outcome" of collaboration, it is something that unfolds, develops and ebbs and flows over time, needs to be nurtured and sometimes repaired, and infuses every interaction between client and therapist (Flückiger et al., 2018). Therapist attributes, such as empathy, respectfulness, flexibility, and genuine interest are thought to contribute positively to its formation and maintenance (Fife et al., 2014). Flückiger et al. (2018) outlined a number of therapist actions and practices integral to therapeutic alliance, such as responding to the client's readiness/stage of change and capabilities, creating an individual case formulation based on the client's problems and preferences, collaborating in words and nonverbal language, and negotiating on goal and task agreement.

The importance of therapeutic alliance in psychotherapy outcomes illustrates a key distinction between the "specific factors" that characterize different therapies (i.e., the particular therapeutic techniques intended to directly enact symptom change) and "common factors," such as therapeutic alliance, which underpin and are potentially present across all modalities (Guthrie et al., 2018). Fife et al. (2014) drew from this notion when they proposed their "therapeutic pyramid" metamodel. They argued that therapeutic alliance is a foundational layer of any effective psychotherapy treatment, upon which specific skills and techniques, which form the next level and peak of the pyramid, can exert their action (Figure 1).

This concept was very notably implemented by the British Department of Health in the mid-2000s in their development of a

Figure 1 — The therapeutic pyramid. Adapted from "The Therapeutic Pyramid: A Common Factors Synthesis of Techniques, Alliance, and Way of Being," by S.T. Fife, J.B. Whiting, K. Bradford, & S. Davis, 2014, *Journal of Marital and Family Therapy, 40*(1), pp. 20–33. Copyright 2013 by John Wiley and Sons.

national program of psychotherapy treatment for individuals with common mental health problems, known as "Improving Access to Psychological Therapies" (IAPT) (Guthrie et al., 2018). Established in 2008, the underpinning objective of the IAPT program, which still exists today, is to provide effective, evidence-based psychotherapy on a mass scale to the proportion of the population that experience depression and anxiety disorders of a mild to moderate severity (Sreenan, 2013). At the heart of the IAPT program's philosophy is the belief that a properly established, developed, and maintained therapeutic alliance will reap effective client outcomes (Richards & Whyte, 2011). Reflecting this, a core training module in the IAPT National Curriculum for the Psychological Wellbeing Practitioner workforce is focused on enabling trainees to develop core common factors competencies, such as empathy, listening, patient-centered information gathering, consensus, and collaboration for them to be able to develop a strong and effective therapeutic alliance with clients. These competencies are then intended to underpin their subsequent ability to utilize disorder-defined specific factors skills and techniques that target clinical symptom improvement (National IAPT Team, 2015; Richards, 2010).

The Potential Application of Therapeutic Alliance to Physical Activity Interventions for Older Adults

Turning now back to PA interventions for older adults, this article proposes that therapeutic alliance could potentially hold similar importance in the field of PA as it does in psychotherapy. This is because, like psychotherapeutic treatments, PA interventions aim to enact some form of healthy, adaptive behavior, centered on collaborative interactions between professional and client, or "change agent" and "change seeker" (Guthrie et al., 2018; Sturgiss et al., 2016). Furthermore, according to Franco et al. (2015), who conducted a systematic review and thematic analysis of 132 qualitative studies exploring older people's perspectives of PA, social contact, interaction and support, key elements of therapeutic alliance, are particularly important facilitators of PA participation in aging populations compared with the more goal and outcome-orientated motivators of younger adults (Devereux-Fitzgerald et al., 2018).

Franco et al. also reported that older adults appear to depend more upon professional guidance and encouragement from others to influence their PA behavior. However, a literature search conducted by the lead author in June 2020 identified no studies to date that had investigated therapeutic alliance in relation to PA interventions for older adults. The MEDLINE, PsycINFO, and ScienceDirect databases were searched, with all article types and languages included in searches, and no limits on time of publication set, to potentially maximize the breadth of articles found. The search terms used were "Therapeutic alliance" OR "Therapeutic relationship" OR "Working alliance" OR "Helping alliance" OR "Alliance" AND "Exercise" OR "Physical activity" OR "Fitness" OR "Aerobic Training" OR "Strength training" OR "Resistance training" AND "Older" OR "Aging" OR "Aged." A further literature search that removed the age-related field also returned no results, suggesting that therapeutic alliance is in fact a concept novel to the entire PA intervention evidence base.

As previously alluded to, research examining the most important components and characteristics of PA interventions for older adults has largely appeared to focus on the motivational, cognitive, and behavioral strategies used to influence behavior. Applying the therapeutic pyramid notion here, it could thus be argued that the emphasis of research has so far been on specific factors and the peak of the hypothetical "PA intervention pyramid," with potentially important common factors, such as therapeutic alliance, overlooked. This could help to explain why uncertainty exists on what constitutes the most important elements of effective PA interventions for older adults and why common-sense interventions are often implemented in the real world. An understanding and appreciation of the foundational layer of the hypothetical PA intervention pyramid is missing from the current evidence base, upon which effective interventions, and a full conceptualization of them, can be built.

The findings of a recent meta-study conducted by Beselt et al. (2021) lend credence to the potential importance of therapeutic alliance to PA interventions for older adults. Beselt et al. synthesized qualitative research pertaining to the experiences of social support of adults aged 55 years and older who had either been involved in some form of PA intervention or who had inquired about PA. Across the 31 studies included in the review, one of the main findings was that participants perceived that the emotional support they received from professionals was very helpful and important. Being made to feel welcome, having care and empathy displayed toward them, being inquired about and checked on, and being accompanied during exercise helped to create a sense of safety, accountability, and motivation. Furthermore, tailoring and person-centered feedback from professionals were also highly valued. These behaviors allowed participants to feel that their presence, ability, and needs had been noticed, and conveyed to them that they were accepted, which engendered feelings of trust and safety to exercise. These findings add to a noted outcome of the previously mentioned umbrella review conducted by Zubala et al. (2017), that client-centered and personalized interventions involving tailored professional guidance and ongoing support in particular led to improved PA participation in older adults.

The findings of recent research by Haynes et al. (2020) are also suggestive of the potential relevance of therapeutic alliance to PA interventions for older adults. In a qualitative study that explored the experiences of older adults aged 60 years and older in Australia who had participated in a preventive healthy aging program targeting physical inactivity to reduce falls incidence, high-quality health coaching was found to be key to participants' positive experiences of the intervention. The participant–coach relationship was said to

mediate accountability, and function as an engagement and maintenance mechanism. In addition, technical expertise, the high-level interpersonal skills of coaches, and their focus on participant directed goals and flexible means of achieving them, enabled trusting relationships to be built that subsequently helped participants to "routinize" PA. The authors concluded by specifically mentioning that these findings strongly resonated with the concept of therapeutic alliance, and had implications for intervention scalability in indicating that the participant–coach relationship was one of the intervention's key ingredients.

Similarly, relevant findings were also reported in recent research conducted by the lead author, which partly inspired this article. In another qualitative study that explored how a lifestyle behavior change support service based in South West England influenced older adults' PA behavior, it was found that participants appeared to most value factors that pertained to the positive aspects of their relationship with their behavior change coach. For instance, it was frequently reported that participants appreciated the kindness, empathy, understanding, encouragement, and nonjudgemental attitude of their coach, as well as the open line of communication via email or telephone that they offered. These things provided participants with a sense of trust and security. Furthermore, participants also alluded to how determining their goals with their coach and breaking them down together into small steps, sometimes with the use of tools, such as activity planning diary sheets, helped them to feel supported and empowered as they attempted to change their PA behavior (Powell & Thomas, 2021). These findings correspond to the three previously mentioned elements of therapeutic alliance: mutual agreement on target outcomes, consensus on tasks to achieve them, and the formation of a positive emotional bond (Baier et al., 2020; Flückiger et al., 2012; Horvath et al., 2011).

Looking at research in other areas that are related to PA, two recent qualitative studies in the physiotherapy rehabilitation field have also supported the potential relevance of therapeutic alliance to PA interventions for older adults. The first study explored the experiences of Norwegian older adults who had participated in an exercise-based intervention during the subacute phase of hip fracture rehabilitation. It was found that participants frequently noted how characteristics of the relationship with their physiotherapist, such as mutuality and respect, trust, shared power, and understandable and tailored communication and instruction, contributed to their motivation to exercise. The authors concluded that the results highlighted the importance of achieving a good therapeutic alliance to facilitate positive outcomes in exercise-based physiotherapy interventions (Vestøl et al., 2020). In the second study, conducted by Moore et al. (2020), interviews were undertaken with older adults in England with knee pain or stiffness who met criteria for a clinical diagnosis of osteoarthritis to find out their experiences and perceived impact of participation in a physiotherapist-led exercise intervention. Participants frequently spoke about developing trusting and empowering relationships where they felt valued, supported, understood, and respected by their physiotherapist and about the importance of building collaboration through continuity over sessions. It was concluded that the presence and quality of therapeutic alliance was a key factor that facilitated their adherence to rehabilitative exercise and PA.

Summary and Applications

This article has highlighted therapeutic alliance as a potentially important, yet largely unexplored concept in the field of PA

interventions for older adults. Long established as a key element of successful psychotherapy treatments, a rationale and evidence have been presented here to suggest that (a) therapeutic alliance could be highly relevant for interventions that aim to increase older adults' PA levels and (b) the previous overlooking of therapeutic alliance in PA intervention research could help to explain why there still exists a general lack of foundational understanding on what constitutes their most effective components and characteristics and why common-sense PA interventions are often adopted in the real world.

A notable limitation of the research evidence presented here in support of the potential relevance of therapeutic alliance to PA interventions for older adults is its solely qualitative nature. Therefore, the hope is that the information and arguments put forward in this article will now serve as a catalyst for a novel wave of original quantitative research that looks at the influence of therapeutic alliance on the PA behavior of older adults and on the outcomes of PA interventions. Such research could begin with a preliminary investigation of the association between therapeutic alliance and older adults' PA intervention outcomes. A therapeutic alliance measure, such as the Working Alliance Inventory—revised short version could be used, which has been tested as a valid and reliable questionnaire that reflects the three key alliance dimensions: goals, tasks, and bond (Hatcher & Gillaspy, 2006; Sturgiss et al., 2016). Working Alliance Inventory—revised short version scores could be correlated with intervention outcome measures, such as self-reported changes in PA levels and quality of life ratings, to determine if therapeutic alliance is related to participant outcomes.

Robust evidence on this topic could potentially improve the conceptualization of PA interventions and their different layers of factors that can contribute to effectiveness. As demonstrated through the IAPT program in the psychotherapy field, such an understanding could have the potential to eventually aid public health policymakers, commissioners, and practitioners in the design, development, and implementation of PA interventions at scale that deliver the desired preventative health and quality of life benefits across the older adult population.

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Chapter 7. Study 4 Article

Title

An exploration of system factors influencing older adults' initial engagement with physical activity interventions.

Summary

This qualitative study explored the system factors influencing older adults' initial engagement with PA interventions.

Contributions

Dr Samuel Nyman (research adviser to AJP, Bournemouth University) contributed to the design of the study, assisted with data analysis, and proof-read and commented on the first draft of the article.

Main findings

Various system factors that could influence older adults' engagement with PA interventions were identified, particularly relating to social support and relationships, and the physical, social, and information environments.

Implications

The findings provide valuable evidence on the important system-related components and characteristics of PA interventions for older adults, and highlight a novel system-based perspective of PA interventions that looks beyond their motivational, cognitive, and behavioural-focused components. The findings provide the rationale for further research to elucidate the role of system factors in influencing older adults' PA behaviour.

CrossMark

RESEARCH ARTICLE

An Exploration of System Factors Influencing Older Adults' Initial Engagement with Physical Activity Interventions

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Abstract:

Background:

Previous work has highlighted the need for researchers to look beyond the behavioural, cognitive, and motivational components of physical activity interventions for older adults, and to investigate the 'system-related' factors that may influence physical activity behaviour, which pertain to their social, physical, and operational contexts.

Objective:

This qualitative study aimed to explore the system factors influencing older adults' initial engagement with physical activity interventions.

Methods:

Semi-structured one-to-one telephone interviews were conducted with 12 individuals aged 55 and over to gather their views on the subject. The study employed a qualitative descriptive approach, and a thematic analysis was carried out.

Results:

Participants identified various system factors they felt could influence older adults' engagement with physical activity interventions, particularly relating to social support and relationships (*e.g.* being able to bring a friend to the first session), and the physical, social, and information environments (*e.g.* venues being reachable by bus or car).

Conclusion:

This study highlights system factors as a potentially important yet largely unexplored concept in the field of physical activity promotion. The findings provide practical information for public health practitioners to use when attempting to design physical activity interventions that older adults will willingly engage with, and the rationale for future research seeking to expand understanding of the influence of system factors on older adults' initial engagement with physical activity interventions, as well as their subsequent physical activity behaviours beyond this.

Keywords: Physical activity intervention, Older adult, Physical activity behaviour, System factors, Intervention design, Public health, Behaviour change, Qualitative methods.

1. INTRODUCTION

Vast evidence suggests that regular physical activity (PA) participation brings many protective health and quality of life benefits for ageing populations [1]. For instance, PA participation has been found to result in improvements in cardiorespiratory fitness, neuromuscular strength and function, mobility, and balance in older adults, which in turn are associated with a lower risk of falls and cognitive decline,

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diseases such as cardiovascular disease, and improved quality of life [2 - 4]. The latest guidelines published by the World Health Organisation advise that to gain these benefits, 55–64-year-olds should perform at least 300 weekly minutes of moderate-intensity PA, with at least 150 minutes per week recommended for over 65s [5]. However, recent figures based on self-reported levels of leisure, sport, and fitness activity participation have revealed that in the UK currently, only approximately 60% of over 55s are achieving these standards [6]. This is not a new concern, though; increasing the PA levels of older adults is a long-standing public health priority in the UK [7], and there is a need for evidence on the most important

factors to consider when designing PA interventions that aim to change older adults' PA behaviour and sustain this change [8].

The findings of a systematic umbrella review conducted by Zubala et al. [9], which synthesised evidence from 19 previous reviews on the effectiveness of multi-modal and multi-component PA interventions for increasing the PA levels of community-dwelling older adults, pointed towards the importance of three components of interventions for their role in influencing PA: behavioural (e.g. to directly facilitate behaviour), cognitive (e.g. to enhance comprehension of behaviour and awareness), and motivational (e.g. to increase readiness and desire to change behaviour). However, the authors also highlighted in their conclusions the need for researchers to look beyond just these aspects of PA promotion in the future, and to investigate the role of extrapersonal 'system-related' factors. System factors are elements of interventions pertaining to their social, physical, and operational contexts, such as the operating procedures, policies, actions and communications of the organisations and professionals involved in their delivery, and the environmental-level characteristics and components [10]. The potential importance of system factors to PA promotion is based on the idea that the person most directly connected to a health behaviour or outcome is not necessarily at the root of its cause and that the latent systemic conditions that it occurred in may have caused or contributed to it [11].

Zubala et al. [9] further noted that system factors may be particularly relevant to facilitating older adults' 'initial engagement' with PA interventions. Initial engagement is the entry-point of intervention participation, often capped by the attendance of an appointment such as an assessment, induction, or taster session, which is usually preceded by some form of registration or sign-up process once an individual has become aware of the intervention. As noted by Pavey et al. [12], initial engagement is an important consideration for PA interventions because, without it, their motivational, cognitive, and behavioural components will logically never be able to exert their intended effects further downstream. Zubala et al. [9] observed that PA interventions for older adults are often developed by public health organisations using a top-down approach lacking end-user involvement, a process that tends to result in an overlooking of the system-related factors that might impact on the acceptability, accessibility, and appropriateness of interventions to potential participants, and therefore their likelihood to initially engage.

No studies to date appear to have directly examined the influence of system-related factors on PA intervention initial engagement in older adults. However, the findings of both a previous umbrella review conducted by Olanrewaju et al. [13] that synthesised the findings of nine qualitative reviews examining the barriers and facilitators of older adults' PA behaviour, and a subsequent systematic review of 49 qualitative studies on the same topic conducted by Spiteri et al. [14], support the notion of the potential link between system factors and initial engagement and indicate a need for further research on the topic. For instance, system-related elements of PA interventions relating to communication of information on the risks and benefits of participation to potential participants;

involvement of healthcare professionals in information provision, signposting, and referral processes; provision of social support to encourage and support participation; cost; timings; and convenience, safety, and accessibility of environments, venues, and facilities were all reported to be important influencers of engagement with PA interventions across both reviews. Furthermore, the findings of a recent qualitative study conducted by the lead researcher (AP), which investigated how a lifestyle behaviour change service in the South-West of England influenced older adults' PA behaviour, also lend credence to the idea. Across the 12 participants that were interviewed, it was frequently mentioned that system-related intervention elements such as the advertising methods and routes used to create initial awareness of the intervention, the involvement of healthcare professionals in signposting processes, ease of registration procedures, cost, and the personal characteristics and communication styles of the professionals responsible for conducting initial conversations with potential participants all influenced their engagement with the intervention [15].

The aim of this study was to explore the system-related factors influencing older adults' initial engagement with PA interventions.

2. MATERIALS AND METHODS

2.1. Research Approach

A qualitative study was conducted, involving semi-structured one-to-one telephone interviews. Ethical approval was obtained from Bournemouth University (ref. 41323). The study employed a qualitative descriptive approach. Qualitative descriptive research, "is typically directed toward discovering the who, what, and where of experiences", as opposed to seeking to, "describe an event in terms of a conceptual, philosophical or other highly abstract framework" [16]. Thus, qualitative descriptive research entails low-inference interpretation, and is said to be, "especially amenable to obtaining straight and largely unadorned answers to questions of special relevance to practitioners and policy makers" [16].

2.2. Participants and Recruitment

The aim was to conduct telephone interviews with a convenience sample of 12 individuals aged 55 and over to gather their views and reflections on the potential influence of system-related factors on older adults' initial engagement with PA interventions. A sample size of 12 was selected based on resource availability, but also with consideration to the previous recommendation that this should be an adequate number to achieve data saturation in qualitative studies that seek to understand common perceptions, on clearly defined topics, among relatively homogenous sets of individuals [17].

Participants were recruited by an invitation email containing an attached recruitment poster, seeking individuals aged 55 and over to participate in a telephone interview to help the study team learn more about the different factors that might make older adults more or less likely to engage with PA interventions. The email and poster were sent to members of two local community groups based in Dorset, South-West

England, with a primary interest in health-related research, via the groups' administrators. Individuals interested in participating in the study were asked to email the lead researcher (AP), and then in a response email from AP, were asked to provide their telephone number so they could be called to discuss their interest in the study. AP called potential participants to explain the study and answer any queries. If willing to participate, a telephone interview was subsequently arranged for a date and time of their convenience, and a participant agreement form and a participation information sheet were sent to them *via* email.

2.3. Interview Procedures

AP conducted all telephone interviews. AP answered any queries that participants had about either the participant information sheet or the participant agreement form on the day of the interview, and verbal consent was recorded prior to the interview commencing. A topic guide was utilised for interviews to ensure areas of key interest were covered, while still allowing for the emergence of unprompted content. Table 1 summarises the content of the topic guide. It was informed by the evidence relating to system factors from both the previous reviews on the barriers and facilitators of older adults' PA behaviour [13, 14] and the previous study conducted by AP [15], as well as the practical experiences of AP. To provide additional context to participants' views and reflections, questions were also included pertaining to their PA habits and demographic characteristics. All telephone interviews were audio-recorded using a digital audio-recorder and transcribed verbatim. After each interview, AP made reflective notes detailing impressions of the data collected and the effectiveness of data collection techniques [18].

Table 1. Summary of the interview topic guide.

Topic Area
Demographic information
Physical activity habits
Modes and methods of creating initial awareness of physical activity interventions
Registration processes of physical activity interventions
Support required to engage with physical activity interventions
Involvement of professionals in physical activity interventions
Environmental and logistical elements of physical activity interventions
Technology and physical activity interventions.

2.4. Analysis

A thematic analysis was conducted by AP, using a hybrid approach incorporating both inductive and deductive processes [19]. The interview transcripts were initially read once through to gain familiarity with the data. At that point, a priori subthemes were added to a codebook in Microsoft Word [20], largely derived from the original interview topic guide. To identify emerging posteriori subthemes, the transcripts were then read twice more, this time with seemingly relevant passages of text colour highlighted and notes made describing their noteworthiness. Common patterns and important threads were then searched for in the highlighted interview data, with each passage coded, and then categorised with other similar passages into subthemes and added to the codebook. The list of

a priori and posteriori subthemes were then clustered into overarching themes. Themes and subthemes, and the strength and accuracy of the interpretations underpinning them, were then critically discussed and evaluated in a debrief session with the co-author (SN), who vetted all content. To enable summarising, reporting, and interpretation, the indexing and collation of illustrative quotations was subsequently carried out.

3. RESULTS

Twelve telephone interviews were conducted in February 2022. Study recruitment ended when the target of 12 interviews had been completed. Data saturation, defined as the point at which no new posteriori subthemes emerged from the data, was detected after nine analysed transcripts, with the final three transcripts substantiating findings [17, 21]. Interview durations ranged from 31 to 57 minutes (mean 48 (SD 7.5) minutes). Four participants were male and eight were female, with participants aged 56 to 86 years (mean 71 (SD 10.5) years) (Table 2). Ten participants reported currently participating in some form of regular PA, with activities including walking, croquet, swimming, aqua aerobics, sailing, yoga, tai chi, and pilates. The remaining two participants reported physical disabilities that limited their ability to perform regular PA.

Table 2. Participant demographics (all names are pseudonyms).

Participant	Sex	Age	Ethnicity	Employment Status
Mary	Female	75	White	Retired
Brian	Male	81	White	Retired
Diane	Female	71	Missing	Retired
Amanda	Female	79	White	Retired
Jean	Female	86	Missing	Retired
Simon	Male	64	White	Retired
Grace	Female	69	White	Working part time
Rosie	Female	57	White	Unable to work due to ill health/disability
Charlotte	Female	56	White	Working full time
Colin	Male	80	White	Retired
Elsie	Female	78	Missing	Retired
Poppy	Female	57	White	Unable to work due to ill health/disability

3.1. Qualitative Themes

Four themes encapsulated participants' views on the system-related factors influencing older adults' initial engagement with PA interventions, with the themes largely corresponding to the different stages of the engagement process: facilitating initial awareness; advertising content; facilitating initial contact; and facilitating initial attendance.

3.2. Facilitating Initial Awareness

Many participants stated that leaflets could be a very effective means of making older adults aware of PA interventions as the first step toward their engagement. Participants suggested it was important to strategically place them in locations where older adults regularly frequent, spend time and linger, such as libraries, surgeries, bus stops, garden

centres, churches, community centres, and coffee shops. Nearly all participants alluded to the frequency with which most older adults visit their general practitioner (GP), and suggested that GPs could play a key role in the process of providing leaflets and information to facilitate awareness of PA interventions:

The [GP] could be such a critically important instrument in all of this, you know, there's so much that could be done, because when you think about it, they are such a central part of our lives. When you get older, you are going to your GP regularly. I'm a pretty fit guy, touch wood. But I go to my GP surgery quite regularly. I go there for my medication. I go there for my annual check-ups. I go there for when anything goes wrong. And I think this aspect has been almost ignored in terms of [creating awareness of PA interventions]. So getting in touch with your GP, who should then [have leaflets] particularly for the older people like me, [saying], "this is where you can go and exercise" [Brian].

The potential effectiveness of GPs was felt to be due to the trust and respect that older adults tend to have for health professionals and the advice and information they offer:

I would sit up and take notice if it was a health professional giving me information [about a PA intervention]. I think it would have more clout if you like. Because I like to think that they know what they're talking about, and that if they do recommend anything, it's of value [Poppy].

Third sector societies and clubs, including the University of the Third Age (U3A), churches, arts groups, and carer support groups, were also cited by various participants as potentially effective sources of PA intervention awareness:

Now there are loads of associations [that cater to older adults] everywhere in the country. Now, if you could get to them, to [provide information on] your flyers, your services, whatever it is, to be able to impart that to the people of their community. You are going to have a far higher hit rate. If you can get through to those bodies to get through to people, they may be able to assist you in getting to the target that you want to get to. If this comes through an association that you are already involved with and trust, you're more likely to give it a look aren't you? [Grace].

Regarding social media, though nearly all participants felt it could be an effective medium through which to facilitate awareness of PA interventions, and reported that Facebook was the platform most used by older adults, they were also unanimous in their view that social media could not be relied upon to any great degree due to its varied use and acceptance among older adults:

I think for some people, [social media] is wonderful because they understand it. I mean, I know older people who are far better than I am. I know, equally, some people that they wouldn't dream of sitting in front of a computer. [Social media], I could certainly think... 60% of people would find it very useful, but then you're not going to conquer all of them, certainly not. But a percentage of people would really like it [Mary].

3.3. Advertising Content

When talking about the content that should be included in PA intervention advertising such as leaflets and social media advertisements, numerous participants felt it was important to first acknowledge their belief that the primary reason most older adults would consider engaging with a PA intervention is to gain access to social opportunities. Therefore, they felt that at the heart of advertising to make older adults aware of PA interventions should be an emphasis on the social benefits potentially offered:

That is the most important [motivation to engage with a PA intervention], that they meet people. There are an awful lot of older people who would love to have the opportunity to meet people, have a talk, and do some exercise afterwards. The social element I think for older people is absolutely imperative, that is your number one thing before any activity or anything. The most important criteria [to emphasise in advertising therefore] is you can go out and meet someone. I think if you say to somebody now, an elderly person, "right, we're going to do a bit of exercise and then we'll meet for coffee", whereas if you said, "we're going to have a coffee and socialise and we will do a little bit of exercise". I think that the second [message] will be more successful. I'm not sure if you said to an older person, "you need to exercise, you need to walk", I don't think they prioritise it like that. The exercise must be point number two or three, not number one [Mary].

A number of participants also stated that older adults would consider engaging in a PA intervention to gain physical health benefits. Therefore, they felt that PA intervention advertising should also make explicit the specific health benefits on offer that are most important to older adults, such as improved balance, lowered blood pressure and cholesterol, weight loss, and medication reduction. Numerous participants also noted that older adults are often concerned about the safety and potential risks posed by exercise due to their physical limitations or health issues. Thus, they felt that advertising should contain further information explaining who activities are suitable for and reassuring them that activities will be safe and practical, appropriate in intensity, and with the flexibility to be tailored to any special needs, preferences, or restrictions:

I love ballet. So I got their leaflet and it says they've got a ballet bar for over 50s or something and it says very, very gentle exercise, and I wanted to go there. I haven't been, but I love the way they advertised it. Gentle exercise. I think that's very important. I think I felt that I wouldn't be pushed too hard, and that they would understand if I had limitations. I suppose [advertising] could say something like at your own pace or, if it's a class, then it's kind of, everybody does what they can. I think maybe just language, like at your own pace, or support if needed, is available [Poppy].

3.4. Facilitating Initial Contact

Nearly all participants commented that a straightforward process should be provided to encourage and make it easy for older adults to make their first contact with PA interventions:

It's got to be easy. If there's a link, it has to work. If there's a phone number, somebody needs to respond. People don't

want to put a lot of effort in. So, if you're going to offer things to people, it's got to be fairly easy to pick it up. And the GPs or whoever, they can say, look, this is a number, here's a piece of paper, give this person a ring. Make it easy [Grace].

Telephone was cited by the majority of participants as the most preferred and acceptable method due to its usability. Furthermore, it was frequently noted that older adults would highly value an invitation to call and speak on the telephone because it would provide them with the chance to find out more information about the PA intervention, ascertain their suitability, ask questions and gain reassurance about any physical limitations or health issues they may have, and make a personal connection, all of which would potentially provide them with the confidence to move forward further:

I think [the value of a telephone call would be] just to explain my situation and to say something like, well, this looks good. I think it might be possible. What do you think, do you think that given my situation, do you think it is something I would be able to do? I think if there's been that human interaction, then you feel like you've communicated with a proper human being and you've kind of made some sort of connection before you've turned up at the activity. I think my generation, we're just so used to meeting people, talking to people, seeing people [Poppy].

3.5. Facilitating Initial Attendance

It was suggested by a number of participants that an invitation to attend a taster session following the phone call could be welcomed by older adults, by providing a non-threatening and low-commitment way of experiencing the activity and ascertaining its suitability and potential benefits. However, participants frequently pointed out that mobility restrictions, social anxiety, and fear of uncertainty could all serve as a barrier to attendance for many older adults:

I can understand that people who think, oh, that would be nice, [but] no, I can't do that. I wouldn't know anybody. I'm going to feel stupid. What if there's nobody there? You know what it's like, all the negative thoughts. Well, if you've never done [the activity], that would be quite scary and you'd think, oh, I can't do that. I can barely walk to the shops and back. Well actually, you're absolutely right for that [activity], but you might not think it. I think sometimes people need their hand held to get started [Grace].

The ability for an individual to attend their first session with a friend, and the offer of a 'buddy', someone already attending the PA intervention, to accompany them, were both suggested as potential social support-based solutions that could overcome these barriers and facilitate attendance:

[Some people] very often have to take somebody along to that first session. That is such a huge step and they will very often carry on without you after that. I took my friend [to aqua aerobics] the other day and she said, oh God, just the thought of having a communal shower sends horrors down my spine. And when I said to her, you do not have to do that, not everybody has a shower, they go home, you don't have to do it - people don't believe you. So, that myth was dispersed [Charlotte].

All participants stated that cost was a very important consideration that could influence the attendance of older adults and stressed that PA interventions had to be affordable for those on a tight monthly budget, and also provide value for money:

If it's [going to cost] too much money, they're not going to do it are they. I've said that the most important thing is to meet people, fine, that's good, but then, money. You often hear about the grey pound, for instance, the fact that people are now on retirement incomes and those that have been fortunate to be in final salary schemes are on an income with less outgoings, so they're far better off than they ever were. But having said that, most elderly people have come from the post-war years. So they're used to things like rationing. So although they may have more money in their pockets, they're less inclined to want to spend it and are looking for bargains and watching the pennies [Brian].

In addition to making PA interventions low cost, also suggested ways to help overcome any potential financial concerns were offering the first session free and providing low-commitment payment options such as 'pay-on-the-day'. Numerous participants also stated that certain venue characteristics could influence older adults' initial decision to attend a PA intervention. Being local, convenient and easy to access; being on a bus route and having car parking available; offering disability access; and providing facilities such as toilets and a coffee shop were all mentioned. Finally, nearly all participants stressed that the time of day that sessions took place could influence attendance. It was frequently mentioned that early mornings could be off-putting for older adults due to the time needed to wake up, as well as evenings due to tiredness and safety concerns about being out after dark. Mid-morning and early afternoon appeared to be the preferable session times to facilitate attendance.

4. DISCUSSION

Through conducting telephone interviews with 12 individuals aged 55 and over, the potential influence of a range of system-related factors on older adults' initial engagement with PA interventions has been highlighted. With a need for evidence on the most important factors to consider when designing PA interventions that aim to change older adults' PA behaviour and sustain this change [8], this information is of high relevance.

4.1. Principal Findings

Participants alluded to a wide array of system-related factors that they felt could influence older adults' engagement with PA interventions. These included the modes, methods, and routes used to create awareness of interventions; the messages and content of marketing materials such as leaflets; environmental and logistic elements of interventions such as costs, timings, and venue characteristics; and availability of social support. Zubala *et al.* [9] previously asserted that researchers should look beyond the cognitive, motivational, and behavioural-focused components of PA promotion to also investigate the extrapersonal, system-related elements that might influence older adults' initial engagement with PA

interventions. Previous qualitative reviews and research indirectly supported this notion, suggesting that system-related elements largely mirroring those mentioned by participants in the present study could all act as barriers and facilitators of older adults' PA behaviour [13 - 15]. The present study now provides primary research evidence directly supporting the novel idea that system factors are a potentially important influence on older adults' initial engagement with PA interventions, and the findings lend credence to the basic concept underlying this idea; that the person most directly connected to a health-related behaviour such as PA intervention engagement should not be assumed to be the sole root of its enactment, and that latent systemic conditions may also contribute [11].

Many of the system factors mentioned by participants related to tailoring certain elements of PA interventions around older adults' existing social and domestic environments. For instance, participants stated that strategies such as advertising in locations regularly visited by older adults, and *via* health professionals and societies that they are already members of; offering an easy and acceptable mode of making initial contact such as the telephone; and being located at local venues conveniently reachable by bus or car, could all positively influence older adults' initial engagement with PA interventions. These system factors relate to the approach of choice architecture theory, or 'nudge', for behaviour change [22]; adaptions to the physical, social, and/or information environment can prompt individuals to adopt health-promoting behaviours. Underpinning this theory is the principle that people often make health-related decisions based on context-dependent automatic thought processes rather than deliberate cognitive processes, and thus tailoring interventions to suit the micro-environments in which individuals make these decisions can trigger desirable behavioural responses [23, 24]. A recent systematic review of 88 studies that examined the effectiveness of choice architecture-centered techniques for encouraging PA in adults [24], and an earlier scoping review that sought to provide an overview of interventions using choice architecture techniques to promote PA in the general population [23], both inferred that a lack of studies exist to draw firm conclusions from and that research in the area is still in its infancy. However, the findings of the present study provide support for this idea that system-related elements pertaining to the physical, social, and information environments could influence older adults' PA behaviours, namely those relating to initial intervention engagement.

Participants also talked about the importance of several system factors related to social support and social relationships. These included the potential social benefits of interventions being conveyed through advertising messages; individuals having the opportunity to speak on the phone with a professional involved in the intervention prior to attending to create a social connection; and being able to bring a friend, or be accompanied by a 'buddy', to the first session to ease uncertainty and anxiety. The importance participants attached to these system factors again supports existing theory and evidence in the area of PA promotion. According to the socioemotional selectivity theory [25], social support and social relationships are significant behavioural motivators for

older adults, because they play a vital role in two of their key priorities in life: the regulating of emotions and the optimising of emotional experiences. Thus, it is thought social elements have the potential to influence older adults' initiation and maintenance of PA and should be at the forefront of thinking when designing PA interventions [26, 27]. A previous review by Lindsay Smith *et al.* [28] supports this assertion. Through synthesising 27 quantitative studies that had examined the association between social support and PA in older adults, it was found that emotional support from other people links to intrinsic motivation to engage in PA, and subsequent PA participation. The present study further supports these findings, suggesting that socially themed system factors could be an important influencer of older adults' initial engagement with PA interventions.

4.2. Applications

Increasing the PA levels of older adults is a long-standing UK public health priority [7], with a need existing for evidence on the most important elements to consider when designing PA interventions [8]. The findings of the present study highlight that system-related factors, particularly those relating to social support and social relationships, and the physical, social, and information environments, could play an important role in influencing older adults' initial engagement with PA interventions. The present study is the first known to directly examine the influence of system-related factors on PA behaviour in older adults. In doing so, it highlights them as a potentially important, yet largely unexplored concept in the field of PA promotion. Furthermore, through critically looking beyond the traditionally behavioural, cognitive, and motivational-focused components of PA interventions for older adults, and bringing together various disparate pieces of existing knowledge, the present study lends evidence to a novel system-based perspective that can potentially aid their future conceptualisation, design and development. A person-focused philosophy arguably predominates the PA intervention field at present. This views people as agents free to choose between desirable and undesirable behaviours, and that undesirable behaviours relating to things such as initial intervention engagement are largely isolated from context and result from aberrant mental processes such as inattention, lack of knowledge, forgetfulness, lack of motivation, and negligence [29]. Conversely, a system-focused perspective puts forward the idea that behaviours such as intervention engagement are influenced by the latent systemic conditions in which they occur, and don't just solely arise out of people's personal psychological, emotional, and behavioural characteristics. Behaviours are thus seen as consequential and non-random, highlighted by the fact that they tend to fall into patterns, rather than being mere reflections of defects in the human condition [11, 29].

The information provided by the present study can now be incorporated into the thinking of 'real-world' public health practitioners when attempting to develop PA interventions that older adults will willingly engage with. Fig. (1) depicts the different system factors alluded to by participants in the present study that can be readily applied by practitioners to the design of PA interventions. In addition, the present study   also

1 People could be made aware via...

Leaflets, left in places where people linger (e.g. bus stops, libraries, surgeries, cafes)

Clinicians and health care professionals (e.g. general practitioners, district nurses, pharmacists)

Clubs and societies that people are already members of (e.g. churches, arts groups)

Word-of-mouth, through other people who have already participated in the intervention)

'In home' advertising methods (e.g. adverts in local magazines, Facebook adverts)

2 Advertising could...

Primarily emphasise the potential social benefits of the intervention

Secondarily emphasise the potential health benefits of the intervention

Provide clear and concise information about the intervention (e.g. cost, address, timing)

Describe the activity, and provide information about safety and potential risks, and who is suitable for it

Take a gentle, non-shaming, empathetic tone

Be visually striking and attention-grabbing

3 To make people more likely to make contact...

Provide an easy, straightforward, telephone-based contact process

Invite people to call if they have any questions or want to discuss the intervention

Provide the name of the person who people can call and speak to on the telephone

4 To make people more likely to attend...

Ensure staff who speak on the telephone are friendly, knowledgeable, enthusiastic and kind

Allow people to attend the first session with a friend, or accompanied by a 'buddy'

Make the first session free, and then offer cheap, low-commitment payment options (e.g. pay-on-the-day)

Ensure the venue is on a bus route, and has car parking available

Ensure the venue provides disability access, and offers toilets and refreshments

Run sessions either mid-morning or mid-afternoon, not early morning or after dark

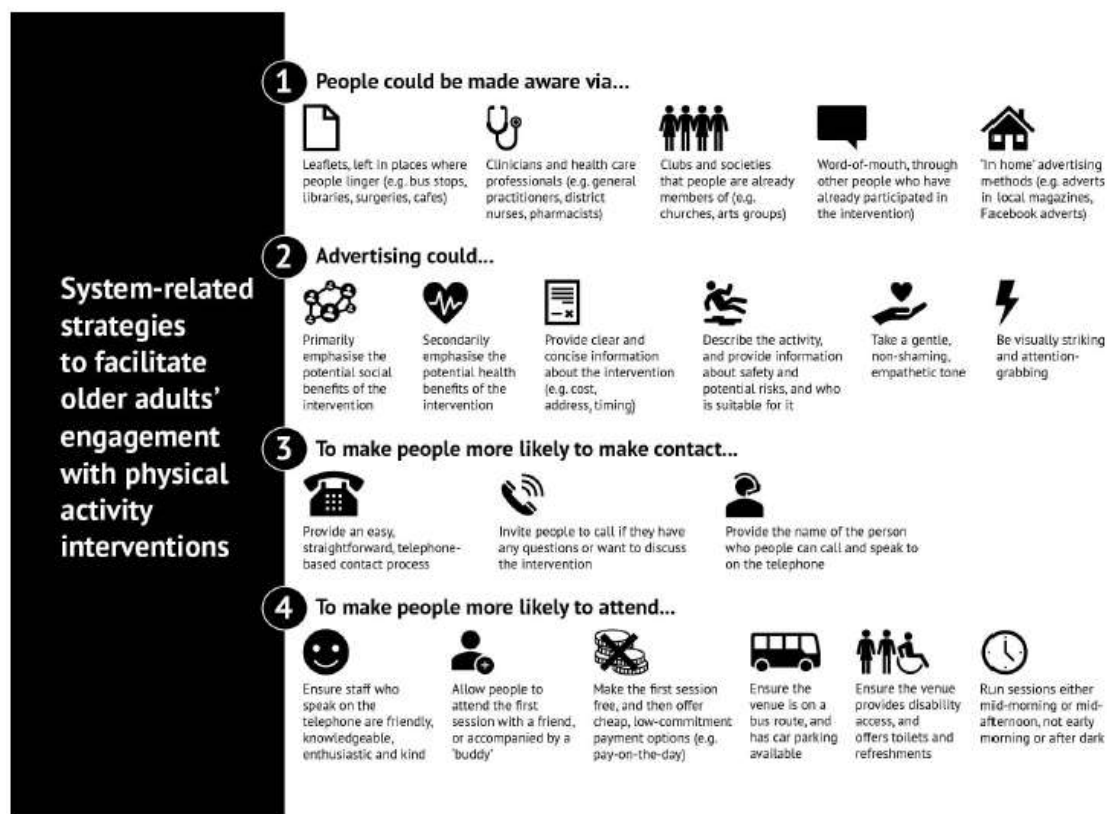System-related strategies to facilitate older adults' engagement with physical activity interventions

Fig. (1). System-related strategies to facilitate older adults' initial engagement with physical activity interventions.

provides a rationale for future, more systematic, research to further elucidate the role of system factors in influencing older adults' PA behaviour. In another health-related field, Duah-Owusu White et al. [10] recently proposed that a system-based model could be applied to the design of acute hospital settings to reduce adverse outcomes in dementia patients, incorporating the following elements: environment (e.g. the functionality of the physical and operational environment), equipment (e.g. the use of equipment and technology, and the functions served), organisational policies (e.g. the impact of organisational processes and protocols that arise from established policies), and human aspects (e.g. the communications and relationships between people). This model could readily be applied to future qualitative PA intervention research, perhaps being used as a coding framework, to help further identify the system-factors most important in facilitating older adults' initial engagement, as well as their subsequent behaviours beyond this.

4.3. Limitations

Participants all reported engaging in regular PA, perhaps suggesting that their choice to participate in the study, and their resultant views and reflections on the factors influencing initial engagement with PA interventions, reflected their pre-existing positivity, and predisposition, towards PA. In addition, the sample consisted predominantly of retired individuals of White British ethnicity, hailing from a rural geographic region, with eight of the 12 participants aged 69 or above. Furthermore, only information pertaining to participants' age, sex, ethnicity, and employment status was formally recorded. These points arguably limit the generalisability of the findings to other older adults. Therefore, future research on the potential influence of system factors on initial PA intervention engagement could seek to gain insights into equally represented sub-groups of older adults (e.g. 55-64 years, 65+ years) with different characteristics and backgrounds and formally record information such as specific health conditions, and current PA levels and socioeconomic status using validated measurement tools, to characterize the sample.

CONCLUSION

This qualitative study has highlighted that a range of system-related factors could potentially influence older adults' initial engagement with PA interventions. The factors identified particularly relate to focusing on aspects of social support and social relationships, and adapting the physical, social, and information environments, to influence behaviour. This study lends evidence to a novel system-based perspective of PA promotion. The findings provide practical information

for public health practitioners on the system factors they may need to consider when attempting to design and develop PA interventions that older adults will willingly engage with and provide the rationale for future research that seeks to expand our understanding of the role of system factors in influencing the initial engagement of older adults with PA interventions.

LIST OF ABBREVIATIONS

PA   =   Physical Activity

ETHICS APPROVAL AND CONSENT TO PARTI-CIPATE

HUMAN AND ANIMAL RIGHTS

No animals were used for studies that are the basis of this research. All the humans were used in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

CONSENT FOR PUBLICATION

Verbal consent was recorded prior to the interview commencing.

STANDARDS OF REPORTING

COREQ guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The datasets generated and analysed during the study are not publicly available on the grounds of the potential commercial sensibility to the data due to the naming of organisations and services.

FUNDING

CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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Chapter 8. Discussion

Thesis recapitulation

Precipitated by a combination of a general inability or failure of public health practitioners to translate scientific knowledge to practice, and uncertainty in the evidence base on what constitutes their key characteristics and components, real-world public health practice often sees the implementation of common-sense PA interventions for older adults (Glasgow & Emmons, 2007; Hansen et al., 2017). Common-sense PA interventions are problematic as they have under-developed rationales for achieving effectiveness, due to not drawing upon theory or evidence to underpin the behaviour change strategies they adopt. Furthermore, they can be difficult to define, and their mechanisms of action hard to explain and measure, making their evaluation and potential larger scale implementation in novel settings challenging (Hansen et al., 2017; Michie et al., 2009; Watkins et al., 2016). As schematically summarised in Figure 3, this thesis has so far detailed five pieces of research, each asking questions seeking new knowledge to address the problems of common-sense interventions and their precipitating factors. Each piece of research has been presented and summarised in its preceding chapter. What now follows is the discussion and integration of the key findings across the five pieces of research, and consideration of the new knowledge offered to aid the evidence-based conceptualisation, design, and development of novel PA interventions for older adults, and optimisation of those already in existence. The key findings can be categorised under two main themes: (a) important elements of PA interventions, and (b) strategies to close the evidence-practice gap in the PA intervention field.

Important elements of physical activity interventions

Despite research on the effectiveness of PA interventions for older adults generally displaying positive outcomes, there appears to be no firm consensus or recommendations on what constitutes their most important elements, as rarely have any been consistently associated with positive or negative research outcomes (Zubala et al., 2017). In the absence of such concrete recommendations, public health practitioners are arguably more likely to draw upon intuitive, 'off-the-shelf' strategies and implement common-sense PA interventions (Hansen at al., 2017; Michie at al., 2009). Adding to the evidence base on the key components and characteristics of PA interventions for older adults, the findings of studies 2, 3, and 4 together highlighted several elements of PA interventions that may exert an important influence on older adults' PA behaviour. Namely, studies 2 and 4 identified social support as being influential to older adults' willingness and likelihood to initially engage with, and adhere to, PA interventions. Numerous factors relating to the physical, environmental, and operational contexts, or

systems, that PA interventions operate in were also underlined. Furthermore, studies 2 and 3 highlighted the potential importance of therapeutic alliance in supporting older adults to change their PA behaviour as they participate in PA interventions. Findings pertaining to these different intervention elements will now be discussed separately, in-depth.
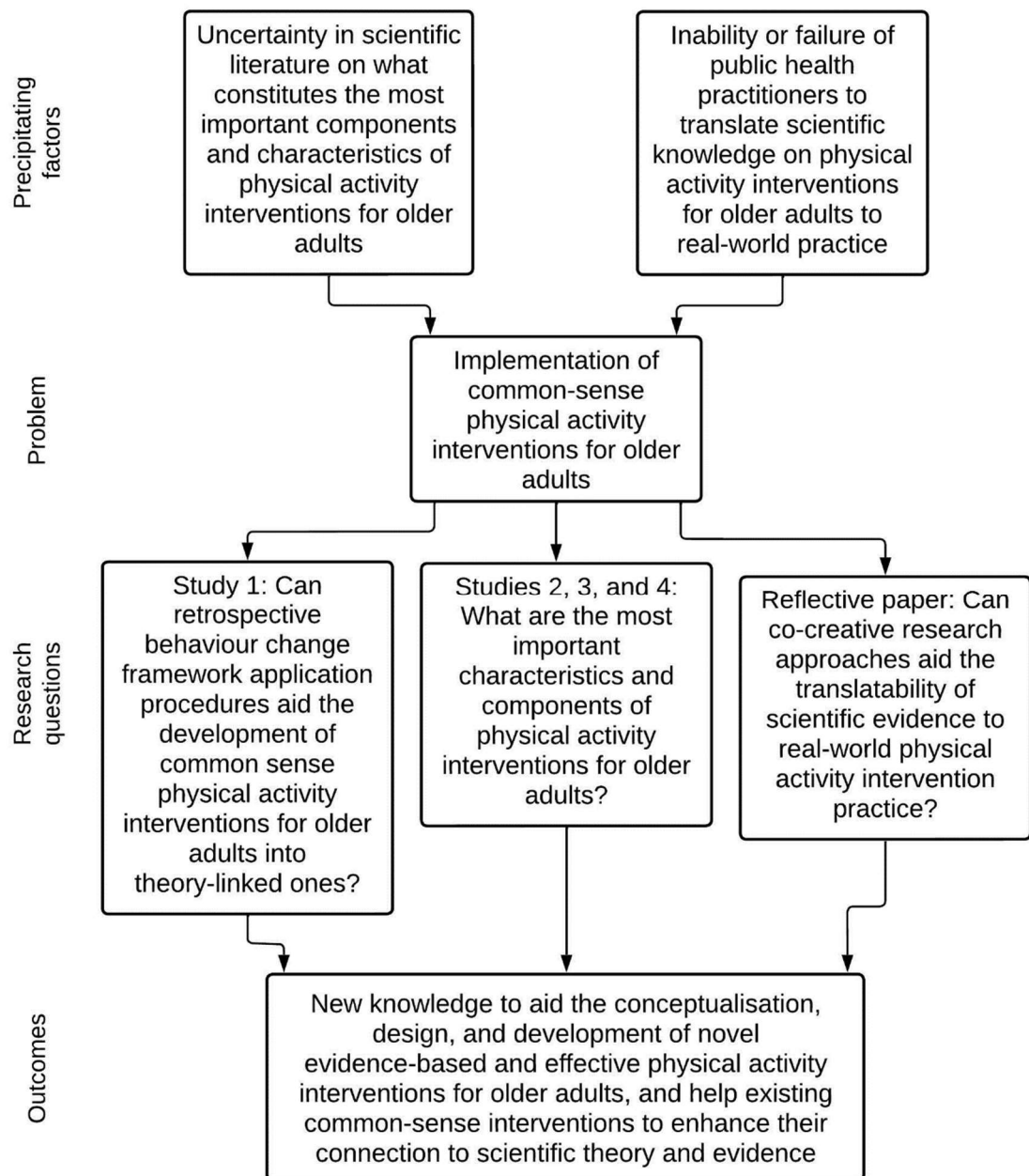

Figure 3. Schematic summary of thesis.

System factors. According to Meadows (2008, p.11), a system is, "an interconnected set of [factors] that is coherently organised in a way that achieves something". Upon this definition, a PA intervention is a system that functions to influence participants' PA behaviour in a positive way. Its constituent parts include the physical

and notional environments in which it operates, the organisations and professionals involved in its operation, and its operating procedures. These factors interrelate and orient synergistically to deliver the function of the system (Arnold & Wade, 2015; Meadows, 2008). In study 2, participants reported that the LWD service's approach of promoting initial awareness of their existence through various marketing channels, and offering a straightforward and flexible registration process, helped to facilitate older adults' initial engagement with the intervention. These findings illuminate the importance, previously underlined by Zubala et al. (2017), of looking beyond just the behavioural, motivational, and cognitive components of PA interventions to consider the system-related factors and processes that might influence older adults' PA behaviour, in particular their initial participation in interventions. Initial participation is a notable consideration for PA interventions, because without it, their motivational, cognitive, and behavioural components will logically never be able to exert their intended effects further downstream (Pavey et al., 2012). Building on this point, participants in study 4 alluded to a wide array of system-related factors that they felt could influence older adults' initial engagement with PA interventions. These included the modes, methods, and routes used to create awareness of interventions; the messages and content of marketing materials such as leaflets; and environmental and logistic elements of interventions such as costs, timings, and venue characteristics. Study 4, through directly examining the influence of system factors on PA behaviour in older adults, built on the findings of study 2 and previous qualitative reviews conducted by Olanrewaju et al. (2016) and Spiteri et al. (2019), which had indirectly supported the notion of a potential link.

The PA intervention field appears to predominantly adopt a person-focused philosophy. This views people as agents free to choose between desirable and undesirable behaviours, and that undesirable behaviours are largely isolated from context and result from aberrant mental processes such as inattention, lack of knowledge, forgetfulness, lack of motivation, and negligence (Reason, 2000; Reason 2004). Thus, conventional PA interventions essentially seek to reduce unwanted variability in people's behaviour, and are concerned primarily with 'correcting' people's psychological, emotional, and behavioural flaws. It could be argued therefore that undercurrents of fear, shaming, blaming, and restraining are inherent (Reason, 2000; Zecevic et al., 2007). Conversely, a system-focused philosophy applied to PA interventions is predicated on the idea that the person most directly connected to a behaviour or outcome such as intervention participation is not necessarily at the root of its cause. Instead, the latent systemic conditions that it occurred in may have caused or contributed to it (Zecevic et al., 2007). Undesirable behaviours are thus viewed as consequential and non-random, evidenced by the fact that they tend to fall into patterns, rather than being reflections of defects in the human condition (Reason, 2000). As

asserted by Reason (2004, p.29), "When a similar set of conditions repeatedly provokes the same kind of error in different people, it is clear that we are dealing with an error prone situation rather than with error prone, careless, or incompetent individuals". Upon this logic, an older adult's decision to engage with, and participate in, a PA intervention would therefore be assumed to be heavily influenced by the context in which they are provided with the opportunity to do so. The system-focused philosophy originally derives from the field of transportation safety, where there was previously a need to analyse and learn from adverse transport incidents and accidents to advance safety and prevent reoccurrences. Starting in the 1970s, models were developed that aimed to aid in the establishing of causal links between an unsafe behaviour or decision and the underlying conditions it occurred in, and the understanding of how those conditions influenced the flow of action that resulted in the unsafe behaviour or decision. In these models, the role of human behaviour was acknowledged, but with equal consideration given to the systemic contexts in which humans operate (Zecevic et al., 2007).

Macro level system-based approaches to PA promotion exist. These reject person-focused, linear cause and effect-based explanations of PA behaviour, and seek to identify the interdependent factors across the wider political, social, cultural, economic, and scientific domains that can be leveraged to increase population-wide PA levels (Baugh Littlejohns et al., 2023; Li, 2012; Nau et al., 2022; Rutter et al., 2019). Macro level approaches are highly useful for government and local authority bodies and commissioners to build an understanding of, "chaotic relations between large numbers of factors and their physical, commercial, sociocultural, and political contexts" (Rutter, 2019, p.162), and bring together stakeholders. This in turn can inform and drive PA behaviour-related policy, planning, and action at local, regional, national, and international levels (Baugh Littlejohns et al., 2023; Nau et al., 2022; Rutter et al., 2019). However, due to their broad scope of focus, macro level approaches arguably zoom their lens out so far that they do not provide clear, granular, practice-oriented information or guidance for real-world public health practitioners on the important system-related factors that relate to the PA interventions they directly operate (Nau et al., 2022). Therefore, micro level system-based approaches, which focus on the immediately surrounding, day-to-day contexts of PA interventions and how to favourably adapt or manipulate them, are also required (Li, 2012). Studies 2 and 4 highlighted factors pertaining to this micro level perspective.

Micro level system-focused logic is perhaps most closely represented in the PA intervention field through social-ecological approaches, such as the social ecological model proposed by Boulton et al. (2018) for promoting PA among older adults. While this model is fundamentally person-focused and places the individual at its centre, it nonetheless acknowledges the dynamic synergy between people and context, and the

complex nature of human situations. It thus recognises and considers the potential impact of a broad range of social, environmental, and organisational factors, as well as psychological factors, on PA behaviour that can be targeted by intervention operators (Boulton et al., 2018). The main principle of choice architecture theory (Thaler & Sunstein, 2008) also aligns with micro level system-focused philosophy. Choice architecture theory asserts that people tend to make behavioural decisions that aren't in their best interests based on context-dependent automatic thought processes rather than deliberate cognitive processes (Beshears & Kosowsky, 2020; Thaler & Sunstein, 2008). Thus, it is believed that making targeted adaptations to the immediate decision-making environment can potentially act as a catalyst for an individual to adopt more desirable behaviours (Forberger et al., 2019). These adaptations are known in choice architecture theory as 'nudges'. Nudges are behaviour change strategies that seek to alter an individual's physical, social, and/or information environment, and which aim to steer them in predictable behavioural directions without forbidding any actions or taking away autonomy (Forberger et al., 2022; Landais et al., 2020). Sunstein (2014) outlines a number of nudge strategy categories that are applicable to PA interventions, and that mirror some of the system-related factors mentioned by participants in studies 2 and 4. These include default rules (e.g. automatic intervention enrolment as part of standard healthcare pathways), simplification (e.g. straightforward intervention enrolment procedures), increase in ease and convenience (e.g. conveniently accessible venues), and reminders (e.g. text message or email notification of opportunities or upcoming appointments/sessions).

Duah-Owusu White et al. (2020) recently proposed in the field of dementia care that a novel, multidimensional, system-focused conceptual model incorporating the influence of (a) human (e.g. the communications and relationships between people); (b) environmental (e.g. the functionality of the physical and operational environment); (c) technological (e.g. the use of equipment and technology, and the functions served); and (d) policy (e.g. the organisational processes and protocols that arise from established policies) aspects could be applied to the design of acute hospital settings to reduce adverse outcomes in dementia patients, without requiring significant increases in resources. Given the rationale and evidence presented in this thesis so far, a micro level model such as this could also be applied as a useful tool to conceptualise both new and existing common-sense PA interventions in a system-focused way, and guide their optimal design and development, while paying mind to elements that might otherwise be overlooked. For instance, considering the human aspect of the model of Duah-Owusu White et al. (2020) would result in questions for PA intervention operators or developers such as: What communication methods are employed by the intervention to make individuals aware of its existence and potential benefits? How do intervention staff build

rapport with individuals and make them feel comfortable? How do intervention staff communicate with healthcare professionals regarding the progress of individuals they signposted or referred, to ensure 'joined up' care? How are social relationships fostered between individuals? Deliberating the environmental aspects of the model would raise considerations such as: Is the intervention delivered to individuals in-person, online, via telephone, or a combination? If delivered in-person, is the intervention situated at an accessible and appealing location? If delivered in-person, does the intervention venue offer appropriate facilities? Pondering the technological aspects of the model would promote questions such as: Does the intervention have a website? Does the intervention have a social media presence? Does the intervention deploy tools or apps to assist the progress of individuals? Does the intervention provide equipment for individuals, or do they have to bring their own? Finally, thinking about the policy aspect of the model would raise questions such as: Does the intervention have strict eligibility criteria? Does the intervention have a defined procedure for healthcare professionals to signpost or refer individuals? Is the intervention incorporated into local healthcare treatment pathways? What does the intervention cost to access, or is it subsidised? What training do intervention staff receive to ensure they are adequately skilled to work with individuals? Attention to details of this nature could potentially result in PA interventions that facilitate participation, thus enhancing their ability to deliver downstream effectiveness. However, in addition to guiding intervention conceptualisation and design, the application of this type of micro level system-focused model could also promote greater self-accountability in PA interventions; awareness and acknowledgement could be facilitated in operators that the systemic conditions and environments that they have control and jurisdiction over are important influences on older adults' PA behaviour along with the more traditional person-focused factors. Furthermore, application of such a system-focused model could support the discovery and granular itemisation of a wide, multidimensional array of previously unrecognised, yet important, intervention components.

Therapeutic alliance. In the field of psychotherapy, the concept of therapeutic alliance is viewed as a key contributor to treatment effectiveness (Flückiger et al., 2012; Horvath et al., 2011). Although no singular definition exists, the term therapeutic alliance essentially refers to the quality, strength, and nature of the collaborative relationship between therapist and client. A considerable amount of research evidence has established a robust positive correlation between alliance and outcomes across different psychotherapy modalities and psychological disorders (Flückiger et al., 2018). It has also recently been suggested that therapeutic alliance may be an independent mediator of psychotherapy response (Baier et al., 2020). In study 2, participants reported that they valued various aspects of the relationship with their LWD coach. These included the

kindness, empathy, understanding, encouragement, and non-judgemental attitude displayed by their coach; the open line of communication via email or telephone they offered; and the assistance they provided with setting and managing goals. Participants reported that these things all helped them to feel secure, supported, and empowered as they attempted to change their PA behaviour. It is notable that these things all correspond to the three processes that are thought to characterise therapeutic alliance: (a) mutual agreement on target outcomes, (b) consensus on tasks to achieve them, and (c) the formation of a positive emotional bond (Baier et al., 2020; Flückiger et al., 2012; Horvath et al., 2011). Study 3 subsequently presented the rationale, drawing upon the findings of study 2 and other previous qualitative studies and reviews, to suggest that therapeutic alliance may be a vital and foundational element of effective PA interventions for older adults. The argument was predicated on the idea that like psychotherapeutic treatments, PA interventions aim to enact some form of healthy, adaptive behaviour, centred on collaborative interactions between professional and client, or 'change agent' and 'change seeker' (Guthrie et al., 2018; Sturgiss et al., 2016). The findings of studies 2 and 3 together highlighted therapeutic alliance as a potentially important, yet largely unexplored concept in the field of PA interventions for older adults, which merits further investigation.

The roots of the therapeutic alliance concept are believed to lie in the early 20th century and the work of Sigmund Freud. As a psychoanalyst, Freud observed that personifying 'serious interest' in, and 'sympathetic understanding' of, clients made it possible for them to undertake the process of healing and change (Freud, 1912; Horvath & Luborsky, 1993). The importance of therapeutic alliance is based on the notion that a strong and positive relationship between professional and client provides a safe and enriched interpersonal 'container' for change to take place (Allison & Rossouw, 2013). Precursing the idea of its potential importance to PA interventions, Edward Bordin argued therapeutic alliance to be a universal concept, applicable to all interpersonal 'change situations', not just psychotherapy (Bordin, 1979). As originally stated by Bordin (1979, p.252), who preferred to use the term 'working' alliance over therapeutic alliance to reflect his belief in the generalisability of the concept, "a working alliance between a person seeking change and a change agent can occur in many places besides the locale of psychotherapy. The concept of the working alliance would seem to be applicable in the relation between student and teacher, between community action group and leader, and, with only slight extension, between child and parent". Bordin further argued the concept of therapeutic alliance to be pantheoretical and generic, and not curative in and of itself, but rather the key element that, "makes it possible for the [client] to accept and follow treatment faithfully" (Bordin, 1980, p.2, as cited in DeSorcy et al., 2020).

There are numerous skills and characteristics that are thought to enhance the likelihood of a professional developing a strong therapeutic alliance with a client. These include interpersonal characteristics (e.g. professional demeanour, interest, alertness, warmth, friendliness, empathy); responsiveness (e.g. flexibility, sensitivity to client's changing needs, adjustment of activities to suit situation and context); and observation skills (e.g. ability to observe client, ability to self-regulate own emotions) (Constantino et al., 2017; Sharpless et al., 2010). Consequently, therapeutic alliance would appear to share commonalities with other relational techniques and approaches that have been evidenced to contribute to the effectiveness of PA interventions for older adults, such as person centredness, tailoring, motivational interviewing, and shared decision making (Olanrewaju et al., 2016; Zubala et al., 2017). It has also been suggested that the therapeutic alliance concept links with the underpinning ideas of self-determination theory (SDT), which itself has demonstrated utility for promoting the adoption and maintenance of PA when applied to interventions (Manninen et al., 2022; Rhodes et al., 2019; Teixeira et al., 2012). SDT (Deci & Ryan, 2000) proposes that when environments are supportive and facilitative of people's needs for competence, relatedness, and autonomy, their motivation will flourish, and optimal growth, function, and the adoption of desirable behaviours such as PA will occur (Morgan & Tan, 2018; Ryan & Deci, 2008; Ryan et al., 2009; Zuroff et al., 2007). In the context of SDT-based PA interventions, the actions of professionals, such as adopting a need-supportive communication style, are said to play a key part in this process (Cross et al., 2023; Manninen et al., 2022; Rhodes et al., 2019). However, attempting to draw such parallels overlooks the fundamental characteristic of therapeutic alliance; rather than a single tool or approach, it is a higher level, foundational, pantheoretical concept that overarches and spans the biological, psychological, and social dimensions in which any cognitive, emotional, and behavioural intervention is delivered (Allison & Rossouw, 2013; Rose, 2007). Modern advances in neuroscience allow this notion to be explained in more empirically rooted terms. Neurobiologically, it is posited that a strong and positive client-professional relationship is comprised of, and depends upon, mainly right-brain to right-brain interactions (Allison & Rossouw, 2013). When brains communicate intersubjectively in this way, neural activity aligns, resulting in the downregulation of stress-related limbic responses, and enhanced mirror neuron activity. It is this interpersonal synchrony that acts as a bonding mechanism (Allison & Rossouw, 2013; Schore, 2022). This all occurs "hidden in plain sight" (Schore, 2022, p.8), via shared auditory, visual, and nonverbal emotional transmissions (Schore, 2022). Attempting to reduce the therapeutic alliance concept into lower-level constructs and techniques, or subsume it into theories of behaviour change, therefore loses sight of its deep, intersubjective nature and functionality (Verschuren, 2001). Ogden (2016) cautions against the trend in behavioural science towards

shrinking, streamlining, and integrating existing perspectives to eliminate gaps in theory, reduce redundancy, and increase parsimony, suggesting that this constitutes 'puzzle solving' not 'problem solving'. Though one of the intended benefits of doing so is to systematise the actions of the professionals that deliver interventions to enhance their effectiveness, Ogden argues that this will only serve to decrease the behavioural flexibility, variability, and responsiveness that the therapeutic alliance concept suggests is required from professionals to influence PA behaviour.

As previously stated, PA interventions appear to predominantly adopt a person-focused philosophy, centred on changing people's motivations, cognitions, and behaviours. Drawing upon neurobiological terms once again, this is synonymous with a 'top-down' approach to behaviour change, which seeks to initiate adaptation at the level of the cerebral cortex through conscious and intentional mental processing activities (Taylor et al., 2010). In contrast, acknowledgement of the potential importance of the therapeutic alliance concept to PA intervention outcomes introduces a 'bottom-up' perspective to the field. Bottom-up approaches target unconscious ascending neural pathways originating in the brainstem through a focus on safe 'being', which in turn enhance neural firing and cortical activity, and influence central processing and mental activities, via the downregulation of fear responses (Allison & Rossouw, 2013; Rossouw, 2012; Taylor et al., 2010). According to Rossouw (2012), combining both bottom-up and top-down mechanisms represents the optimal approach to facilitating behaviour change. This is because, for the brain to learn, adapt, and activate and develop the neural connections and pathways that constitute change, an individual must experience, consciously or unconsciously, a sense of safety to relinquish their existing unhelpful patterns of behaving, feeling, and thinking, and replace them with new ones (Allison & Rossouw, 2013). In the context of PA interventions, this equates to incorporating professional practices that aim to promote the formation of a positive therapeutic alliance alongside specific BCTs that directly aim to influence behaviour. These practices might include establishment and frequent review of goals; demonstration of an empathic stance (e.g. using the word *we*, making reflective clarifying statements, reviewing the symptoms and costs to the client of their current situation); encouragement of emotional expression (e.g. commenting and enquiring about detected changes in the client's affective state); displaying non-verbal warmth (e.g. smiling, forward leaning, displaying facial expressions that convey interest); and conveying verbal affirmation (e.g. commenting on positive changes and attributes in the client) (Crits-Christoph et al., 2006). As postulated in study 3, the resulting relationship between professional and client would effectively serve as the foundation upon which the BCTs could exert their intended action. According to Summers & Barber (2003), the ability of a professional to nurture and maintain a positive therapeutic alliance can be developed through training and the

acquisition of skills and attributes such as those listed above, with therapeutic alliance training in and of itself thought to foster a greater awareness and focus on the concept in psychotherapists. Several training manuals exist that are supported by empirical evidence for their effectiveness and utility, such as 'alliance-fostering therapy', which is taught via a one-day workshop and follow-up supervision (Constantino et al., 2017; Crits-Christoph et al., 2010). A training approach such as this could feasibly be applied in the PA intervention field, to enhance the alliance-building skills of professionals that work in this domain.

Social support. Social isolation and loneliness have both been associated with physical inactivity in older adults (de Koning et al., 2020), and previous evidence suggests that social support is a particularly important facilitator of PA participation in ageing populations, with the potential to influence both initiation and maintenance of PA (Whaley, 2018). In a systematic review of 27 quantitative studies that examined the relationship between mainly self-reported levels of social support and PA in healthy older adults, it was found that individuals that received greater levels of PA-specific social support from sources such as friends, family, and fellow group members were more physically active (Smith et al., 2017). The authors concluded that social support exerts an important influence on older adults' PA behaviour, and that it should therefore be a key consideration when designing PA interventions (Smith et al., 2017). This suggestion extends to PA interventions delivered digitally to older adults; a systematic review and meta-analysis of 25 randomised controlled trials found that social support is a key component of effective digital PA interventions, with the recommendation made that future interventions should include aspects of online social support to enhance their effectiveness (Kwan et al., 2020). In study 2, nearly all participants reported that certain components of the LWD service relating to social support were particularly valuable in helping them to increase their PA levels. These included the 'open line' of email or telephone communication provided by LWD coaches, and the LWD Facebook group that allowed interaction with other service users. Similarly, in study 4, most participants mentioned system factors relating to social support that they felt could influence older adults' engagement with PA interventions. Examples included individuals being able to speak on the phone with a professional involved in an intervention prior to attendance to create a social connection, and being able to bring a friend or be accompanied by a 'buddy' to the first session to ease uncertainty and anxiety. These findings all accord with the previous evidence suggesting the importance of social support to older adults' PA behaviour, and that they are a vital element of PA interventions.

Though it is not fully known *how* and *why* social support appears to exert such an important influence on older adults' PA behaviour, nor which types and sources can

be combined for maximal effect (Whaley, 2018), socioemotional selectivity theory (Carstensen et al., 1999) helps to shed some light on these matters. Socioemotional selectivity theory postulates that as individuals age, the primary goal of their social interactions shifts from gathering information from others to aid learning and growth, to seeing them as a source of emotional regulation and feeling better (Löckenhoff & Carstensen, 2004; Whaley, 2018). Thus, social support and social relationships are thought to become significant behavioural motivators for older adults, and a means for negotiating purposeful changes to optimise their emotional experience in life (Löckenhoff & Carstensen, 2004; Whaley, 2018). A recent qualitative study that explored the experiences of social support and friendship among older female softball players supports this idea directly in the context of PA. Sixty-four participants aged 55-79 years who played across six different softball teams frequently stated that forming and maintaining relationships with teammates was a primary motivator for wanting to play softball and for attending consistently, and that their social focus only emerged in later life as a means to help them adjust to age-related changes and cope with negative life events (Choi et al., 2022).

As the goal of social interaction changes with age towards emotional regulation, what is also said to be important is *who* one is interacting with, and *what* type of interaction they are providing (Thoits, 2011; Whaley et al., 2018). Thoits (2011) asserts that two broad categories of social support known as 'active coping assistance' and 'emotional sustenance' may particularly assist emotional regulation in older adults. Active coping assistance refers to when another person either advises or directly helps an individual with the implementation of problem-focused and emotion-focused coping strategies (Thoits, 2011; Thoits, 2021). This form of support is thought to lessen situational demands and/or the individual's emotional reactions to them, and is said to be most effective when delivered by significant others (e.g. family, spouse, close friends) due to being more normatively appropriate (Thoits, 2011; Thoits 2021). The second type of social support highlighted by Thoits (2011), emotional sustenance, involves another person demonstrating behaviours of a caring, understanding, encouraging, validating, and valuing nature towards an individual. These behaviours aren't instrumental or informational like those of active coping assistance, and don't directly alter the individual's situation or affective reactions. Rather, they likely exert an indirect influence on their emotional state through bolstering self-esteem and senses of belonging and mattering (Thoits, 2011; Thoits, 2021). Emotional sustenance is thought to be most effective when delivered by experientially similar others (e.g. similar age, shared health condition/physical restriction, fellow widow/widower, fellow group/club member). Their relevant experiential knowledge provides them with an appreciation and understanding of the nuances and dimensions of the individual's situation, which allows them to

empathise and validate their affect (Thoits, 2011; Thoits, 2021). The findings of a systematic review and thematic synthesis of 132 qualitative studies on older adults' perspectives of PA participation, which involved 5987 participants aged 60-89 years, lend evidence to the idea that these two types of social support can exert an important influence on older adults' PA behaviour (Franco et al. 2015). For instance, in 62% of the studies examined, participants reported that active coping assistance-related support from family and friends in the form of verbal encouragement, practical assistance, and financial assistance, was essential to their efforts to become more active. Furthermore, participants in 64% of studies reported that emotional sustenance-related support from peers through general interaction and friendly competition provided them with a sense of belonging and motivated them to participate in PA and continue attending sessions (Franco et al. 2015).

This knowledge of the putative mechanisms by which social support might exert a positive influence on older adults PA behaviour, the types of supportive acts that are most beneficial, and the people they are most effectively delivered by, can help to guide the design of PA interventions to ensure they most optimally utilise social support. For instance, active coping assistance could be incorporated into interventions through strategies such as encouraging prospective participants to bring a significant other to their first session who can offer problem-focused help with things such as transportation, offering participants refer-a-friend incentives to encourage co-participation with significant others, and encouraging participants to nominate a significant other to share their experiences and challenges with following each session. Similarly, emotional sustenance could be incorporated into interventions through strategies such as highlighting the social opportunities that the intervention will provide in advertising materials/communications, conducting group and partner-based activities in sessions to facilitate shared experiences, arranging coffee meetings before or after sessions to provide participants with opportunities to make social connections with each other, enlisting current or former intervention participants to act as 'buddies' with new participants to help them acclimatise and feel comfortable, and setting up social media groups to enable participants to communicate with one another between sessions. Many of these strategies were highlighted by participants in studies 2 and 4, and all could feasibly contribute to providing older adults with the sense of social support that appears to be vital in influencing positive changes in their PA behaviour when participating in PA interventions.

Strategies to close the physical activity intervention evidence-practice gap
Despite the existence of literature detailing evidence-backed PA interventions for older adults, and suggesting that behaviour change theory-based PA interventions are more

effective (Gourlan et al., 2016; Zubala et al., 2017), public health practitioners often lack the confidence and requisite skills in seeking, interpreting, and applying research evidence and theory to their PA intervention practice (Glasgow & Emmons, 2007; Hansen et al., 2017). Furthermore, due to much PA research arguably adopting researcher-centric designs and methodologies, and observing populations across various contexts and against a variety of outcome measures, practitioners may not see the relevance or usability of the information to their own specific objectives and concerns (Glasgow & Emmons, 2007; Mercer et al., 2007). These problems together contribute to the implementation of common-sense PA interventions, as opposed to interventions with components, methods, and objectives that are linked to scientific evidence and theory (Hansen at al., 2017; Michie at al., 2009). Contributing valuable evidence regarding how this evidence-practice gap in the PA intervention field can potentially be closed, study 1 and the reflective paper both highlighted different practical strategies that can be used to enhance the translatability of scientific knowledge to PA intervention practice. Study 1 detailed a systematic procedure used to retrospectively apply a theoretical behaviour change framework, the BCW, to reverse code an existing intervention and characterise its content along with the links to behaviour change theory. The reflective paper outlined the methodological process used to ensure a qualitative research study was conducted co-creatively in partnership with a real-world public health organisation, to optimise the relevance and translatability to them of the evidence it produced. Findings pertaining to these different strategies will now again be discussed separately.

Behaviour change framework application. Several previous studies have outlined procedures for retrospectively applying the BCW framework to reverse code different common-sense public health interventions, with the aim of enhancing their links to behaviour change theory. In fields including hospital implementation, asthma management, fibromyalgia self-management, falls prevention, and diabetes prevention, these procedures have all been demonstrated as being useful for identifying and characterising the content and putative theoretical rationales of existing interventions. This information is in turn said to provide a sound platform for future intervention development, optimisation, and evaluation (Bourne et al. 2020; McHugh et al., 2018; Pearson et al., 2020; Steinmo et al., 2015; Watkins et al., 2016). In study 1, a clear, systematic, and replicable procedure was demonstrated in the PA domain for the first time, with elements of the BCW framework retrospectively applied to reverse code the Dorset PA pathway. The procedure provided a detailed characterization of the Dorset PA pathway's content and the links to behaviour change theory, with 41 different components and 20 separate BCTs identified, which related to eight theoretical intervention functions. Furthermore, the procedure demonstrated practical applications

for identifying content gaps such as a lack of role modelling and behavioural examples for people to aspire to or imitate, and for guiding future evaluation in the form of study 2. In support of previous literature, study 1 concluded that the procedure offers a practical tool to retrospectively apply behaviour change theory to existing common-sense PA interventions, which can be used to aid their development in accordance with theory.

In a review conducted by Davis et al. (2015) that aimed to identify the full range of behaviour change theories in existence that have been applied to health-related behaviours, 82 separate theories were identified as being applied across 256 research articles, pertaining to 18 different health behaviours that included PA. However, three theories accounted for 49% of articles: the Transtheoretical Model of Change (TTM), Social Cognitive Theory (SCT), and SDT. These three theories are reported to be among the most frequently applied to successfully understand, explain, and predict PA behaviour in older adults over the past three decades since behaviour change theories have gained prominence in this field (Rhodes et al., 2019). TTM (Prochaska & DiClemente, 1984) posits that changing a behaviour such as PA participation is not an event but a process, and that individuals move through stages of change towards the point where a desirable behaviour is 'ingrained'. The main premise of TTM applied to PA is that an individual will be physically inactive when they lack attributes such as awareness, motivation, intention, and skill to engage in PA. Thus, any strategies to change PA behaviour should be 'stage-matched', meaning they target the appropriate processes and principles required to move an individual through the different stages of change (Janevic & Connell, 2018; Morgan & Tan, 2018). SCT (Bandura, 1995) on the other hand centres on the premise that people form expectancies of behavioural events based both on predicted outcomes and their importance, and their perceived capability to influence them, which link to determine actual behavioural action. SCT therefore assumes that if an individual believes the outcomes of a behaviour such as PA participation to be important and desirable, and that they can effectively perform PA, then they will subsequently be more likely and willing to initiate, undertake, and maintain it (Rhodes et al., 2019). Finally, SDT is predicated on the idea that human action is motivated by the innate desire to grow, develop, and achieve one's potential, or *self-actualise* (Rhodes et al., 2019). Therefore, as previously touched upon, SDT-based approaches to influencing PA behaviour seek to offer settings and interactions that meet people's needs for competence, connectedness, and choice, which in turn can support and enable them to develop the volitional motivation to perform PA (Morgan & Tan, 2018). Essentially, theories such as SDT, SCT, and TTM attempt to explain the causal and predictive mechanisms linked to PA behaviour (Hansen et al., 2017). Behaviour change frameworks such as the BCW are therefore broadly intended as devices for condensing and applying these ideas and ensuring that PA interventions understand and

pay heed to the theoretical determinants of the behaviour they are targeting, consider their logical relationship with the behaviour change strategies they deploy, and can thus answer the question of why the intervention should have a positive effect (Hansen et al., 2017; Watkins et al., 2016).

Through converging 19 other behaviour change frameworks into one unified model, the BCW framework was specifically developed to offer a compact and unifying tool to enable, "a range of users to design and select [interventions] according to an analysis of the nature of the behaviour, the mechanisms that need to be changed in order to bring about behaviour change, and the [interventions] required to change those mechanisms" (Michie et al., 2011, p.9). At its core is the Capability, Opportunity, Motivation, Behaviour (COM-B) model, itself a purportedly all-encompassing behaviour change theory formulated by the BCW's developers. COM-B recognizes that influencing behaviour results from changing one or more components of psychological and/or physical capability, social and/or physical opportunity, and automatic and reflective motivation (Michie et al., 2014; Smits et al., 2018). As demonstrated in study 1 and in previous research, a framework such as the BCW, when applied retrospectively, can act as a tool for delivering an in-depth characterisation and understanding of a common-sense PA intervention in terms of its practical components and their functional relationship with the intended outcomes (Bourne et al. 2020; McHugh et al., 2018; Pearson et al., 2020; Steinmo et al., 2015; Watkins et al., 2016). This characterisation can in turn help to determine any components that may be missing, or that need to be optimised, for the intervention to maximally adhere to its theoretical rationale. The characterisation can also help to identify any superfluous components that might add to the cost or complexity of the intervention, and thus reduce its efficiency and potential cost-effectiveness, without serving a theoretically linked purpose (Bourne et al. 2020; McHugh et al., 2018; Michie et al., 2009; Steinmo et al., 2015). The characterisation of the intervention can also aid its subsequent evaluation. This might include the examination of the relationship between clearly defined intervention content and measurable outcomes, or as demonstrated in study 2, the further investigation of aspects identified to be particularly important (McHugh et al., 2018; Steinmo et al., 2015). The rigorous empirical evidence that results from this evaluation work can then further illuminate the functional relationship between the intervention's components, behaviour change theory, and its intended outcomes, and therefore further inform the intervention's refinement and optimisation (Michie et al., 2009; Michie et al., 2011). In a wider sense, this empirical information can provide an 'audit trail' for the intervention that can add to the cumulative evidence base on the effectiveness of PA interventions, and their key components and characteristics (Michie et al., 2009). Enhancing this knowledge base is crucial to the future introduction, upscaling, and replication of PA interventions and

specific content that are linked to theory and effective outcomes, as well as the avoidance of those that are not (Michie et al., 2009; Watkins et al., 2016).

However, despite the apparent ability of the BCW to simplify and streamline the behaviour change framework application process, and the potential benefits of framework application previously alluded to and demonstrated in study 1, an argument nevertheless exists that theory-based approaches should not constitute the sole focus when conceptualising, designing, and developing PA interventions. Through seeking to define and label abstract psychological variables and processes, behaviour change theories by their very nature constitute reductions of reality. Thus, no theory will ever be able to explain or predict every aspect of a real-world behaviour such as PA (Peters & Kok, 2016). This arguably becomes even more so the case the greater a theory claims to encompass or transcend others, as it will presumably have had to move even further away from reality to do so (Ogden, 2016). Therefore, an overreliance on behaviour change theory risks overlooking or diminishing an array of complex elements, phenomena, and perspectives that can potentially influence PA behaviour (Peters & Crutzen, 2017). This thesis has highlighted two such examples: therapeutic alliance and system factors. In considering these limitations, Peters & Crutzen (2017) recommend an approach to incorporating behaviour change theory that warns against valuing theory too much, while also seeing it as crucial due to postulating variables that serve as useful metaphors to understand, predict, influence, and measure PA. Criticality and openness towards all individual theories, rather than a singular focus on one, are encouraged, and the flexible application of the most suitable theory for the specific behaviour change situation at hand, without losing sight of the bigger picture and the many potentially relevant determinants of a behaviour in a given context (Peters & Crutzen, 2017).

Co-creative research. Co-creative research is thought to deliver empirical evidence that reflects as closely as possible the actual context and circumstances of practice for the practitioners and organisations involved, and consequently, feedback and findings that are more relevant, understandable, and immediately actionable to them (Camden et al., 2015; Green, 2008). A recent umbrella review that examined the outcomes reported in 86 reviews of health-related research partnership literature (a categorisation that includes co-creative research) stated that partnership-based research can directly lead to systems change or action through influencing policymaking and improving community services and the health-related outcomes attached to them (Hoekstra et al., 2020). The same review also identified six categories of strategy that appear to characterise effective and productive partnership-based research, and that its activities should centre around: relationships; capacity, support, and resources; communication; planning of research; conducting of research; and dissemination and

application of research (Hoekstra et al., 2020). The reflective paper described the process and strategies used to informally underpin research co-creation during study 2, and the outcomes of the co-creative approach from the perspective of Active Dorset in terms of providing them with translatable research evidence. A range of strategies were reported to facilitate co-creation in study 2, such as engaging Active Dorset in the identification of the research question and development of the research protocol, and involving them in participant recruitment. The co-creative research approach resulted in timely, relevant, and understandable research evidence for Active Dorset, which provided them with clear actions and information to plan their future work and objectives pertaining to the LWD service. Supporting the above literature, the reflective paper highlighted how a co-creative research approach can produce evidence that is directly translatable to real-world PA intervention practice.

Health-related research is most readily delivered to real-world practitioners in the form of guidelines, systematic reviews, and textbooks. These are secondary forms of research which have synthesised the available primary evidence to provide best-practice recommendations in a supposedly palatable format (Green, 2008). However, even these concentrated forms of empirical knowledge can be difficult to apply for practitioners without training or skill in navigating and comprehending information of an academic nature (Glasgow & Emmons, 2007). Furthermore, it has been estimated that only 14 percent of the applicable primary research that has been conducted makes inclusion into secondary research and subsequently reaches the hands of practitioners. This means that before any best-practice recommendations are published, a large body of potentially relevant evidence has been lost (Green, 2008). This attrition can occur due to poor or inconsistent indexing of studies, and through the weeding out of studies during evidence screening processes that do not meet certain methodological criteria such as randomised control trial standards (Green, 2008). However, even prior to this, the attrition of potentially relevant research is likely to occur through the non-submission of research that is assumed by its investigators to be unpublishable due to negative results, and indeed the rejection of research by journal publishers due its depiction of negative results, or sample size and design issues (Green, 2008). Underpinning all of this, the narrowing of the potentially relevant pool of evidence to real-world practitioners arguably begins with the framing of research agendas by government bodies and funders, which largely dictates the nature of the studies, and publications, that will follow (Green, 2008; Green & Allegrante, 2020). Due to each of these impediments and constrictions to the flow of research knowledge, the research that does eventually make it all the way through for inclusion in guidelines, reviews, and textbooks may not fully illustrate or reflect the varied circumstances, populations, interventions, and outcomes that have been evidenced and that would be of interest to practitioners (Ammerman et al., 2014). For

instance, studies detailing the negative results of interventions may contain potentially pertinent information for practitioners regarding the aspects of an intervention that might be unsuitable or a misfit for their own context of practice, and that they might wish to avoid (Green, 2008). Furthermore, studies of an observational nature, though not experimental or highly powered statistically, usually have high external validity. They may therefore provide information that more closely reflects the unmanipulated and often chaotic circumstances and situations into which interventions are implemented (Mercer et al., 2007). As highlighted in the reflective paper and previous literature, co-creative research offers a means to circumvent the above problems. It can ensure that practitioners in the PA intervention field are directly supplied with relevant, comprehendible evidence that they can readily translate to their practice, either to optimise existing interventions, or to design new, evidence-informed ones.

However, despite the potential benefits and positive outcomes of co-creative research, co-ordinating both academics and real-world public health organisations to conduct research together is a complex and resource-demanding task. It involves the integration of individuals with different dispositions, skillsets, and levels of knowledge across organisational sectors that often vary in terms of working cultures and practices, and operational and financial objectives and concerns (Sibbald et al., 2019). Reflecting this, a scoping review conducted by Gagliardi et al. (2016) that synthesised 13 studies that had previously examined research collaborations between academics and organisational or system-level decision-making health partners (e.g. clinician managers, policy makers, healthcare managers) identified numerous barriers that can impede co-creative research from initially taking place. These included the differing needs and priorities of the collaborators; busyness of the health partners with other more urgent tasks or responsibilities; a lack of funding or infrastructure to support collaboration; negative attitudes from health partners towards academics and/or the value of research; a lack of perceived incentive for health partners to collaborate; the negative effect of staff turnover on collaboration continuity; unclear goals, roles, and expectations; and a lack of skill or understanding in co-creative research processes. A subsequent study conducted by Sibbald et al. (2019), which surveyed the views of 141 academics and 75 health partners (e.g. health systems managers, policy-makers, healthcare providers, practitioners/clinicians) working co-creatively on funded research projects, identified some of the barriers that can occur once co-creative partnerships have been formed and research projects are underway. Inadequate resources, differences in availability among research team members, and lack of financial or professional incentives for health partners were the factors most commonly identified by both groups of respondents as potentially impeding the completion of co-creative studies. Academics also separately reported the following factors most commonly: compatibility of problem-solving styles

among research team members, concerns about the quality of the research, amount of turnover among research team members, and competing agendas among research team members. In addition, responses from both groups alluded to the potentially variable engagement and disproportionately lower involvement of health partners in research projects, which might feasibly decrease their satisfaction levels and subsequent likelihood to collaborate on future co-creative projects. Health partners were rarely perceived to take a lead on projects and tended to report feeling like 'advisors', with academics seeming to take a particularly leading role during the earlier research phases such as research design and data collection. To enhance the feasibility and likelihood of co-creative research taking place, solutions to negate or eliminate each of these factors need to be considered.

Academics therefore have a key role to play in striving to address some of the barriers that impede the conduction of co-creative research. The scoping review conducted by Gagliardi et al. (2016) also highlighted numerous factors that enable co-creative research, which academics and their institutions can help to facilitate. These included creating multiple and varied opportunities for interaction among research team members; establishing clear and agreed upon goals, expectations, and roles for all research team members; the immersion of academics in the settings/locations of health partners and/or establishing of co-locations; encouraging all research team members to demonstrate a willingness to listen, learn, and adapt to each other and the research process; deploying facilitative and 'boundary spanning' members of staff to initiate and maintain collaborative research partnerships and support and review the collaborative aspects of ongoing co-creative research projects; and building or sharing common research governance structures. Other strategies not listed in the review that academics and their organisations could also realistically promote include establishing clearly defined pathways and routes for health partners to engage with academia to conduct co-creative research; providing research-related training and continuing professional development courses for health partners to learn about co-creative research; establishing 'standard operating procedures' for the conduction of co-creative research; and facilitating cost-effective and cost-efficient modes of conducting co-creative research that require less extensive resources and funding (e.g. student dissertation projects, co-funded PhD studentships). Each of these suggestions could help to address the aforementioned factors that impede the successful completion of co-creative research and the initiation and long-term sustainability of the partnerships that underpin it. They could thus increase the likelihood of research being conducted in the PA field that produces evidence directly translatable to real-world intervention practice.

Implications for practice

Increasing the PA levels of older adults is an enduring public health priority in the UK, to both increase health-related quality of life, and reduce the economic and societal costs associated with the health conditions that can result from physical inactivity (Dallmeyer et al., 2017). Consequently, there is a requirement for evidence-based interventions, implementable at scale, that can facilitate sustained changes in older adults' PA behaviour and help to reverse the trend in the UK towards declines in PA as individuals reach older age. Evidence-based interventions recognise the connections between research evidence, behaviour change theories, and intervention components, strategies, and objectives. They are thus proposed to have a greater chance of achieving effectiveness than those based on common-sense (Hansen at al, 2017; Michie at al., 2009). The original purpose of this PhD was to contribute new knowledge to support the implementation of evidence-based PA interventions for older adults. Having integrated and discussed the key findings across the five pieces of research, their practical implications can now be considered, for (a) helping the common-sense PA interventions already in existence to enhance their connection to theory and evidence, and (b) underpinning the future conceptualisation and development of novel evidence-based interventions that are effective and implementable at scale by public health practitioners and commissioners.

As previously outlined, the retrospective application of the BCW framework detailed in study 1 provided Active Dorset with theoretically informed suggestions to optimise the Dorset PA pathway, such as adding more content focused on providing behavioural examples for participants to follow and model. In addition, as outlined in study 2 and the reflective paper, the findings of study 2 provided Active Dorset with clear and actionable information on the needs and preferences of individuals accessing the LWD service, pertaining to factors such as social support and accessibility. However, on a wider scale, through being fed back to Sport England via Active Dorset, the findings have also helped to inform Sport England's recent recommendations regarding actionable strategies that public health organisations can use to make small, simple adaptations to the PA interventions they operate, "to help deliver more positive, inclusive physical activity experiences that are relevant, achievable and enjoyable for everyone" (Sport England, 2022, p.14). These recommendations are based largely upon the key learning points from the 20 Active Ageing projects Sport England initially funded. Figure 4 graphically incorporates the strategies recommended by Sport England that link with the findings discussed in this thesis.

Figure 4. Summary of Sport England strategies that link with the findings discussed in this thesis (Sport England, 2022).

Extending the practical implications in a more conceptual manner, figure 5 depicts an original schematic model created by AJP that distils the ideas discussed in this thesis so far, which can now be used by real-world public health practitioners to guide the practical conceptualisation, design, and development of novel PA interventions for older adults, and the optimisation of common-sense interventions already in existence. At its core, the schematic model illustrates a hypothetical PA intervention for older adults represented by a pyramid (Fife et al., 2014), which incorporates the key intervention elements highlighted by this thesis. At the base of the intervention pyramid lies *therapeutic alliance*, the foundational layer upon which effective interventions centred on collaborative interactions between professional and client, or change agent and change seeker, are said to be built. At the next level sits *behaviour change theory*, which provides the underpinning rationale for why any given behaviour change strategy contained within the intervention may work to influence PA behaviour. Finally, at the top of the pyramid lie *BCTs*, the specific 'ingredients' of the intervention that aim to directly influence PA behaviour, which draw from the intervention's underpinning theory, and which are thought to be most effectively delivered within the 'safe container' provided by a strong and positive professional-client relationship. Running alongside and throughout the intervention, as denoted by a bi-directional arrow, is *social support*, a significant behavioural motivator for older adults that appears to exert an important influence on their PA behaviour. Finally, surrounding the intervention pyramid is the systemic environment in which the intervention operates, represented by an enclosing circle. Within the circle are *micro level system factors*, aspects of the intervention pertaining to its immediate social, physical, and operational contexts, which also have the potential to influence PA behaviour. The model also incorporates the strategies for enhancing the translation of scientific theory and evidence to PA interventions that have been outlined within this thesis. Below the depiction of the intervention lies a broken line, which separates real-world intervention practice from empirical knowledge. This line denotes the *evidence-practice gap*. Crossing the line to feed into the intervention, signified by an arrow, is *behaviour change framework application*, which can ensure that the intervention considers the theoretical determinants of PA behaviour and their logical relationship to the behaviour change strategies it deploys, and thus has behaviour change theory embedded within it. Also crossing the line to feed into the intervention is *co-creative research*, which can deliver relevant, understandable, and immediately actionable research evidence that reflects the intervention's actual contextual circumstances, and which can inform its design, optimisation, and refinement. By referring to this model, practitioners can base their thinking, decision-making, and actions pertaining to PA interventions on evidence, theory, and logic, rather than falling back upon habitual cognitive biases or heuristics, i.e., common-sense, to guide their intervention practices,

without detailed assessment or consideration of how to influence behaviour change (Kelly, 2019).
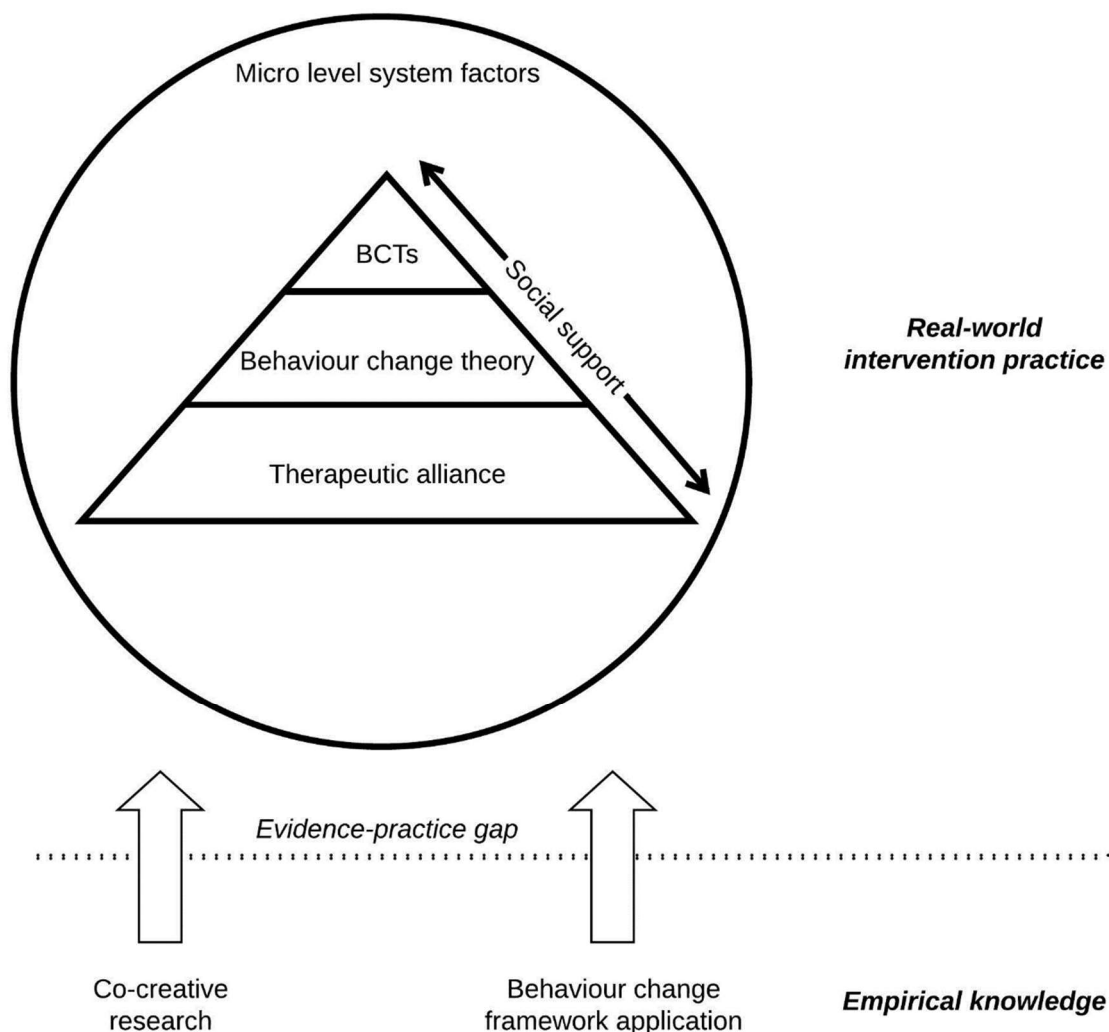

Figure 5. Schematic model to guide the practical conceptualisation, design, development, and optimisation of PA interventions for older adults.

Implications for research

The five pieces of research and their discussion points have generated numerous avenues for future research that would be of great interest to both academics and practitioners alike. These include:

- Qualitative research that aims to further identify the different micro level system factors that influence older adults' PA behaviour, through interviewing participants of an existing PA intervention, and potentially using the system-focused model of Duah-Owusu White et al. (2020) as a coding framework.
- Quantitative research that aims to systematically evaluate the influence of therapeutic alliance on older adults' PA behaviour and the outcomes of PA

interventions, such as investigating the correlation between self-reported intervention outcomes (e.g. changes in PA levels) and scores on a validated therapeutic alliance measure such as the Working Alliance Inventory (Hatcher & Gillaspy, 2006).

- Qualitative research that aims to examine the existing skills, characteristics, practices, and subsequent training needs pertaining to therapeutic alliance of professionals working in the PA intervention field. This could entail the analysis of videos or transcripts of professional-client interactions, or interviews with practitioners to ascertain their views and experiences regarding therapeutic alliance. This work could lay the foundation for subsequent research that aims to develop a bespoke course of therapeutic alliance training for application to the PA intervention field, or to apply an existing one such as alliance-fostering therapy.

- Research that aims to formally explore the processes, strategies, and conditions that contribute to co-creative research most effectively producing evidence that is relevant, understandable, and actionable to public health practitioners.

- Research that seeks to develop an objective classification system for reporting co-creative processes and strategies and measuring their application and outcomes.

This research would add to the evidence base on the subjects discussed within this thesis, and thus lend further support to the schematic model presented above.

Strengths and limitations

Some of the strengths and limitations of the five pieces of research have been outlined within their respective articles. However, there are some additional strengths and limitations of the combined body of work that must now be considered.

Strengths: A strength of this thesis is the thread of pragmatism that runs through it, with the intention at its heart to create knowledge in the interest of change and improvement, and offer ideas and practical solutions to counter the implementation of common-sense PA interventions (Kaushik & Walsh, 2019). The five pieces of research draw upon a variety of methods deemed to connect to the research problems at hand, and the ideas they have generated were born out of a funded research project that originally aimed to answer questions raised by a real-world public health organisation. The findings have demonstrated practical implications that are of direct relevance to practitioners in the PA intervention field, and this thesis therefore exemplifies the pragmatic process of exploring concrete, real-world issues in context, to deliver

subsequent 'knowing' that has practical consequence and the potential to transform action (Kelly & Cordeiro, 2020).

A further strength of this thesis, reflected in the proposed schematic model, is that it introduces and applies several novel or previously underexplored concepts, topics, and processes to the PA intervention field. These include behaviour change framework application, therapeutic alliance, micro level system factors, and co-creative research. In doing so, this thesis looks beyond the narrow person-focused philosophy typically associated with PA interventions that is centred on changing people's motivations, cognitions, and behaviours through conscious and intentional mental processing activities (Taylor et al., 2010). Instead, it prompts the consideration of interventions in a multi-faceted, multi-layered, and multi-dimensional manner. Closely related to this point, another strength is that this thesis collates various disparate pieces of evidence and theory, drawn from the broad areas of social psychology, behavioural psychology, neurobiology, psychotherapy, and systems thinking, to offer a diverse, nuanced, and novel perspective on PA interventions and their putative role in influencing older adults' PA behaviour. Therefore, as well as pragmatism, the principles of creative holism are exemplified within this thesis. Creative holism acknowledges that real-world problems are often of a heterogeneous and complex nature (Dongping, 2010; Jackson, 2006). To find solutions, it therefore considers, "radically different views of the world derived from different paradigms" (Jackson, 2006, p.654), "seeks to be multi-paradigm, multi-methodology, and multi-method in orientation" (Jackson, p.648), and recognises the importance of both process and structure (Jackson 2006). The result of creative holism is said to be the generation of the broadest possible array of explanations, possibilities, and problem responses (Dongping, 2010; Jackson, 2006).

Limitations: A limitation of this thesis is that the two qualitative studies both incorporated relatively small samples of predominantly retired, physically active older adults of White British ethnicity, hailing from a rural geographic location. Furthermore, both studies used a recruitment gatekeeper and convenience-based recruitment strategies, which may have increased the likelihood that an individual's choice to participate, and resultant views and reflections on PA-related topics, reflected their pre-existing positivity and predisposition towards PA, and thus an element of self-selection. The lack of demographic diversity and potential bias in the samples, and the relatively narrow situational context from which they were drawn, arguably limit the generalisability of the findings to the wider population of older adults. Generalisability (e.g. the extent to which extrapolation of broad conclusions to other settings and samples is possible) is considered by many to be an integral aspect of applying research findings to advance knowledge (Hays & McKibben, 2021). Resource constraints placed a realistic upper limit

on the number of interviews that could be conducted for both studies, and the recruitment strategy was deployed largely due to the need to adhere to Active Dorset's legal and data protection procedures. However, scholars such as Carminati (2018), Myers (2000), and Shenton (2004) question whether generalisability is in fact a realistic aim of qualitative research, given its inherently subjective, exploratory nature, and potential for generating understanding rather than predicting causes and effects. Instead, it is argued that all knowledge generated through qualitative enquiry is context-dependent, and that this context shouldn't detract from extending the understanding gained to other people in similar situations (Carminati, 2018; Libarkin & Kurdziel, 2002; Myers, 2000). Therefore, it has been proposed that 'transferability' is a more achievable aim than generalisability for qualitative research, a term that refers to the extent to which readers can draw their own inferences on the applicability of findings to wider settings and populations based on the information, and vividness and depth of descriptions, provided (Carminati, 2018; Shenton, 2004; Slevitch, 2011). In the reporting of both qualitative studies, the context and boundaries were clearly articulated, and information on participant demographics supplied. Therefore, readers of these studies are able to make their own judgements on how the findings apply to other settings and situations, and how they contribute to their understanding of the topic under investigation (Carminati, 2018; Shenton, 2004).

A further limitation is the low methodological transparency and potential degree of bias involved in the reflective paper and study 3. The experiential reflection that constituted the reflective paper did not involve a systematic process of data collection and was based on individual experiences and interpretations. Furthermore, the integrative narrative review conducted for study 3 did not have a clearly articulated and reported evidence synthesis process due to the subjective nature of literature selection and extraction of information. Both pieces of research could thus be critiqued as weak forms of evidence for informing healthcare-related decisions and strategies (Aguinis et al., 2018; Green et al., 2006). However, in adherence with the pragmatism philosophy and its emphasis on methodological flexibility, the methods were deemed accountable and appropriate to the inductive aims of enquiry, with the findings presented realistically (Kaushik & Walsh, 2019). Furthermore, pragmatist scholars generally believe that there is an objective reality that exists separately from human experience, but which can only be subjectively encountered through human experience, leading to the position that research should seek to accommodate many different perspectives to create new knowledge (Kaushik & Walsh, 2019; Marshall et al., 2005). Upon these ideas, it is argued that the inherent subjectivity of both pieces of research can therefore be viewed positively. The reflective paper constitutes a valuable form of constructed, situational knowledge based on participatory interactions, which can help to understand and prompt focus or change to the part of reality in question (Buetow & Kenealy, 2000; Kaushik &

Walsh, 2019). In a similar manner, study 3 makes a valid contribution to the evidence base; it draws upon and reflects the knowledge, experiences, and perspectives of its author, and its outcomes can thus provide fresh and unique understandings that provoke scholarly thought and dialogue, and help to identify research gaps and lay a foundation for future research (Green et al., 2006; Snyder, 2019; Torraco, 2005).

Chapter 9. Conclusions

To reduce the implementation of common-sense PA interventions for older adults and support the implementation of those based on theory and evidence, there is a need for research that (a) investigates how different interventions influence older adults' PA behaviour and their key components and characteristics, and (b) attempts to identify strategies and procedures that can enable or enhance the translation of scientific evidence and theory to real-world PA intervention practice. In response, this PhD thesis has detailed and presented the integrated findings of five pieces of research that each asked questions seeking new knowledge to address the problems of common-sense PA interventions for older adults and their precipitating factors. The five pieces of research spanned mixed methods. They encompassed two qualitative studies, an experiential reflection, a descriptive study, and a narrative literature review.

The findings across the five pieces of research together highlighted the potentially important influence of social support, system factors, and therapeutic alliance on older adults' PA behaviour. Furthermore, the usefulness of behaviour change framework application and co-creative research to close the evidence-practice gap in the PA intervention field were underlined. The integration of the findings has prompted a broad and holistic perspective of PA interventions, which goes beyond the traditional person-centred, top-down philosophy normally associated with them. Instead, it considers the potential importance of factors such as the contexts in which interventions operate, and the neurobiological underpinnings of the interpersonal relationships and interactions that occur within them. The findings have demonstrated practical applicability pertaining to the optimisation of local PA interventions and services, and informing Sport England's recent recommendations regarding actionable strategies that public health organisations can use to make small, simple adaptations to the PA interventions they operate. Furthermore, the findings have been distilled into an original schematic model, which can be referred to by real-world public health practitioners to guide the conceptualisation, design, and development of novel PA interventions for older adults, and the optimisation of common-sense interventions already in existence, in a holistic and evidence informed way. The findings and their discussion have generated numerous avenues for future research relating to the themes identified within this thesis, which can further their evidence base and strengthen the rationale behind the schematic model.

In combination, the information supplied by this thesis can help to increase the prevalence of evidence-based PA interventions for older adults, rather than those of a common-sense nature. Evidence-based interventions have a greater potential to effectively facilitate and support older adults to achieve the regular and sustained PA participation that provides them with a multitude of preventative health and quality of life

benefits, and that reduces the economic and societal costs associated with physical inactivity.

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