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MEASURING THE DETERMINANTS AND BARRIERS TO
PHYSICAL ACTIVITY FOR OLDER PEOPLE.

Section A: What is the quality of questionnaires measuring
determinants and barriers to physical activity for older people?
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Section B: The development of the Determinants and Barriers to
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Summary of the MRP Portfolio

Section A provides an evaluation of the quality of questionnaires that have been developed to measure the determinants and barriers faced by older people regarding physical activity. Literature was included that either developed or validated a pre-existing questionnaire for use with older people populations, validated a pre-existing questionnaire to an older people population, or validated a pre-existing questionnaire to older people from a specific country. The quality of these questionnaires was appraised by exploring their methodology and psychometric properties including reliability, factorial validity, and validity.

Section B documents the stages of the development of a measure of the determinants and barriers specific to walking for older people. An overview of the stages of development are outlined, and include elicitation interviews with nineteen older people to generate an initial item pool, reduction of the item pool, identifying initial domains, and a two-part piloting procedure involving older people to review the initial items and initial domains. These stages resulted in the development of the Determinants and Barriers to Walking for Older People Scale (DABWOP-S). An evaluation of the psychometric properties of the DABWOP-S will be undertaken by a trainee clinical psychologist as part of a future major research project.

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Section A

What is the quality of questionnaires measuring determinants and barriers to physical activity for older people?

Word Count: 8000 (173)

Abstract

Introduction: Physical activity can improve the mental and physical health of older people, but a vast proportion do not meet recommended levels. Understanding the determinants and barriers to physical activity for older people is an important step towards developing, and shaping, effective physical activity interventions. This review examined the quality of questionnaires measuring determinants and barriers to physical activity for older people.

Method: The literature search was conducted on three databases and included literature up to November 2018. Literature was included if it developed a questionnaire specifically for older people, or if it validated for older people a questionnaire designed for other populations. Following the screening process fourteen papers remained, with six developing a questionnaire specifically for older people.

Results: The reported psychometric properties of included questionnaires varied, but tended to be acceptable. However, methodological limitations included neglecting to define the specific physical activity the questionnaire measured, and assumptions of homogeneity of populations. The limitations suggest that these questionnaires should be used cautiously.

Conclusion: The review provides some insight into the reliability and validity of existing questionnaires, but further validation is required for some questionnaires. Recommendations are made for future questionnaire development, especially within the United Kingdom context.

Keywords: Physical activity, determinants, questionnaire, older people, quality.

Physical activity (PA) has many known physical health benefits, including across several diseases (Penedo & Dahn, 2005). It also has many known mental health benefits, including reducing symptoms of anxiety and depression (Strohle, 2009). Despite these benefits, approximately 30% of the world's population does not meet the recommended levels of PA (Hallal et al., 2012). For people aged 65-74 within the United Kingdom (UK), this figure increases to 48% of women and 42% of men (Townsend, Wickramasinghe, Williams, Bhatnagar, & Rayner, 2015). Given that the UK population of people aged over 65 is expected to rise by 5.9% by 2046 (Office for National Statistics; ONS, 2017), there is a need to identify the determinants and barriers to PA for people over 65. One such method could be the application of questionnaires, which could be used to help to develop and shape PA interventions to improve accessibility for OP populations.

Definition of Older People

It has been suggested that if the definition of OP is not operationalised within research, it would be inappropriate to infer findings to develop effective policies (Lawrence & Singleton, 2017). Differing definitions are used across, and between, societies. For example, The United Nations (2015) define OP as somebody aged 60 plus. This is contrasted by the UK's National Health Service (NHS), which defines OP as somebody aged 65 or older (NHS, 2018a). Within research, the cut-off age can be as low as 50 (Evans & Sleap, 2012). The current review will define OP as those aged 65 or older, to be consistent with the NHS definition within the UK context.

In 2016, 18% of the UK population was aged 65 or older, a figure that is expected to rise to 23.9% by 2046 (ONS, 2017). This aging population has already raised questions regarding the sustainability of healthcare services (ONS, 2017), and may necessitate that such services shift focus, and funding, from acute health problems to chronic health problems (Rook, Charles, & Heckhausen, 2011).

Definition of Physical Activity

Within the literature, it is suggested that a distinction is made between *'physical activity'* (PA) and *'exercise'* as they describe different constructs (Lawrence & Singleton, 2017). Casperson, Powell, and Christenson (1985) define exercise as '*a purposeful and repetitive motion that is intended for fitness*', and PA as '*contraction of skeletal muscle that increases energy expenditure*'.

Guidelines by the NHS (2018b) of recommended PA for OP state that people should do a minimum of 150 minutes of '*moderate physical activity*' every week. Moderate physical activity is defined as '*activities that require moderate effort*' and examples provided included: *walking*, *water aerobics*, *ballroom and line dancing*, *riding a bike on level ground*, *playing doubles tennis*, *pushing a lawn mower*, *canoeing* and *volleyball*. These guidelines are similar to those recommended by the National Institute for Health and Care Excellence (NICE; 2012), as 150 minutes of moderate intensity PA per week is recommended for adults aged over 19. Although the terminology differs, these guidelines appear to replicate World Health Organisation (WHO; 2010) global guidelines, which also recommend 150 minutes of moderate-intensity aerobic PA per week (WHO, 2010).

The differentiation between the constructs of PA and exercise becomes more complex in the consideration of the behaviours of OP. For example, an activity, such as water aerobics, could conceivably be classified as either PA or exercise under the definitions provided by Casperson et al. (1985). The differentiation in the definition of exercise and PA should be considered when exploring intentional processes, cognitions, and motivations, as they may differ between definitions (Shephard, 2003). For the purposes of the current review, literature including any PA will be included regardless of how the author(s) defined the construct. Henceforth, all activities that fall within the definition provided by the NHS (2018b) will be referred to as PA.

Difficulties Faced by Older People

Whilst a brief overview of two difficulties faced by some OP are presented below, chronological age is limited in predicting both health and functional outcomes, and therefore an attribution to the aging population may prove inaccurate (Rook et al., 2011). Additionally, significant variations exist between the health of OP within the UK based upon factors such as socio-economic background, ethnicity, and gender (Government Office for Science, 2016).

Sedentary behaviour. Sedentary behaviour (SB) has been defined as any waking activity that is characterised by a low energy expenditure (Tremblay, 2012). Whilst this may differ from '*inactivity*', which can be defined as those who achieve amounts of PA that fall below guidelines (Tremblay, 2012), it is an important construct to consider when exploring PA for OP.

OP in assisted living communities have been found to spend as much as 87% of their waking hours in SB (Leung et al., 2017), and SB can result in an increased risk of falls (Thibaud et al., 2011). Research by Grøntved and Hu (2011) found that SB appeared to have a detrimental effect on health even if recommended levels of PA have been met. Therefore, the inference can be made that an increase of PA for OP may not necessarily result in a reduction of SB.

Loneliness and social isolation. The detrimental impact of social isolation for OP in the community has been of growing concern for both policy makers and healthcare services (Robins, Hill, Finch, Clemson, & Haines, 2018). It has been postulated that poor social relationships are more strongly associated with mortality than consuming six alcoholic beverages, or smoking 15 cigarettes, per-day (Holt-Lunstad, Smith, & Layton, 2010). A meta-analytic review by Holt-Lunstad, Smith, Baker, Harris, and Stephenson (2015) found that, after accounting for multiple covariates, social isolation corresponded to a 29% increase in the likelihood of death. Conversely, the likelihood of mortality can be reduced by as much

as 50% for individuals with strong social relationships (Holt-Lunstad, Smith, & Layton, 2010).

Between 2016 and 2017, approximately 5% of adults in England reported that they felt lonely (ONS, 2018). AGE UK (2017) report that approximately 1.2 million OP in England alone reported feeling chronically lonely. Whilst the mechanisms that underpin the impact of PA on social factors comprise many determinants (Michie, Abraham, Whittington, McAteer, & Gupta, 2009), a meta-analysis suggested positive effects on social functioning for OP from PA interventions (Shvedko, Whittaker, Thompson, & Greig, 2018). In addition to the positive effects on social functioning, there are many other known benefits of PA for OP.

The Benefits of Physical Activity for Older People

Some of the physical health benefits of PA for OP include having a healthier body weight (Murphy, Nevill, Murtagh, & Holder, 2007), and reducing the risk of developing Type 2 diabetes and coronary heart disease (Lee et al., 2012). It has also been associated with less mobility difficulties (Tsai et al., 2015) and frailty (Peterson et al., 2009). In addition to physical health benefits, PA also offers cognitive health benefits, as higher levels of PA have been associated with a 14% reduction in the likelihood of developing dementia (Blondell, Hammersley-Mather, & Veerman, 2014), with physical inactivity identified as the most preventable risk factor for the development of Alzheimer's disease (Norton, Matthews, Barnes, Yaffe, & Brayne, 2014). Regarding psychological health, engagement in a PA programme resulted in improvement for OP with minor depression (Brenes et al., 2007), while PA interventions have also been reported to help reduce anxiety (Shin, 2002). This suggests that PA interventions may represent an effective method of tackling long-term chronic health conditions, premature mortality, mental health difficulties and social isolation. Despite these benefits, many OP do not meet recommended levels of PA.

The Amount of Physical Activity Undertaken by Older People

It is estimated that, worldwide, physical inactivity causes as many deaths as smoking (Lee et al., 2012). Despite NICE (2012) recommending at least 150 minutes of PA per week, in 2012 it was found that just 58% of men and 52% of women aged 65-74 met these guidelines (Townsend et al., 2015). It could be inferred that increased access to PA for OP, whether within the context of individual or group interventions, could help a greater number of OP reach recommended levels of PA.

Social Prescribing

The Five Year Forward View for Mental Health (Mental Health Taskforce Strategy, 2016) highlighted the importance of innovative approaches to healthcare to protect the long-term future of the NHS. One such approach is social prescribing, which aimed to expand the options available to general practitioners, and patients, when faced with a health difficulty, particularly when it may originate in socioeconomic deprivation or psychosocial issues (Brandling & House, 2009). It has been estimated that approximately 20% of patients attend their general practitioner owing to a social problem (Torjesen, 2016). The aim of social prescribing is to make general practice more sustainable over the longer-term (Bickerdike, Booth, Wilson, Farley & Wright, 2017). Of the six commonly identified outcomes, one is '*physical and emotional health and wellbeing*' and another is '*social determinants of ill-health*' (University of Westminster, 2017), which both could be addressed with a referral for PA. Currently, there are no NICE guidelines regarding social prescribing (The Kings Fund, 2017), but there is emerging evidence of it resulting in reduced healthcare use (Maughan et al., 2015). For the social prescription of PA to be beneficial for OP, it appears pertinent to understand the factors that may present as determinants, or barriers, to PA for OP. There are a number of psychosocial theories that can inform this.

Social Cognitive Models

Guidance on individual approaches to behaviour change published by NICE (2014) highlights the considerable potential that the implementation of interventions to help people increase PA can have on improving health and wellbeing. One '*key theory*' of behaviour change identified by NICE (2007) is self-efficacy (Bandura, 1997).

Self-efficacy. One of the most widely applied social cognitive models in health behaviour research is self-efficacy theory, which is a salient construct of Bandura's social learning theory (Bandura, 1977), and aims to explain an individual's appraisal of their confidence to successfully undertake a specific behaviour.

There are two types of belief expectations described by Bandura (1977; 1997). The first is the belief an individual has that they are capable of performing a specific behaviour, known as '*self-efficacy expectations*'. The second, known as '*outcome expectations*', are the beliefs that individuals hold that the specified behaviour will result in a desired outcome. Regarding PA, outcome expectations can be both positive and negative in nature (Melillo et al., 1996). The theory postulates that the stronger an individual's self-efficacy expectations and positive outcome expectations, the more likely that they will either initiate, or persist, with the specific behaviour. For OP, reappraisals and misappraisals of their capabilities are central issues for their self-efficacy (Bandura, 1994). These may arise from negative cultural expectations associated with aging, and major life changes including retirement or loss (Bandura, 1994).

In a cross-cultural study, self-efficacy was found to significantly predict PA for OP in Spain and the United States (Perkins, Multhaup, Perkins, & Barton, 2008). A review of literature by Lee, Arthur, and Avis (2008) concluded that PA interventions focusing upon improving the perception of PA self-efficacy for OP can increase confidence in their ability to initiate and maintain PA behaviour. However, for female OP self-efficacy was not found to

be a predictor of exercise initiation (Litt, Kleppinger, & Judge, 2002). Regarding outcome expectations, although Bandura (1977; 1997) suggested that outcome expectations are closely related to self-efficacy expectations and may not add much predictive utility, Schuster, Petosa, and Petosa (1995) reported that they accounted for 2.5% more variance of PA for OP beyond self-efficacy expectations and perceived barriers. However, there are a number of experimental studies that have failed to find an association between self-efficacy and either PA initiation or maintenance for OP (van Stralen, De Vries, Mudde, Bolman, & Lechner, 2009). The inference could be that there are multiple factors that represent determinants and barriers that may not be accounted for.

Literature Exploring the Determinants and Barriers to Physical Activity

A systematic review by Franco et al. (2015) aimed to identify and synthesise a range of determinants and barriers to PA participation for people aged 60 and over. This review of qualitative literature included 132 studies involving 5987 participants. Six major themes were identified: '*social influences*', '*physical limitations*', '*competing priorities*', '*access difficulties*', '*personal benefits of physical activity*', and '*motivation and beliefs*'. Whilst these themes partially support self-efficacy theory, as '*personal benefits of physical activity*' could be consistent with outcome expectations*, and '*physical limitations*' and '*motivation and beliefs*' could contribute to self-efficacy expectations, some themes appear to lend themselves to other theoretical frameworks. For example, the theory of planned behaviour (TPB; Ajzen, 1991) predictor variable '*subjective norm*' (SN), the perceived social pressure to perform a specific behaviour, appears consistent with '*social influences*' and the predictor variable '*perceived behavioural control*' (PBC), the individual's perception of the ease or difficulty of a specified behaviour, appears consistent with '*physical limitations*'.

The experiences of PA interventions for OP was explored in a systematic review and meta-synthesis by Devereux-Fitzgerald, Powell, Dewhurst, and French (2016). There were 14

papers included, covering 12 studies, but the *n* of participants was not reported. Six descriptive themes were identified: '*attitude towards physical activity*', '*value of social interaction*', '*understanding older adults' needs*', '*feeling good*', '*managing expectations*' and '*keep at it*'. The review highlights that the perceived value of PA is an important factor, which is consistent with the '*attitude towards behaviour*' (ATB) predictor variable in the TPB (Ajzen, 1991). These reviews suggest that the application of a single theoretical framework may not account for all determinants and barriers to PA for OP.

Aim of the Current Review

Questionnaires represent an appropriate assessment method of PA as they can be self-administered and are cost-efficient (Pols, Peeters, Kemper, & Grobbee, 1998), and they are commonly used in large-scale research trials (Forsén et al., 2010). Whilst NICE (2013) recommend the use of a physical activity questionnaire (PAQ) to identify the amount of PA undertaken for people aged up to 74 (Department of Health, 2013), it neglects to recommend a measure that could predict the likelihood of an individual initiating, or maintaining, PA.

The aging population highlights the necessity to identify cost-effective methods to reduce demands on healthcare services, and one such recent method has been social prescribing, with one primary outcome being to improve physical and emotional health (University of Westminster, 2017). However, for the social prescribing of PA for OP to be most effective, it appears pertinent to understand the determinants and barriers to PA. The identification of an appropriate measure of these factors could also help to shape future healthcare and social policies, and could influence the structure of available PA interventions.

The current review will explore the quality of PAQs that measure determinants or barriers to PA for OP. Quality will be explored by reviewing the methodology of each paper using a quality appraisal tool as guidance, in addition to the reported psychometric properties; specifically, reliability, factor validity, and validity.

Scope

  Physical activity. Whilst PA and exercise have been defined as distinct constructs by Casperson et al. (1985), the definition of moderate physical activity provided by the NHS in their guidelines for PA for OP included example activities that could be located within either definition. For example, playing doubles tennis, riding a bike on level ground, and water aerobics could conceivably be placed under either definition. As such, to ensure that all relevant literature pertaining to PAQs for OP was identified, both PA and exercise were used as search terms.

  Older people. Owing to the range of terms used to describe OP, this term was not exclusively relied upon to search for applicable literature (a comprehensive list of search terms is displayed below). For the current review, the definition by the NHS (2018a) of OP being aged 65 or older was used, as this represents a broadly accepted age range within the UK. Literature that featured participants with a mean (*M*) age below 65 was excluded. This definition is not without limitations, as age cut-offs are somewhat arbitrary (Kowal & Dowd, 2001) and often include more than one generation (Neugarten, 1974). This is applicable to the implementation of the NHS (2018a) definition, as no age range or upper limit cut-off was used. However, this definition was selected for the current review to improve clinical utility within the UK context.

  Physical activity questionnaires. There were no restrictions placed upon what constituted determinants or barriers of PA, but the papers had to include a measure of a minimum of one hypothesised determinant or barrier, irrespective of the underlying theory, rather than solely measuring PA. The included literature fell within one of three areas, which were:

- the development and validation of a PAQ for specific use within OP populations;

- the validation of a pre-existing PAQ that was developed for a non-OP population to an OP population;

- the validation of a pre-existing PAQ to a population from a specific country or culture.

Method

Literature Search

Literature searches were performed1 on the PsychINFO, SportDISCUS, and Web of Science databases for papers with the following search terms in their title, or listed under '*key concepts*'; "*old* people*" OR "*old* adult*" OR "*senior citizen**" OR "*elder**" OR "*retire**" OR "*senior**" AND "*walk**" OR "*physical activity*" OR "*exercise*" AND "*predictor**" OR "*barrier**" OR "*acceptab**" OR "*perception**" OR "*belief**" OR "*attitude**" OR "*motivat**" OR "*factor**" OR "*self-efficacy*" OR "*determinant**" OR "*perceive**" OR "*facilitat**" AND "*measure**" OR "*questionnaire**" OR "*inventory*" OR "*scale**" OR "*survey*" OR "*assessment tool*" AND "*reliab**" OR "*valid**" OR "*psychomet**" OR "*develop**". There was no selected timeframe to maximise the scope of the research, and a review of grey literature, including Google Scholar, identified further literature subsequently included within the review.

Limits to the Literature Search

The following limits were added to literature searches in an attempt to ensure that the identified literature remained pertinent to the aim of the review.

For PsychINFO and SportDISCUS, limits to the searches were *'humans'* and *'English language'*, with *'peer reviewed'* added to the PsychINFO search. The Web of Science search was restricted to their core collection and included open access only, with further limits being '*article*' as document type, and '*English language*'. The search was restricted to the Web of

1 Search occurred in November 2018.

Science categories of '*geriatrics gerontology*', '*gerontology*', '*public environmental occupational health*', '*rehabilitation*', '*sport sciences*', '*nursing*', '*psychology*', '*psychology clinical*', '*psychology applied*' and '*psychology experimental*'. These categories were decided upon following a preliminary review of the literature to identify the categories that contained relevant literature.

Eligibility Criteria

The following inclusion criteria were used:

- the *M* age of the study population was 65 or greater, to fit with the definition of OP by the NHS (2018a);
- the PAQ featured items relating to determinants or barriers of PA;
- the study was either developing a PAQ specifically for use with OP, examining the measurement properties of a pre-existing PAQ for an OP population, or testing psychometric properties of a PAQ to a different culture;
- the article had to be written in English.

Figure 1 depicts a flow diagram displaying the process of the review, in addition to the number of papers excluded at each stage.

PsychINFO
n = 676

SPORTDiscus
n = 435

Web of Science
n = 703

Grey literature
n = 8

Total *n* = 1822

Duplicates
n = 125

Literature after duplicates removed *n* = 1697

Removed after title screened *n* = 1548

Literature after title screened for eligibility *n* = 149

Removed after abstract screened *n* = 99

Literature did not validate a *PAQ n* = 74
PAQ did not include determinants or barriers *n* = 23
M age <65 *n* = 2

Literature after abstract screened for eligibility *n* = 50

Removed after full paper screened *n* = 36

Full paper unavailable *n* = 1
Literature did not validate a *PAQ n* = 7
PAQ did not include determinants or barriers *n* = 19
M age <65 *n* = 9

Literature after full paper screened for eligibility *n* = 14

Included literature *n* = 14

Figure 1: **Flow diagram displaying the search results and screening process**

A list of the included literature is outlined in Table 1, in addition to an overview of the study aims and the acronym of each PAQ. Whilst some papers refer to '*exercise*', owing to the inconsistencies in how individual activities were defined within and between papers, the review will continue to use PA as a single definition for all activities and behaviours.

Table 1: *Literature included within the current review*

Acronym	Full name of the PAQ	Author(s)	Stated aim(s) of study
AESOP	Adherence to Exercise Scale for Older Patients	Hardage et al. (2007)	Develop a PAQ for predicting home exercise adherence for OP discharged from home physical therapy.
ATES	Amotivation Toward Exercise Scale	Vlachopoulos & Gigoudi (2008)	Develop and validate a PAQ exploring OPs reasons for refraining from exercise.
EBBS1	Exercise Benefits/Barriers Scale	Enrìquez-Reyna et al. (2017)	Assess the psychometric properties of the Spanish version of the PAQ in a Mexican OP population.
EBBS2	Exercise Benefits/Barriers Scale	Victor, Ximines, & Almeida (2011)	Test the reliability and validity of the PAQ for older people.
FSMI-10	French Self-Motivation Inventory-10	André & Dishman (2012)	Validate the factor structure, and provide construct validity, as a measure of exercise adherence.
GCEQ	Goal Content for Exercise Questionnaire	Antunes et al. (2017)	Test the validity of the PAQ on a Portuguese sample of OP.
MOEES	Multidimensional Outcome Expectations for Exercise Scale	Hall, Wójcicki, Phillips, & McAuley (2012)	Explore the psychometric properties and validity in a sample of OP with physical and functional comorbidities.
NEWS-A	Neighbourhood Environment Walkability Scale Abbreviated	Starnes et al. (2014)	Develop and test the factorial validity on a sample of older women.
NEWS-SC	Neighbourhood Environment Walkability Scale for Chinese Seniors	Cerin et al. (2010)	Develop and validate an appropriate measure of neighbourhood characteristics related to walking that is appropriate for Chinese older people.

OEE	Outcome Expectations for Exercise Scale	Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner (2000)	To develop, and test the reliability and validity, of a measure of outcome expectations for OP.
OEE-C	Outcome Expectations for Exercise Scale Chinese	Lee, Chiu, Ho, Wu, & Watson (2011)	To test the reliability and validity of the translated version of the PAQ among Chinese OP.
OEE-2	Outcome Expectations for Exercise Scale-2	Resnick (2005)	To test the reliability and validity of the PAQ on residents of a continuing care retirement community.
SEE	Self-Efficacy for Exercise Scale	Resnick & Jenkins (2000)	To test the reliability and validity of the PAQ.
SEE-C	Self-Efficacy for Exercise Scale Chinese	Lee et al. (2009)	A preliminary assessment of reliability and validity of the PAQ to a Chinese population of OP.

Quality Assurance Tool

The Quality Assessment of Physical Activity Questionnaire (QAPAQ; Terwee, et al., 2010) is a quality appraisal checklist designed to help select an appropriate tool for a specific purpose in research on PA. It was developed by applying criteria identified by Terwee et al. (2007), before assimilating input from literature on the measurement of PA, and applying their experiences of relevant systematic reviews. The QAPAQ was used as a quality appraisal tool for papers featured in the current review, with an overview of quality presented in Table 3. Table 2 summarises the qualitative attributes contained within the checklist.

Table 2: *QAPAQ: Checklist for the appraisal of physical activity questionnaires*

Domain	*Definition*
1. Construct	What was the construct that the questionnaire intended to measure (e.g. exercise, walking, determinants and barriers)?
2. Setting	In what setting was PA measured?
3. Recall period	What is the recall period to which PA is referred?
4. Purpose	What was the purpose of the questionnaire?
5. Target population	For what kind of person was the questionnaire originally developed (e.g. was OP defined by age, sex, health status, living situation)?
6. Justification	Why was the questionnaire needed and how was it superior to questionnaires that may already exist?
7. Format	Are the number of questions, the response categories and the scoring procedure described?
8. Interpretability	Is there any information available on the interpretability of scores? Do these differ for relevant groups?
9. Ease of use	Is the effort required to complete the questionnaire acceptable? How can a full copy of the questionnaire can be obtained?

Structure of the Review

The quality of the included PAQs will be reviewed by initially providing an overview, and critique, of their methodology. For those that translated a PAQ from English, an appraisal of the translation process will follow, before a critique of the reported psychometrics. This final section will include the reporting of reliability, confirmatory factor analyses, and validity for the PAQs.

<div align="center">

Results

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Of the 14 included papers, six aimed to develop and validate a PAQ specifically for applicability to OP. These were the Adherence to Exercise Scale for Older Patients (AESOP; Hardage et al., 2007), the Amotivation Toward Exercise Scale (ATES; Vlachopolous & Gigoudi, 2008), the Outcome Expectations for Exercise Scale (OEE; Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000), the Outcome Expectations for Exercise Scale-2 (OEE-2; Resnick, 2005), the Neighbourhood Environment Walkability Scale Abbreviated (NEWS-A; Starnes et al., 2014) and the Self-Efficacy for Exercise Scale (SEE; Resnick & Jenkins, 2000). This included the OOE-2, which provided a rationale that the original PAQ did not provide a comprehensive representation of outcome expectations, as there was insufficient focus upon negative factors that may represent a barrier to PA adherence.

Eight of the studies aimed to validate a pre-existing PAQ on a population of OP. These were the Exercise Benefits/Barriers Scale (EBBS1; Enríquez-Reyna et al., 2017), the Exercise Benefits/Barriers Scale (EBBS2; Victor, Ximines, & Almeida, 2011), the French Self-Motivation Inventory-10 (FSMI-10, André & Dishman, 2012), the Goal Content for Exercise Questionnaire (GCEQ; Antunes et al., 2017), the Multidimensional Outcome Expectations for Exercise Scale (MOEES; Hall, Wójcicki, Phillips, & McAuley, 2012), the Neighbourhood Environment Walkability Scale for Chinese Seniors (NEWS-SC; Cerin et al., 2010), the Outcome Expectations for Exercise Scale Chinese (OEE-C; Lee, Chiu, Ho, Wu, &

Watson, 2011) and the Self-Efficacy for Exercise Scale Chinese (SEE-C; Lee et al., 2009).

Four of these translated the measure from English to their populations' native language

(FSMI-10, NEWS-SC, OOE-C, & SEE-C), and three (EBBS1, EBBS2, & GCEQ), relied

upon a previously validated translated version of the relevant PAQ.

Review of Methodology

An overview of the methodology of each paper is displayed in Table 3. The column

labelled '*quality appraisal*' highlights the most salient positive and negative points identified

from the application of the QAPAQ.

Table 3: *Methodology of each paper*

Acronym	Construct (How is exercise defined)	Theory	Scales of measure	Study population (Country, setting, n, M age, gender)	Format (n of questions, how administered)	How was PA measured	Quality appraisal
AESOP	Predicts exercise adherence to Home Exercise programme (HEP), strength and balance training exercises developed by physiotherapists.	Three social cognitive constructs.	Three scales: Self-efficacy expectations, outcome expectations, outcome expectancies.	Patients being discharged from a home health physical therapy in Mississippi, USA. $n = 50$, M age 79.9. Those with acute changes to medical status, ongoing contact with physical therapist, and auditory or visual difficulties were excluded.	42 items Administered during a face-to-face interview. Participants wrote their responses.	Adherence to the HEP PA programme was defined as performing the PA >3 times weekly.	The purpose of the PAQ as predicting home intervention adherence for OP discharged from physical therapy was clear. Not good ease of use, as the PAQ contained 43 items and was administered via interview.
ATES	Exercise is not defined.	Self-determination theory and amotivation theory.	Four scales: Capacity beliefs, outcome beliefs, effort beliefs, value beliefs.	Two samples were used: Calibration sample (CS) and validation sample (VS) CS participants were $n = 250$ Greek speaking individuals, M age = 70.06 ($SD = 4.72$), 46.7% men and 53.2% women. VS participants were $n = 300$ Greek speaking individuals, M age = 71.13 ($SD = 5.84$), 52.3% men and 47.7% women. Only inclusion criteria reported was not having done exercise for 6 months, as measured by the physical health activity questionnaire.	12 items with 3 per subscale. A 5 point Likert scale. Administered via interviews with OP by the researcher.	Perceived exercise competence was measured a subscale of the Physical Self-Perception Profile (Fox & Corbin, 1989). Other measures were attitude towards exercise, assessed through a single question, and intention for exercise involvement, measured by responses on three items.	The setting of PA was clearly defined as involvement in a specific intervention. Despite reporting demographics of participants in the validation study, it is unclear whether the PAQ was designed for a specific sample.

EBBS1	Not reported.	Health promotion model.	Two scales: Exercise benefits & exercise barriers.	North-East Mexican women, *n* = 329, *M* age 69 (*SD* = 5.44). Those without intact cognitive skills, as measured by Pfeiffer's questionnaire (1975), medical barriers to walking, or the ability to read or write were excluded.	43 item Likert scale with four response items. Benefits scale had 29 items, Barriers scale had 14 items.	Not reported.	All of the PAQ items, response options, and the subscale they belonged to were clearly reported. The construct of PA was not defined.
EBBS2	Not reported.	Health promotion model.	Two scales: Exercise benefits & exercise barriers.	OP treated at a basic unit for family health in Fortazela, Brazil. *n* = 214, *M* age 68, 77.1% female. Those experiencing physical or psychological discomfort were excluded.	Adapted version of the EBBS, with 42 items; Benefits scale had 28 items, Barriers scale had 14 items. Administered by a structured interview.	Self-reported "active lifestyle" and "practiced physical activity" during structured interview.	All of the PAQ items, response options, and the subscale they belong to were clearly reported. Although the paper used participants from Brazil, it did not note that validation would be for this population only.
FSMI-10	Exercise adherence.	Self-motivation.		Three cohorts (*n* = 471) were recruited: 1) Healthy adults (*n* = 189, *M* age 68.6, *SD* = 6.2, 122 women and 67 men) 2) OP referred through physical rehabilitation centre (*n* = 154, *M* age 64, *SD* 9.43, 98 women and 56 men). These OP had low back problems, or knee, shoulder or hip prosthesis. 3) Healthy OP enrolled to a preventative-medicine	Ten item 5-point Likert scale. Cohort 1) completed the questionnaire upon recruitment. Cohort 2) completed the questionnaire on entry into a supervised exercise programme. Cohort 3) completed the		The setting in which PA was measured, walking or swimming, was clearly defined. Although an overview of social learning theory was provided, and the differences between self-motivation noted, it was unclear why self-motivation would be superior to social learning theory.

				exercise programme (*n* = 128, age *M* 68.3, *SD* 7.4, 76 women and 52 men)	questionnaire upon enrolment into the programme, which consisted of walking or swimming three times a week for 45 minutes.		
GCEQ	PA included maintenance gymnastics, aerobics, water aerobics.	Self-determination theory.	Five factors: social affiliation, image, health management, social recognition and skills development.	Attendees of Senior Universities and day care centres in the regions of Ribatejo and Western regions of Portugal. *n* = 311, *M* age 68.63, 244 females and 67 males. No exclusion criteria reported.	20 item 7 point Likert scale. Administered in a "classroom context" with OP answering autonomously and anonymously.	PA frequency was reported. Unclear how this data was gathered.	The justification was well described, as the PAQ assessed the importance that individuals place upon their efforts, which extends upon other self-motivation theories. No information was provided regarding the interpretability of the PAQ.
MOEES	Walking.	Outcome expectations.	Three scales: physical outcome expectations, social outcome expectations, self-evaluative outcome expectations.	Sample of OP with physical and functional comorbidities living in retirement communities in Midwestern USA. *n* = 108, *M* age 85.4, 75% female 25% male. Those who did not pass a cognitive screening task (Pheiffer, 1975) were excluded.	15 item 5 point Likert scale. Physical outcome expectations had six items, social outcome expectations had four items, self-evaluative outcome has five items. Questionnaires were posted to participants.	Accelerometer, functional performance measured by the Short Physical Performance Battery (SPFB; Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995), and number of chronic conditions.	The target population of OP with physical and functional comorbidities was well defined. It is unclear whether the original PAQ was validated on a specific type of PA.

NEWS-A	Walking.	Environmental determinants of walking.	Six factors: Access to destinations, street connectivity, infrastructure for walking factor, aesthetics factor, traffic safety factor and personal safety factor.	Surveys sent to n = 3900 members of the Nurses Health Study cohort based in Massachusetts, California and Pennsylvania. n = 2920, M age 73 (SD = 6.9), 100% women, 97.3% white. Those unable to walk, lived in current location for <9 months, or lived in an institutional setting were excluded.	24 item, six factor questionnaire that was posted to OP.	Not recorded.	The PAQ was developed for females only, perhaps adding to its utility. Despite the PAQ being available in the appendices, no information was provided regarding scoring or interpretation.
NEWS-SC	Participation in a regular exercise programme; either walking, biking, jogging, swimming, resistive training for 20 minutes at least three times per week.	Environmental determinants of walking.	Modified Chinese version, with sixteen factors: Access to services, street connectivity, infrastructure for walking, indoor places for walking, physical and social disorder, aesthetics, crowdedness, presence of people, traffic and road hazards, crime, and six single item factors.	Sample of OP from four districts in Hong Kong. n = 484, age reported as 65+, 58% female and 42% male. Those unable to walk without assistance or with a reported cognitive impairment were excluded. n = 92 invited to retake the questionnaire two to three weeks later for test/retest reliability.	A 30 item sixteen factor four-point Likert scale. Interviewed administered.	Not recorded.	The setting of the neighbourhood environment was stated clearly, with good justification from literature. The final PAQ might not have good ease of use, as it contained 76 items.
OEE	Measured by asking OP how frequently they "exercise".	Outcome expectations.	Two scales: physical benefits and mental health benefits.	OP living in a continuing care retirement community in East coast of USA. n = 175, M age 85 (SD = 5.7), 78% female, 22% male.	A nine-item measure with a five point Likert scale. Administered in an interview format.	Asked about participation in regular exercise programme. Exercise behaviour was also measured	An overview of research suggesting that outcome expectations might be better predictors of PA than self-efficacy provided good justification.

				Those scoring <20 on the Mini Mental State Examination (Folstein, Folstein & McHugh, 1975) were excluded.		with the Yale Physical Activity Scale (YPAS; DiPietro, Casperson, Ostfeld, & Nadel, 1993). Reliability and validity reported.	The target population was defined as older adults, despite using adults from retirement communities as participants.
OEE-C	Adherence to PA, defined as participating in 20 minutes of walking two to three times per week.	Outcome expectations.	Not reported.	OP from a rural community in east Taiwan. $n = 200$, M age 77.1 ($SD = 5.77$), male 58.3%, female 41.7% Those with physical limitations that prevent walking excluded.	A nine-item modified Chinese version measure. Administered by a nurse researcher by interviews in OPs homes.	Regular exercise was defined as any form of PA three times a week for at least 20 minutes over the past 3 months.	A copy of the PAQ, including response options, was provided in the appendices for further use and dissemination. An adequate justification to validate the OEE for Chinese people was provided, though no reference to the OEE-2 was made.
OEE2	PA included playing table tennis, cycling, hiking, swimming and walking for 20 minutes on any single occasion.	Outcome expectations.	Two scales: Positive outcome expectations and negative outcome expectations.	OP living in a continuing care retirement community. $n = 161$, M age 88.6 (5.9 SD), 79% female and 21% male. Excluded if scored less than 20 on the Mini Mental State Exam (Folstein, Folstein, & McHugh, 1975).	A 13-item measure featuring a five point Likert scale. Administered by interviews by graduate nursing students.	Regular exercise defined as those exercising >60 minutes per week, at least 10 minutes per occasion. Information derived from interviews with OP.	A good justification to update the OEE was provided, as it did not have enough of a focus on negative outcome expectations. Despite validating on OP with a M age of 88.6 residing in retirement communities, it did not state that validation was intended for this population only.

SEE	Aerobic exercise, including walking, swimming, biking and jogging.	Self-efficacy.	OP living in a continuing care retirement community. *n* = 24, *M* age 81, 91% women and 9% men. Excluded if scored less than 20 on the Mini Mental State Exam (Folstein, Folstein, & McHugh, 1975).	A 13 item 10 point Likert scale. Administered by interview.	Verbal self-report by OP, confirmed with records kept by the walking programme coordinator.	A good theoretical justification was provided. Ease of use was unclear, as the PAQ was administered by interview.
SEE-C	PA included playing table tennis, cycling, hiking, swimming and walking for 20 minutes on any single occasion.	Self-efficacy.	Taiwanese OP (*n* = 192) with a *M* age of 71.2, 57.8% female and 42.2% male.	A nine item 10 point Likert scale. Collected by administration of a nurse practitioner.	OP rated their physical activity as one of: never, less than once a week, two-three times per week, or more than three times per week. Regular exercise was defined as any form of PA three times a week for at least 20 minutes over the past 3 months.	A copy of the PAQ, including response options, was provided in the appendices for further use and dissemination. The construct of PA was not well defined, as it included different activities including table tennis, cycling and walking.

Definition of construct. The first step in questionnaire development is to clearly define the construct that is being measured (DeVellis, 2017). A clearly defined construct allows validation of the questionnaire, whilst ensuring post validation that it is selected for the most appropriate purpose (Rennie & Wareham, 1998). Only four papers clearly defined their construct (AESOP, MOEES, NEWS-A, & OEE-C), whilst two did not state the type of PA that the PAQ was intended to measure (EBBS1 & EBBS2). The remaining seven papers included different types of PA, which restricts the specificity and future application, as determinants or barriers to PA are likely to differ based upon the nature of the activity.

Theoretical frameworks. Six of the included papers developed original PAQs (ATES, AESOP, NEWS-A, SEE, OEE, & OEE-2). Of these, three papers included the same co-author, who used self-efficacy theory as framework (SEE, OEE, & OEE-2), and gave a good overview of the model. Self-efficacy theory, outcome expectations, and outcome expectancies were used by the AESOP. The NEWS-A developed an abbreviated version of a pre-existing measure that looked at how perceptions of the built environment affected OPs PA. Despite referencing the original measure and its validity, no theory was reported. The ATES used self-determination theory (Ryan & Deci, 2000) and amotivation (Pelletier, Dion, Tuson, & Green-Demers, 1999), and provided a good overview of both theories.

Participants' demographics. The papers had a notable age range for their participants. The lowest was $M = 68$ (EBBS2) with the highest being $M = 88.6$ (OEE-2). In total, three studies (EBBS1, FSMI-10, & GCEQ) had M age within the 60s and four studies (MOEES, OEE, OEE-2, & SEE) had a M age within the 80s.

Two studies used exclusively female participants (EBBS1 & NEWS-A). The EBBS1 provided no theoretical justification, reporting that this was because participants were recruited from a community-based public centre for OP, where the majority of attendees were female. The NEWS-A recruited exclusively retired female nurses, as it was felt that they

could answer health-related questionnaires with relative accuracy. It is possible that their health-related profession resulted in a more favourable appraisal of PA than the general population, which likely introduced a significant response bias. It would also appear to restrict future application to females with a history of working within healthcare professions only. However, the NEWS-C used a translated and adapted version of this measure for their study, which included 42% males. Of the fourteen studies, four (MOESS, OEE, OEE-2, & SEE) recruited participants from retirement communities.

Exclusion criteria. No exclusion criteria were reported in three studies (FSMI-10, GCEQ, & SEE-C). Of the fourteen studies, six reported that those with cognitive impairment were excluded. The Mini-Mental State Exam (MMSE), a screen developed by Folstein, Folstein, and McHugh (1975) that has good reliability in validity in identifying cognitive impairment, was used in three studies (OEE, OEE-2, & SEE). Two of the studies (EBBS1 & MOEES) used the Short Mental Status Questionnaire (SMSQ), which is also a validated measure (Pfeiffer, 1975). The remaining study (NEWS-SC) relied upon self-report for cognitive impairment. Physical limitations represented an exclusion criteria for six studies (AESOP, EBBS1, EBBS2, NEWS-A, NEWS-SC, & OEE-C).

Translation of PAQs to English

In total, four papers translated a PAQ from English to a different language. Whilst ATES, GCEQ, EBBS1, and EBBS2 validated an English PAQ to respective populations, they used a version of the measure that had been translated to their native language in preliminary studies. The stages of these processes were not reported, but EBBS2 noted that no published psychometric properties were available for the Spanish version used. The WHO (2018) provide a method of translation for questionnaires that is displayed in Table 4.

Table 4: *WHO guidelines for translation and adaptation of instruments*

Step	*Description of each step*
1. Forward translation	A translator should strive for a conceptual equivalent of the text, rather than a literal translation. They should be equipped with interview skills and preferably be a health professional.
2. Expert panel	The translated questionnaire should be reviewed by a bilingual expert panel to identify discrepancies between the forward translated questionnaire, and the original version. The panel should include experts in the areas of interest and in questionnaire design and translation.
3. Back translation	Step one should be repeated, with the questionnaire being translated back to its original language by an independent translator.
4. Pre-testing and cognitive interviewing	A minimum of 10 respondents' representative of the target population should be used. They should be asked for their views on the wording.
5. Final version	Completion of the above stages should result in the final version of the questionnaire.
6. Documentation	Completion of the above stages should be outlined in appropriate documents.

Table 5 provides an overview of the translation process reported by the papers, using the stages recommended in the method proposed by the WHO. Steps 5 & 6 were excluded from the quality appraisal, as they did not appear to be relevant to processes reported within the literature.

Table 5: *Stages of translation of the PAQ*

Paper	Forward translation	Expert panel	Back translation	Pre-testing and cognitive interviewing
FSMI-10	No initial translation reported.	Three bilinguals independently translated the questionnaire. Their profession and role in the research was unreported. A comparison was made with a French-Canadian version.	The PAQ was back-translated, but no mention of who did this and whether they were independent.	No feedback from individual's representative of the population was reported.
NEWS-SC	Two bilingual Chinese speakers familiar with physical activity and urban planning. Two independent bilingual experts in study development assessed the accuracy.	A panel of professionals ($n = 3$ public health, $n = 1$ urban planning, $n = 3$ physical activity) reviewed the English and Chinese versions of the PAQ. This resulted in modifications to 14 response options, and three original items. Eleven items were added to the measure to reflect the built environment in Hong Kong. Five newly developed items were added to the PAQ that were thought to be important to OP. Response options were modified for more appropriate language.	Undertaken by a different translator with no knowledge of the original questionnaire.	Pre-tested on $n = 50$ of a representative sample. Participants were asked to verbalise their thought process and were asked questions regarding the meaning, choice of word, and appropriateness of the items. This information was used to modify the pilot version of the PAQ.
OEE-C	Reported the use of a bilingual translator, though their profession and role in the research was unreported. The focus was on conceptual equivalence.	The forward translation was the focus of a "a series of meetings", with a focus on conceptual equivalence. Two bilingual public health and gerontology professionals were consulted regarding the wording and phrasing.	A different back translator was used, though their role and profession was unreported. The back translated version was then compared with the original version.	The translated measure was piloted on $n = 22$ OP living in a nearby community. One item required further elaboration, but it is not reported whether this item was modified.
SEE-C	Two bilingual public health and gerontology professionals were consulted regarding the wording and the phrasing. This resulted in the wording of two items in the translated scale being amended.	Following "a series of meetings" between the study team, a modified Chinese version was developed.	No back translation reported.	The translated measure was piloted on $n = 22$ OP living in a nearby community. No information regarding this piloting procedure, or outcomes, were reported.

One paper (NEWS-SC) reported a translation process as comprehensively as the WHO recommend, and therefore the procedure appears robust. Information reported in FMSI-10 was relatively sparse, with only two steps referenced, while omitting salient factors such as the profession and role of the translator, their relationship to the research, and whether a piloting procedure was done. The methodology described in OEE-C and SEE-C were similar, perhaps owing to both papers having the same co-author who used comparable processes. The SEE-C, however, made no reference to back translation or how the information derived from the piloting process was used.

Psychometric Properties and their Evaluation

This section will provide an overview, and evaluation, of the reliability, factorial validity, and validity of the PAQs. This will be followed by a visual overview of the reported psychometric properties.

Reliability. For a measure to be reliable the scores should represent the variable being explored, with scores on a perfectly reliable measure being a reflection of the true score and no additional factors (DeVellis, 2017). Internal consistency is a form of reliability that explores the homogeneity of items within a measure. Chronbach's alpha (α) provides a well-established method of measuring internal consistency. An α of 0.7 or greater is recommended, as this indicates that 70% of the variance of a score is systematic, with the remaining 30% being random errors (Nunally & Bernstein, 1994). An alternative method of internal consistency, using a squared multiple correlation coefficient (R_2), can also be used. The R_2 differs from the α, as it provides an estimate of the systematic variance of a score that can be explained by each item (Bollen, 1989). The amount of variance accounted for by each item should ideally be at least 50%, or .5 (Bagozzi & Yi, 1988). Table 6 displays an overview of the α and R_2 reported by each paper.

Table 6: *Reliability of PAQs*

Paper	Measure	α	R₂ for each item
ATES	Capacity beliefs scale	$\alpha = .94$	
	Outcome beliefs scale	$\alpha = .97$	
	Effort beliefs scale	$\alpha = .92$	
	Value beliefs scale	$\alpha = .98$	
	Full measure	*Not reported*	
EBBS1	Benefits scale	$\alpha = .96$	
	Barriers scale	$\alpha = .72$	
	Full measure	*Not reported*	
EBBS2	Benefits scale	$\alpha = .93$	
	Barriers scale	$\alpha = .87$	
	Full measure	$\alpha = .94$	
FSMI-10	Full measure on all groups	$\alpha = .83$	
	Elderly rehabilitation	$\alpha = .80$	.31, .43, .55, .57, .58, .67, .69, .71, .76, .81
	Elderly community	$\alpha = .87$	.46, .47, .49, .51, .54, .60, .60, .61, .61, .70
	Elderly prevention	$\alpha = .84$	.32, .35, .35, .39, .41, .44, .52, .52, .54, .60
GCEQ	Social affiliation	$\alpha = .76$	
	Image	$\alpha = .76$	
	Health management	$\alpha = .83$	
	Social recognition	$\alpha = .87$	
	Skills development	$\alpha = .78$	
MOEES	Physical	$\alpha = .75$	
	Social	$\alpha = .82$	
	Self-evaluative	$\alpha = .84$	
	Full measure	*Not reported*	
NEWS-A	Street connectivity-m	$\alpha = .57$	
	Infrastructure for walking	$\alpha = .81$	
	Traffic safety	$\alpha = .75$	
	Personal safety	$\alpha = .81$	
	Aesthetics	$\alpha = .77$	
	Access to destinations	$\alpha = .80$	
OEE	Full measure	$\alpha = .87$	.33, .41, .41, .41, .44, .61, .62, .63, .68
OEE-C	Full measure	$\alpha = .85$	.24, .27, .24, .27, .28, .33, .35, .37, .61, .72
OEE-2	Positive outcome expectations	$\alpha = .93$	.37, .41, .50, .50, .50, .57, .57, .57,
	Negative outcome expectations	$\alpha = .80$	.60, .69, .71, .82, .83
SEE	Full measure	$\alpha = .92$	Range of $0.38 - 0.76$
SEE-C	Full measure	$\alpha = .75$	Range of $0.15 - 0.36$

An α reliability of >.70 was reported for all six papers that used this statistic on the full measure. Three of the papers reported the α for individual domains of the PAQ without reporting the α for the full measure (EBBS1, OEE-2, & MOEES). The α of the OEE-C (α = .85) was reported to be similar of the English version (α = .89).

Seven of the papers reported the α of individual domains of the respective PAQ, with five of the papers reporting an α of >.70 for all domains. The NEWS-A reported one domain, street-connectivity-m, with an α of <.70.

The SEE reported a range of R_2 without providing results for each item, but it noted that three items had a coefficient <.50. Similarly, the SEE-C reported a range, but all of the items fell below .5, providing limited evidence of reliability. The OEE featured just four of nine items with R_2 greater than .5. For the OEE-2, two of seven items were <.50 for positive outcome expectations, while all six items for negative outcome expectations were >.50, suggesting better internal consistency for the negative outcome expectations items. The OEE-C did not fare as well as the OOE-2, as seven of the nine overall items had an R_2 of <.50. The FSMI-10 reported the R_2 for the three individual groups the PAQ was tested on, with elderly rehabilitation displaying the best internal consistency, as it was the lone population without an R_2 <.50. It did not report the R_2 for the overall population.

Three of the papers reported test-retest reliability (AESOP, EBBS2, & NEWS-C). AESOP reported that self-efficacy expectations and outcome expectations demonstrated test-retest reliability, whilst outcome expectancies did not. The EBBS2 reported good test-rest reliability, whilst NEWS-SC reported moderate reliability, with four items (out of 30) having poor reliability.

Factorial validity. A primary function of factor analysis in the design of measures is to determine the number (n) of latent variables that underlie a set of items (DeVellis, 2017). Confirmatory factor analysis (CFA) requires that the researcher has expectations regarding

the n of factors, which variables reflect the factors, and whether they are correlated (Thompson, 2004). The larger the probability associated with the chi square (χ_2), the better the model fits to the data (Bollen, 1989). Whilst the χ_2 can evaluate the comparative fit of nested models, it is not good at evaluating the fit of single models (Thompson, 2004). As a result, other measures of fit have been developed. Owing to the limitations of χ_2, the current review will focus upon other measures of fit. Table 7 provides an overview of the measures that were used in the papers included in the current review, and the value literature recommends that suggests good fit.

Table 7: *Measures of fit used for the PAQs*

Acronym	Fit index	Function	Recommended value of good fit
CFI	Comparative fit index	Assesses the model fit relative to a baseline, or null independence, model (Thompson, 2004).	>.95 indicates good fit (Hu & Bentler, 1999)
GFI	Goodness fit indices	Measure of fit between the tested model and the observed covariance matrix (Baumgartner & Hombur, 1996).	>.90 indicates good fit (Hooper, Coughlan, & Mullen, 2007)
NFI	Normed fit index	Compares the χ_2 of the tested model against the χ_2 of the baseline model, presuming that the variables are independent (Thompson, 2004).	>.95 indicates a reasonable fit (Thompson, 2004)
NNFI	Non-normed fit index	Similar to NFI, but attempts to resolve issues of negative bias (Tucker & Lewis, 1973).	>.95 indicates reasonable fit (Hu & Bentler, 1999)
RMSEA	Steigers root mean error of approximation	Estimates how well the model parameters reproduce the population covariances (Thompson, 2004).	<0.6 indicates reasonable fit (Hu & Bentler, 1999)
RMSR	Root mean square residual	Square root of the discrepancy between the sample covariance matrix and the model covariance matrix. This range is based upon the scales of indicators within the model (Hooper, Coughlan, & Mullen, 2007).	<.10 indicates good fit, whilst <.05 indicates very good (Loehlin, 1998)
SRMR	Standard root mean squared residual	When a model is rejected by χ_2, SRMR can be used to establish the approximate fit (Hu, & Bentler, 1999).	<0.08 indicates a good fit (Hu & Bentler, 1999).

The GFI can be prone to bias (Bollen, 1990) and as such it has been recommended that it should not be used as fit indices (Sharma, Mukherjee, Kumar, & Dillon, 2005). Table 8 displays the eleven papers that used CFA, in addition to the reported values of the respected fit indices as displayed in Table 7.

Table 8: *Factorial validity of PAQs*

Paper	X2	df	X2 df	CFI	GFI	NFI	NNFI	RMSEA	RMSR	SRMR
ATES	154.61	48		.98a			.97a	.086		
EBBS1										
Benefits	362.57		6.25		.99a		.99a		0.22a	
Barriers	216.8		2.82		.67		.67	.07		
FSMI-10	197.1	80		.90				.06		
GCEQ				.93				.057a		.049a
MOEES	68.54	51		.97a				.60		
NEWS-A	1313.07	137		.94			.92	.05a	.05a	
NEWS-SC	358.3	217		.89				.037a		0.067a
OEE	50	20				.98a		.08		
OEE-C	60.92	27	2.26	.99a		.98a		.108		
OEE-2	167.3	64				.88a		.08		
SEE-C	45	27	1.67			.90		.059a		

a = indicates good fit

The EBBS1 reported a good fit for all indices of the benefits domain (GFI = .99; NNFI = .99; RMSR = .22), but the barriers domain had a poor fit for all indices (GFI = .67; NNFI = .67; RMSEA = .22). The EBBS1 was the lone paper to report the GFI, which can be prone to bias (Bollen, 1990), and perhaps detracts from the reported good fit. The FSMI-10 did not have a good fit in either indices (CFI = .90 and RMSEA = .6), but both were marginal. The OEE reported a good fit for NFI (= .98) but not for RMSEA (= .08). The OOE-C reported a similar fit to the OEE, with support described as "*acceptable*" owing to the NFI = .98 and CFI = .99, with a RMSEA = .108 described as "*marginal*". The nine PAQ items described 40% of the variance. The OEE-2 reported "*some evidence of validity*", highlighting the NFI = .88 and RMSEA of .08, despite the latter not being in the range indicative of reasonable fit (<0.06). The SEE-C reported a fair model fit, using the NFI = .90 as support, despite this value being <.95. The MOEES reported an "*excellent*" fit to the data, with CFI = .97 and a RMSEA on the borderline of 0.6. This was following the deletion of three items of factor loadings <.50 which initially resulted in a poor fit. The GCEQ reported good fit for RMSEA (= .57) and SRMR (= .049) with a marginal CFI (= .93). Despite the CFA suggesting adequate fit, the authors contend that the majority of cut-off values are too conservative, and suggest a CFI >.90 should suffice. A good fit was also reported in ATES, with CFI = .98 and NNFI = .97. The NEWS-A reported an "*acceptable*" fit, despite two of four fit indices suggesting good fit. The NEWS-C described the factorial validity as "*sufficient*", with RMSEA and RMSR suggesting a good fit.

Validity. Validity explores whether the variable is the cause of covariation in an item, to ensure that the variation in score can be attributable to the measured phenomenon (DeVellis, 2017). Construct validity explores whether scores on the new measure correlate with scores on similar measures (Bollen, 1989). Another type of validity is criterion validity,

which requires either an item or scale to have an empirical association with a '*gold standard*'

criterion (DeVellis, 2017). Table 9 displays the reported validity of the PAQs.

Table 9: *Validity of the PAQs*

Reference	Type of validity check	Other measures	About other measure	Factors	Statistics
AESOP	Spearman Rho was used to examine how scores on the AESOP correlated with scores with another questionnaire.	Short Form Health Survey (SF-12; Ware, Kosinski, & Keller, 1996)	No description provided	SF-12 Physical component & Self-efficacy expectations of AESOP	*rs* = .13
				SF-12 Physical component & Outcome expectations of AESOP	*rs* = -0.01
				SF-12 Physical component & Outcome expectancies of AESOP	*rs* = -.04
				SF-12 Mental component & Self-efficacy expectations of AESOP	*rs* = 0.01
				SF-12 Mental component & Outcome expectations of AESOP	*rs* = -0.06
				SF-12 Mental component & Outcome expectancies of AESOP	*rs* = -0.09
EBBS2	Association between personal and clinical aspects and EBBS score, with information gathered from self-report forms.	Level of education Physical activity practice	Self-report form Self-report form	Level of education & benefits scale of EBBS	*p* = 0.02
				Physical activity practice & benefits scale of the EBBS	*p* = 0.0001
				Level of education & barriers scale of the EBBS	*p* = 0.0001
				With whom the OP resides & barriers scale of the EBBS	*p* = 0.032
				Lifestyle & barriers scale of the EBBS	*p* = 0.0001
		Marital status, occupation, with whom the OP resides, income, weight, height, body mass index, blood pressure, random glucose level, activity or sedentary, regular physical activity practice, smoking, alcohol consumption, mobility difficulties, chronic degenerative pathologies, and falls.	Self-report form	Each personal and clinical aspect & benefits scale of EBBS	No associations
				Each personal and clinical aspect & barriers scale of EBBS	No associations

FSMI-10	Correlation with other measures of exercise adherence.	Stage of Exercise Change Questionnaire (SECQ; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997)	Exercise adherence	SECQ & FSMI-10	Positively correlated
		The Decisional Balance Inventory (Prochaska et al., 1994)	Pros and cons of exercising	Pros of exercising & FSMI-10 Cons of exercising & FSMI-10	Positively correlated Negatively correlated
		EQ-5D (Brooks, Rabin, & de Charro, 2003)	Perceived quality of life	EQ-5D & FSMI-10	Positively correlated
SEE	Structural equation modelling was used to explore whether scores on another measure of exercise could significantly predict SEE scores.	SF-12 (Ware, Kosinski, & Keller, 1996)	12 item measure exploring health dimensions influencing exercise. Reliability and validity reported.	SF-12 & SEE	$F = 78.8a$
SEE-C	Pearson's correlation coefficient was used to explore whether scores on the measure and perceived health correlated.	Participants self-rated their perceived health as 'very good', 'good', 'poor', or 'very poor', and their health compared to peers as 'better than average' or 'worse than average' based on measures used by Mason-Hawkes and Holm (1993).	Based on research suggesting that self-efficacy expectations are more likely to be observed in individuals with good health.	Perceived health and SEE-C score	$r = -0.17a$
	Multiple regression was used, with four variables (age, gender, education year, and perceived health) as predictors of SEE-C score. Age, gender and education were controlled for to see if perceived health	Participants self-rated their perceived health as 'very good', 'good', 'poor', or 'very poor', and their health compared to peers as 'better than average' or 'worse than average' based on measures	Based on research suggesting that self-efficacy expectations are more likely to be observed in individuals with good health.	Perceived health and SEE-C score	$F = 3.43a$

	significantly predicted SEE-C score.	used by Mason-Hawkes and Holm (1993).			
	SEE-C score was also included as a predictor of physical activity.	Physical activity	Participants classified as regular exercisers were classified as those who self-reported engaging in PA 3 times a week for a minimum of 20 minutes each occasion, and maintaining this behaviour for a minimum of three months.	SEE-C score as a predictor of physical activity.	$r = 0.46a$
MOESS	Prediction of scores using multiple regression.	Actigraph accelerometer	Objective information regarding the amount, frequency and duration of PA.	Actigraph & physical domain of MOEES	$r = .30b$
				Actigraph & self-evaluative domain of MOEES	$r = .21a$
				Actigraph & social domain of MOEES	$r = .04$
		Number of chronic conditions	Participants asked to self-report whether they have any of 17 identified chronic conditions.	MOESS & self-report conditions	$r = -.05$ to $-.07$
		Short Physical Performance Battery (SPPB; Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995)	Measures standing balance, gait speed, and chair-stand ability.	SPPB & physical domain of MOEES	$r = .37b$
				SPPB & self-evaluative domain of MOEES	$r = .25b$
				SPPB & social domain of MOEES	$r = 0.1$
OEE	Prediction of scores using multiple regression.	SEE	Measure that focuses on difficulties with engaging with PA for OP. Reliability and validity reported.	SEE & OEE	$r = .66a$
OEE-C	Prediction of scores using multiple regression.	Physical activity	OP were asked how often they exercised and the frequency,	M hours exercise & OEE-C	$r = .33b$

			providing a calculation of M hours.		
		SEE-C	Explores self-efficacy expectations relating to confidence when facing barriers. Validated in Chinese sample.	OEE-C & SEE-C	$r = .34b$
OEE-2	Prediction of scores using multiple regression.	SEE	Measure of self-efficacy expectations related to the OPs ability to continue exercise when facing barriers.	POEE & SEE NOEE & SEE OEE-2 & SEE	$r = .69a$ $r = .61a$ $r = .71a$
		Yale Physical Activity Scale (YPAS; DiPietro, Casperson, Ostfeld, & Nadel, 1993)	Interviewer administered PAQ looking at typical types of exercise performed within a week.	YPAS & POEE YPAS & NOEE YPAS & OEE-2	$r = .32a$ $r = .34a$ $r = .38a$

$a = p <0.5$
$b = p <0.1$

The SEE reported evidence of construct validity, as scores on the Short Form Health Survey (Ware, Kosinski, & Keller, 1996) significantly predicted self-efficacy scores and accounted for 30% of the variance in exercise activity. However, the SEE-C had weak construct validity, as despite a statistically significant correlation between SEE-C score and perceived health, it accounted for only 15.1% of the variance. The OEE reported a statistically significant correlation with self-efficacy expectations, which provided evidence of construct validity. Criterion-related validity was supported in the OEE-C, as outcome expectations were related to the hours of exercise per week. However, PA was reported using self-report measures, rather than an objective measure, such as an accelerometer. Exercise self-efficacy was also related to outcome expectations. The OEE2 reported evidence of convergent validity, as both scales in the PAQ were significantly related to self-efficacy expectations. The MOEES reported evidence that more active OP, and those with higher self-efficacy, reported more positive physical and self-evaluative outcomes to exercise participation.

The EBBS2 reported that the benefits scale had associations with levels of education and physical activity practice, whilst the barriers scale had associations with levels of education, with whom the OP resides, and lifestyle. However, values were not reported for these associations. Additionally, no objective measures, or previously validated PAQs, were used in the validation process. The FSMI-10 reported correlations between the PAQ and pros and cons of exercising, exercise adherence, and quality of life. However, it neglected to report the values for these apparent correlations. The AESOP found no correlation between scores on their self-efficacy expectations, outcome expectancies, or outcome expectations scales and either scale of the Short Form Health Survey (Ware, Kosinski, & Keller, 1996). It also reported that their PAQ did not predict exercise adherence. Validity was not reported in the NEWS-CS, EBBS1, or NEWS-A.

Summary of psychometric properties. A visual overview of the reported psychometric properties of each PAQ is displayed in Table 10. Green indicates that *all results* from a given analysis displayed good fit or significance, yellow indicates that *some* analyses did, red indicates that *none* did, and grey indicates that *analysis was not undertaken*. Good fit or significance is defined using the recommended CFA values displayed in Table 7, an α of 0.7 or greater, an R_2 value of .5>, and validity of $p <0.5$.

Table 10: *Visual overview of reported psychometric properties*

Paper	Reliability (Chronbach's α)	Reliability (R_2)	Factorial validity	Validity
AESOP	grey	grey	grey	red
ATES	green	grey	yellow	grey
EBBS1	green	grey	yellow	grey
EBBS2	green	grey	grey	yellow
FSMI-10	green	yellow	red	green
GCEQ	green	grey	yellow	grey
MOESS	green	grey	yellow	yellow
NEWS-A	yellow	grey	yellow	grey
NEWS-CS	grey	grey	yellow	grey
OEE	green	yellow	yellow	green
OEE-C	green	yellow	yellow	green
OEE2	green	yellow	yellow	green
SEE	green	yellow	grey	green
SEE-C	green	red	yellow	green

Discussion

Lack of Definition of Exercise

Guidelines regarding PA for OP, such as those by the NHS (2018b), include a number of recommended activities requiring different demands. For example, walking may require less energy expenditure than riding a bike, water aerobics requires access to such facilities,

and some might inherently involve social interaction whilst others might not. It is therefore possible that each specific PA presents its own unique factors that act as determinants or barriers. This highlights the importance of the construct of PA being clearly defined, as in addition to allowing appropriate validation of a measure, it allows the PAQ to be selected for an appropriate purpose (Rennie & Wareham, 1998). Of the fourteen papers, just four clearly defined PA, whilst five neglected to report the type of PA that the PAQ was intended to measure. PA interventions should be planned effectively and creatively, as certain types of PA are not suitable for all OP, and interventions should be enjoyable for each individual (McAuley, Szabo, Gothe, & Olson, 2011). It therefore appears pertinent that further PAQs are developed for specific activities, rather than considering PA as a single construct.

Reporting of Participant Demographics

It has been argued that definitions of OP span more than one generation (Neugarten, 1974). This is a limitation of the current review, as the definition of OP used as those aged 65 and older takes a heterogeneous sample and implies homogeneity. This is highlighted by the *M* age of participants in the literature varying between 68 and 88.6. The caution of applying findings to different ages was highlighted within some papers, such as the SEE, which featured *M* age of 85 and recommended further validation studies on OP aged 65-75. However, even with age accounted for, it should be noted that chronological age is a poor predictor of outcomes and attributing specific features of health to OP could be inappropriate (Rook et al., 2011).

Two studies used exclusively female participants (EBBS1 & NEWS-A). Whilst it could be argued that the determinants and barriers affecting participation in PA differ between male and female OP, no theoretical justification was provided by either paper. Rather, both reported that it was owing to access to participants.

Three papers used participants with physical difficulties (AESOP, FSMI-10, & MOEES) whilst four recruited from retirement communities (MOEES, OEE, OEE2, & SEE). Whilst this could improve the clinical applicability, as it is validated for specific populations, it is important that this restriction is recognised within the paper. The AESOP and MOEES made clear that the validation was specific to their population, whilst the FSMI-10, OEE, OEE2, and SEE used language that implied validation for OP living in the community and without physical difficulties.

Translation Procedures

Whilst four papers translated a PAQ from English to a different language, only one, the NEWS-SC, reported an exceptional translation process. However, this PAQ used the less robust test-retest as a reliability measure, and its factorial validity did not meet an acceptable level of goodness of fit, perhaps detracting from this robust procedure.

Theoretical Frameworks

Given that empirical literature has identified social influences as an important determinant of PA for OP, with 62% of OP highlighting social support as a key factor to participation (Franco et al., 2015) and social interaction being identified as an important factor in PA interventions (Devereux-Fitzgerald et al., 2016), it is perhaps unsurprising that the majority of PAQs used social cognitive models as their theoretical base. Specifically, seven of the PAQs used constructs deriving from social learning theory (Bandura, 1977), which has been identified as the most widely used measure of PA and its outcomes (McAuley & Blissmer, 2000). However, there are a number of experimental studies that have failed to find an association between either PA initiation or maintenance for OP (van Stralen et al., 2009), which questions the decision to include self-efficacy as the lone, or dominant, theory for PAQs. It is perhaps surprising that the identified papers did not use a wider range of models, such as the TPB (Ajzen, 1991), which has been partially supported as a predictor of

PA in younger adults (Bozionelos & Bennett, 1999). Only ATES referenced multiple theories in the development of their PAQ.

Outcome expectations was the theoretical underpinning of four papers. The OEE PAQ was updated to the OEE-2 by the original authors, owing to a lack of focus in the original PAQ on negative outcome expectations. Whilst the α of the negative outcome expectations was not as strong as the positive outcome expectations scale, more R_2 values were >.5. Despite the relatively encouraging reliability and validity, OEE-C used the initial version of the PAQ, despite OOE-2 being published six years previously. Additionally, the OEE PAQ was originally developed on OP aged 85 living in retirement communities and, as such, should be used on similar populations. The OEE-C attempted to validate the PAQ on OP living in the community, which could partly explain why its reliability was limited.

Psychometric Properties

Whilst the reporting of the validation procedures tended to be robust, there were some notable omissions in the reporting of relevant values, in addition to some values that suggested either poor, or marginal, reliability and validity.

The reported α for all full measures was good, being >.70. The NEWS-A was the lone paper that reported an α of <.70 for a subscale, but all other subscales in the included papers displayed good internal consistency. Six papers reported R_2 values with four (FSMI-10, OEE, OEE-C, & OEE-2) listing the values for each item, whilst two (SEE & SEE-C) provided a range. The FSMI-10 listed the R_2 values by the elderly rehabilitation, elderly community, and elderly prevention groups. The elderly prevention group had six of ten items with R_2 values <.50, whilst the others had two and three respectively. This suggests that reliability was best within a specific group. The reliability of the remaining PAQs was limited, with the negative outcome expectations scale of the OEE-2 having an R_2 >.5 for all items, and the positive outcome expectations scale featured six of eight with acceptable

reliability. The SEE featured three items with $<.5$ $R2$. The other three PAQs (OEE, OEE-C, & SEE-C) had either the majority, or all items, $<.5$.

Eleven of the papers reported criterion or construct validity. The AESOP reported no correlation with scores on any of their three subscales to either scale of a validated measure of health, whilst also not predicting exercise adherence. There was good validity for both OEE and OOE-C, however the OOE-C used self-report to measure PA, rather than the use of a more objective measure, such as an accelerometer. Two papers, FSMI-10 and EBBS2, reported good validity without presenting respective values. In addition to OEE, MOEES and SEE reported evidence of construct validity. However, despite the SEE reporting a statistically significant correlation, it only accounted for 15.1% of the variance.

Of the eleven papers that reported CFA, authors tended to report "*acceptable*" fit. This included the FSMI-10, which reported acceptable evidence despite neither index displaying a good fit. The GCEQ was similar, as authors argued that the accepted cut-off value was too conservative and that their marginal value should be deemed sufficient. It should, however, be noted that the other two indices displayed a good fit. The OEE-C also reported a relatively encouraging fit, with two of three falling within an acceptable range. The claims of an "*acceptable*" fit by the NEWS-A (two of four displaying a good fit), NEWS-C (two of three displaying a good fit), and the OEE and OEE-2 (one of two displaying good fit) could also be appraised as appropriate. The EBBS1 reported a good fit for the benefits domain, but they used the GFI, which is prone to bias (Bollen, 1990). As such, the reported findings should be questioned.

Summary of the Quality of PAQs

AESOP did not find a relationship between the PAQ, using social cognitive theories, and PA in OP living in the community. Other PAQs drawing upon social cognitive theories reported better findings. The SEE reported good internal consistency, but some items

accounted for less than .5 of the variance and CFA was not reported. The SEE-C did report fair model fit in CFA, but it had weak construct validity, and was unclear regarding their back-translation and piloting procedure. OEE reported good internal consistency, internal reliability and acceptable factor validity, but used participants from retirement communities without acknowledging this validation was regarding this population of OP only. The rationale for the development of the OEE-2 was a lack of focus on negative outcome expectations, but the α of this added scale was not as robust as the positive scale and, as such, did not report good factor validity. Despite a relatively good translation process, OEE-C used the original OEE PAQ, without rationale as to why this was selected over the OEE-2. Its psychometric properties were relatively similar to the OEE. The final PAQ drawing upon social cognitive theory, MOEES, clearly defined the construct of PA and had good internal consistency, and reported good factorial validity, suggesting that it could be a reliable and valid measure for OP with physical health difficulties in retirement communities.

Of the two PAQs measuring environmental factors, neither reported a theoretical framework. Whilst both the NEWS-A and the NEWS-C reported good internal consistency, one scale of the NEWS-A had an $\alpha < .70$. Factor validity for the NEWS-A was questionable, whilst the NEWS-C had sufficient factor validity. Participants in the NEWS-A were restricted to females only, without a theoretical justification which restricts its clinical utility, but the NEWS-SC reported a robust translation process.

There was poor factorial validity for the EBBS1, whilst PA was not clearly defined. This was also true for EBBS2, which did not report factorial validity and did not include any standardised measures in its validation process. Good factorial validity and internal consistency were reported in GCEQ, but no exclusion criteria were reported. Similarly encouraging internal consistency and factorial validity were reported in ATES, but this paper did not include a definition of PA. Despite "*acceptable evidence*" being reported by the

FSMI-10, internal consistency, especially within the elderly prevention group, was poor, and factorial validity was marginal. Table 11 provides a summary of the most pertinent strengths, and limitations, of each PAQ.

Table 11: *Strengths and limitations of each PAQ*

Paper	*Strength(s) of PAQ*	*Limitation(s) of PAQ*
AESOP	The PAQ was designed for a specific purpose, which was adherence to a strength and balance training programme designed by physiotherapists. Multiple theoretical frameworks were used in the development.	The PAQ displayed poor validity. Reliability and factorial validity were not reported.
ATES	All four subscales had good internal reliability and the measure had acceptable factorial validity.	The type of PA that the PAQ was intended to measure was not reported.
EBBS1	Both the benefits and barriers scale had good reliability.	The type of PA that the PAQ was intended to measure was not reported. Participants were all female, with no theoretical justification reported.
EBBS2	The benefits and barriers scale, and the full scale, had good reliability.	The type of PA that the PAQ was intended to measure was not reported.
FSMI-10	The type of PA that the PAQ intended to measure was clearly defined.	The PAQ had marginal factorial validity. No exclusion criteria were reported.
GCEQ	The justification for the development of the PAQ was well described, as it extended upon other self-motivation theories. All five of the subscales had good reliability, and the PAQ had acceptable factorial validity.	No exclusion criteria were reported.
MOESS	The target population of OP with physical and functional comorbidities was well defined.	

	The type of PA, walking, that the PAQ intended to measure was well defined.	
	It was made clear that validation was specific to the population of OP with physical and functional comorbidities living in retirement communities.	
NEWS-A	The type of PA, walking, that the PAQ intended to measure was well defined.	No theoretical frameworks that influenced the PAQ were reported. Participants were all female, with no theoretical justification reported.
NEWS-CS	A comprehensive translation process was reported.	The final PAQ might not have a good ease of use, as it contained 76 items.
OEE	The PAQ had good reliability and validity, and acceptable factorial validity.	Participants were recruited from retirement communities, without acknowledging that validation was regarding this population of OP only.
OEE-C	The type of PA, walking, that the PAQ intended to measure was well defined. The PAQ had good reliability and validity, and acceptable factorial validity.	An adequate justification to validate the OEE for Chinese people was provided, though no reference to the OEE-2 was made.
OEE-2	A good justification to update the OEE was provided, as it did not have enough of a focus on negative outcome expectations.	Participants were recruited from retirement communities, without acknowledging that validation was regarding this population of OP only.
SEE	A good theoretical justification for the development of the PAQ was provided.	Ease of use of the PAQ was unclear, as the PAQ was administered by interview.

		Participants were recruited from retirement communities, without acknowledging that validation was regarding this population of OP only.
SEE-C	The PAQ had acceptable factorial validity.	No exclusion criteria were reported.
		The construct of PA was not well defined, as it included different activities including table tennis, cycling and walking.
		The PAQ had limited evidence of reliability.

It is recommended that further validation is required for PAQs that displayed promising psychometric properties, such as the ATES, MOEES, OOE-2, and GCEQ. More contemporary validation, featuring more robust reporting of methodological procedures, with specific PA being measured on homogenous OP populations, could possibly improve clinical utility.

The Need for PAQ Development within UK Populations

None of the PAQs in the current review were developed or validated within the UK context. There is a need for such a measure owing to the recent focus within healthcare and policy on the benefits of PA for OP, with social prescribing representing an avenue for OP to access such interventions or programmes. One such programme is Walking for Health, whose developers have worked with local Clinical Commissioning Groups to implement walking interventions for inactive individuals, or those with long-term health conditions (Walking for Health, 2017).

The growing focus upon the benefits of PA for OP is exemplified by recent systematic reviews exploring the experiences of OP and identifying determinants and barriers to participation, such as those by Franco et al. (2015) and Devereux-Fitzgerald et al., (2016). However, despite the knowledge base growing regarding factors affecting participation, of the fourteen included studies in the current review, five were developed and validated more than ten years ago, and just three were published within the past five years. There appears to be a need to develop PAQs exploring the experiences of OP that act as determinants or barriers to PA within the UK context, as this could strengthen programmes used in social prescribing, while drawing upon empirical literature that was unavailable at the time when the PAQs within the current review were developed.

Conclusion

Despite some of the papers reporting acceptable reliability and validity for their respective PAQs, few of the papers can report robust psychometric properties. Additionally, there were some notable methodological flaws, perhaps the most significant being the frequent omission of an operationalised definition of PA, with some papers neglecting to elaborate upon merely "*exercise*". Unclear exclusion criteria, and how PA was measured, also restrict the clinical applicability of these PAQs.

There is a wide range of empirical literature that highlights the positive benefits of PA for OP, with contemporary literature focusing upon qualitative methodologies to better understand the experiences of OP themselves. With the developing recognition of the need for healthcare, social, and third sector services to develop, shape, and refer to services that can facilitate wider engagement in PA, it appears important that more up-to-date PAQs are developed and validated. It is recommended that the process of development should incorporate the beliefs and experiences of OP, whilst clearly defining the specific PA being measured. If such a PAQ is developed, it could influence the structure of PA interventions, whilst strengthening a cost-effective intervention that could improve the physical and mental health of an aging population, help to tackle the issue of social isolation and sedentary behaviour, and help to make healthcare services more sustainable.

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Section B

The development of the Determinants and Barriers to Walking for Older People Scale (DABWOP-S)

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Abstract

Objective: Despite a recent focus upon the promotion of walking owing to its physical and mental health benefits, there is no appropriate measure that explores the determinants and barriers of walking for older people.

Method: Interviews were conducted with 19 older people to generate an initial item pool, which was supplemented with relevant literature. A preliminary scale was developed, with a two-part preliminary piloting procedure that reviewed the initial items and domains.

Results: The preliminary measure contained 73 initial items and 15 proposed initial domains. The development procedure suggested that the measure has acceptable face and content validity. These stages resulted in the development of the Determinants and Barriers to Walking for Older People Scale (DABWOP-S).

Conclusions: Following a future psychometric evaluation, it is hoped that the DABWOP-S will result in a greater understanding of the determinants to walking for older people to shape social prescribing practices and walking programmes.

Keywords: Walking, older people, determinants, scale, development.

Despite the many known benefits of physical activity for older people (OP), only 58% of men and 52% of women aged 65-74 within the United Kingdom (UK) meet the recommended levels (Townsend, Wickramasinghe, Williams, Bhatnagar, & Rayner, 2015). Walking represents an appropriate physical activity to promote to help OP meet the recommended levels, as it is accessible irrespective of an individual's gender, ethnicity, education, or income (Lee & Buchner, 2008). There have been recent initiatives within the UK to promote walking for OP, including Walking for Health and social prescribing. However, despite these initiatives, the number of walks taken by people aged over 70 appears to be declining (Department for Transport, 2018). The development of an appropriate measure of the determinants and barriers to walking for OP could help to understand what makes it easier and harder for OP to regularly walk. This information could be used to shape interventions to make them more enjoyable or accessible to OP, whilst at an individual level helping professionals to identify the most appropriate referral for a person based upon their individual needs.

Recommended Levels of Physical Activity for Older People

It is recommended that OP, defined as somebody aged 65 or older by the UK's National Health Service (NHS; 2018a), should partake in a minimum of 150 minutes of '*moderate physical activity*' per week (NHS, 2018b). Recommended activities included: *walking*, *water aerobics*, *ballroom and line dancing*, *riding a bike*, *playing doubles tennis*, *canoeing* and *volleyball*. However, in 2016, just 44% of people over 65 in England met these guidelines (Scholes, 2017). Figures from 2012 suggest that this number decreases with age, as 58% of men and 52% of women aged 65-74 met the guidelines compared to 36% of men and 18% of women aged 75 and older (Townsend et al., 2015).

Of the recommended physical activities, it appears appropriate to focus upon the promotion of walking, as it represents an effective and easily accessible form of exercise (de

Moor, 2013). Additionally, OP may be less confident than younger people in initiating a new form of physical activity (Newsom, Kaplan, Huguet, & McFarland, 2004).

The Benefits of Walking for Older People

A longitudinal study including people over 65 found that earlier levels of walking contributed significantly to life satisfaction (Morgan & Bath, 1998). A study looking at moderately depressed OP reported that there was a significant reduction in depressive symptomatology for those participating in a walking programme rather than wait-list control (McNeil, LeBlanc, & Marion, 1991). In addition to mental health benefits, a prospective cohort study reported an association between people over 80 walking for an hour a day and being less likely to die from any cause (Landi et al., 2008). These benefits highlight the importance of promoting walking for OP.

Walking Programmes

Recent initiatives have focused on promoting the benefits of walking for OP. The UK population of OP is projected to increase by 23.9% between 2016 and 2046 (Office for National Statistics, 2017). This is likely to lead to considerable demand on healthcare provision for this cohort, in the face of reduced funding opportunities for the NHS. Walking for Health are England's largest network of health-based walking programmes (de Moor, 2013). In a 2016 survey of 400 such schemes, 75% reported a '*formal*' link with health professionals, with 10.7% of attendees being referred by health professionals (Walking for Health, 2019). These referrals could have derived from social prescribing, which expands the options available to general practitioners when the difficulty appears to originate from psychosocial issues (Brandling & House, 2009). For those who may not want to join a walking programme, AGE UK (2019) have published recommendations to help OP increase walking '*a little every day*', suggesting methods such as '*walk to the shops instead of driving*'.

Despite these initiatives, the average number of walks of over a mile taken by people aged over 70 within a year in the UK has decreased from 53 in 2003 to around 40 each year between 2008 and 2017 (Department for Transport, 2018). This apparent reduction in walking, coupled with a recent focus upon referrals to walking programmes in social prescribing, highlights the necessity to better understand the determinants and barriers to walking for OP. There are a number of theoretical models that can inform this.

Application of Theoretical Models

For behavioural change to be successful, a theoretical underpinning is required prior to the development of interventions (Bartholomew, Parcel, Kok, & Gottlieb, 2011). Two '*key theories*' recommended by the National Institute for Health and Care Excellence (NICE; 2007) are self-efficacy (Bandura, 1997) and the theory of planned behaviour (TPB; Ajzen, 1991).

Bandura (1977; 1997) describes two types of self-efficacy expectations. The first is the belief an individual has that they are capable of performing a specific behaviour, known as '*self-efficacy expectations*'. One study, a self-efficacy based intervention on OP post cardiac event, reported an increase in distance walked (Allison & Keller, 2004). However, whilst self-efficacy has been associated with exercise programme initiation, it was unclear whether this resulted in long-term maintenance for adults with a *mean* (*M*) age of 54 (McAuley, Lox, & Duncan, 1993). The second type is '*outcome expectations*', where the individual holds the belief that a specific behaviour will result in a desired outcome. Outcome expectations have been reported as a necessary, but not sufficient, criterion as initiation is unlikely to occur unless an individual believes the behaviour is sustainable (Wójcicki, White, & McAuley, 2009).

The TPB (Azjen, 1991) represents another commonly applied theoretical model to behavioural change interventions (Glanz & Bishop, 2010). The TPB postulated that

behavioural intentions were predicted by three different variables: '*attitude towards behaviour*' (ATB), whether the behaviour-specific appraisal is positive or negative, '*subjective norm*' (SN), the perceived social pressure to perform the behaviour, and '*perceived behavioural control*' (PBC), the perceived ease or difficulty of the specific behaviour. Whilst ATB and SN have been shown to be a valid predictor of exercise behaviour in people aged 60 and older (Courneya, Nigg, & Estabrooks, 1998), in OP only PBC was found to be a predictor of exercise initiation (Brenes, Strube & Storandt, 1998). It appears that a large proportion of physical activity behaviour for OP is unexplained by the TPB model (van Stralen, De Vries, Mudde, Bolman, & Lechner, 2009).

It has been proposed that the inclusion of planning with behavioural intention could result in an increased likelihood of implementation (Gollwitzer & Sheeran, 2006). One theoretical model incorporating planning is implementation intention, which increases the probability of a behaviour being performed by linking it to behavioural cues (Gollwitzer, 1999). Planning has been found to facilitate physical exercise in people aged 55-64 (Scholz, Sniehotta, Burkert, & Schwarzer, 2007). However, it is recognised that there are multiple influencing factors regarding engagement in regular physical activity for OP (Thornton et al., 2017).

Systematic Reviews of Determinants and Barriers to Physical Activity

A review of 38 studies found that group-based walking interventions for OP can result in increased walking, but these changes are frequently short-lived (van der Bij, Laurant & Wensing, 2002), suggesting that there are influencing determinants, or barriers, that may not be accounted for.

A systematic review synthesising the determinants and barriers to physical activity engagement for people aged 60 and over, that included 132 studies involving 5987

participants, was published by Franco et al. (2015). Six major themes, each including several subthemes, were identified. These themes are presented in Table 1.

Table 1: *Determinants and barriers identified by Franco et al. (2015)*

Theme	*Subthemes*
Social influences	
	Valuing interaction with peers
	Social awkwardness
	Encouragement from others
	Dependence on professional instruction
Physical limitations	
	Pain or discomfort
	Concerns about falling
	Comorbidities
Competing priorities	
Access difficulties	
	Environmental barriers
	Affordability
Personal benefits of exercise	
	Strength, balance and flexibility
	Self-confidence
	Independence
	Improved health and mental well-being
Motivation and beliefs	
	Apathy
	Irrelevance and inefficacy
	Maintaining habits

These themes appear consistent with multiple theoretical frameworks. Some seem to fall within the TPB (Azjen, 1991) framework, as '*social influences*' could be consistent with SN, '*access difficulties*' could be consistent with PBC and '*motivation and beliefs*' could be consistent with ATB. Additionally, '*physical limitations*' could be consistent with self-efficacy expectations (Bandura, 1977; 1997) and '*perceived benefits of exercise*' with outcome expectations (Bandura, 1977; 1997). The '*maintaining habits*' subtheme could fit within implementation intention (Gollwitzer, 1999). A review by Devereux-Fitzgerald,

Powell, Dewhurst, and French (2016) found that OP place a low value upon physical activity itself, whilst a systematic review and synthesis by McGowan, Devereux-Fitzgerald, Powell, and French (2018) reported that the vulnerabilities of aging compromise OPs' desire for autonomy. These reviews seem to suggest that there are multiple determinants and barriers to physical activity, and that the application of a single theoretical framework may not encapsulate all relevant factors.

The Need for a Measure

NICE (2012) recommend that barriers to walking programmes should be addressed, and the use of a measure appears to be an appropriate method, as they are cost effective, quick to complete, and easy to analyse (Bowling, 1997). Within developed measures, the term '*physical activity*' is often not clearly defined, as homogeneity is frequently assumed regarding different activities. The Self-Efficacy for Exercise Scale (SEE; Resnick & Jenkins, 2000) and the Outcome Expectations for Exercise Scale-2 (OEE2; Resnick, 2005) represent two measures developed with the theoretical underpinning of self-efficacy (Bandura, 1977; 1997). However, the SEE accounted for just 15.1% of variance in exercise behaviour, whilst OEE2 displayed poor internal consistency on its positive outcome expectations scale. A review of the literature identified just one questionnaire, the Neighbourhood Environment Walkability Scale-Abbreviated (Starnes et al., 2014), that was developed exclusively for walking. This scale, however, solely measures environmental factors. There has been no measure that has been developed specifically within the UK context.

The Present Study

Literature has highlighted the positive effects that walking has on the physical and mental health of OP, which appears to have influenced the development of a number of walking interventions that can be accessed through social prescribing. However, group based

walking programmes can result in short lived changes, and people over 70 appear to be walking less than they were 15 years ago (Department for Transport, 2018).

The present study aimed to complete the initial phases of developing a measure of determinants and barriers to walking for OP. A greater understanding of what makes it easier, and harder, for OP to walk could help to shape interventions offered through social prescribing to make walking more enjoyable, and beneficial, for OP. At an individual level, it could also help health professionals to determine the type of referral that could be most appropriate for a person based upon their own individual needs. Based on the psychometric principles (DeVellis, 2017), the following stages were planned to develop the measure:

- determination of the construct of the measure;

- generation of an initial item pool from elicitation interviews with OP;

- reduction of the initial item pool;

- determination of the measurement format;

- construction of a preliminary measure;

- a two-part preliminary piloting procedure involving a small number of participants.

The above stages of development were intended to provide a substantial qualitative grounding to produce a preliminary measure that would then be ready to undergo a robust statistical evaluation of its psychometric properties in a future major research project.

Method

Design

Because the developed measure would contain a collection of items regarding unobservable theoretical constructs pertaining to individual OP, the type of measurement format was a scale (DeVellis, 2017). As such, the design followed the stages of scale development recommended by DeVellis (2017), outlined within the above section. Whilst

these stages were adhered to, they were not approached in a linear fashion, as overlap occurred between stages.

Materials

A semi-structured interview schedule (Appendix A) was designed to facilitate the generation of the initial item pool. This included open-ended questions about OPs' beliefs about engaging in regular walking, and what makes it easier or harder to engage in regular walking. Prompts were influenced by relevant literature that included expected outcomes (Bandura, 1977; 1997), the beliefs of others (Ajzen, 1991), participation of others (Franco et al., 2015), environmental factors (Starnes et al., 2014), and competing priorities (Franco et al., 2015). The interview schedule was developed in collaboration with the two research supervisors, before a review by the chairperson of a local walking group, which resulted in amendments to its content.

Participants

Participants were aged 65 or older, to remain consistent with the NHS (2018a) definition of OP. However, age cut-offs within definitions have been described as arbitrary (Kowal & Dowd, 2001). For example, the Outcome Expectations for Exercise Scale (Resnick, Zimmerman, Orwig, Furstenburg, & Magaziner, 2000) was developed with an eligibility criteria of 65 years or older, but the *M* age of participants was 85. The current definition of OP includes more than one generation (Neugartern, 1974), and would exclude participants aged just below the cut-off, whose experiences might be more similar to the rest of the population than somebody aged 85, who would fit the NHS (2018a) definition.

Those with a known disability that prevented walking were excluded, as were OP with a diagnosed organic neurological condition. This was owing to their potentially more complex physical and emotional presentations, which potentially makes them a distinct subgroup for which additional factors may be relevant.

In total, *number* (*n*) = 19 OP took part in elicitation interviews as part of the item generation stage. The first part of the piloting procedure featured *n* = 23 participants, including *n* = 10 who did not participate in the item generation stage. The second part of the piloting procedure featured *n* = 6 participants. Further demographic information is provided in the results section.

Ethical Approval

The study was granted full ethical approval by Canterbury Christ Church University's Salomons Ethics Panel (Appendix B). A declaration of the completion of the study was submitted (Appendix C) in addition to a summary of the study and its findings that was disseminated to participants (Appendix D).

Procedure

Determination of the construct. An important step in determining the construct is to identify the boundaries of the measured phenomena (DeVellis, 2017). The current scale was developed for intended use within healthcare settings for OP who are not meeting the recommended guidelines of 150 minutes of moderate physical activity per week (NHS, 2018b). The measured constructs were determinants and barriers to walking for OP. The background construct of walking to be measured by the scale did not include activities of daily living, such as shopping or housework, as this is considered insufficient to raise an individual's heart rate (NHS, 2018b). It included brisk walks, defined as approximately 3 miles per hour, for a minimum of 10 minutes per occasion (NHS, 2016).

Research exploring behavioural change for physical activity should distinguish between '*initiation*', defined as behaviour occurring within the previous six months, and '*maintenance*' (van Stralen et al., 2009). As the scale was developed for OP not meeting physical activity guidelines, the focus was upon initiation. Whilst there are pre-existing measures developed to explore factors underpinning physical activity for OP, homogeneity is

assumed regarding determinants and barriers for different types of physical activity, resulting in a lack of specificity. This highlights the need for the development of a measure specifically developed for walking for OP.

It was anticipated there would be multiple domains that act as determinants or barriers to the initiation of walking, resulting in the construct being multidimensional. Several theoretical frameworks were anticipated to underpin the relevant domains, including self-efficacy theory (Bandura, 1977; 1997), TPB (Azjen, 1991) and implementation intentions (Gollwitzer, 1999). Whilst the domains would relate to walking, they would each represent a separate construct that would fall under the category of either a determinant or barrier to the initiation of walking. As the scale would contain multiple constructs, rather than a single construct related to the initiation of walking, they might not covary in the way that a unidimensional scale might (DeVellis, 2017).

Item generation.

Recruitment for elicitation interviews. Whilst the scale was developed for the initiation of walking, participants were recruited from walking groups, as those who currently walked could provide rich data regarding both the determinants and barriers. An online database that listed all walking groups across a mostly rural area of England, with provincial towns and small villages, was used to access contact information for those that welcomed OP.

In total, $n = 47$ walking groups were identified and the respective chairperson was e-mailed an overview of the research, with $n = 7$ walking groups used for recruitment. A purposive sample was used that included a range of OP from different contexts who could provide differing perspectives. The chairpersons were sent an information sheet (Appendix E), and the recruitment procedure was mutually agreed and included the dissemination of a research poster (Appendix F), an e-mail from the chairperson to their members, and an

overview published in a monthly newsletter. Those interested in participation were requested

to e-mail the principal researcher, before being provided the information sheet and given the

opportunity to ask questions over the telephone. They were given at least 24 hours to make a

decision before being provided with a consent form (Appendix G).

Elicitation interviews. The elicitation interviews were conducted over the telephone

at a time convenient for the participant. As it is important that responses to semi-structured

interviews are presented verbatim in the analysis (Saks & Allsop, 2013), they were recorded

using digital audio recording equipment. The audio recordings and resultant transcripts were

stored on a password protected encrypted memory stick that was only available to the

principal researcher. Although there has been variability in the definition of '*data saturation*'

within literature (Saunders et al., 2018), it has been defined by Fusch and Ness (2015) as

being met when no new data is being reported in interviews, as this likely means no new

codes or new themes. Grady (1998) recommended that when the same comments are being

provided during multiple interviews that data collection should be stopped and data analysis

should commence. The recruitment procedure continued until '*data saturation*', as defined by

Fusch and Ness (2015), and Grady (1998), was met.

Potential risk of harm. The semi-structured interview included questions that were

not anticipated to be emotive or distressing. However, participants were provided with the

telephone number for a 24-hour voicemail phone line and were encouraged to leave a

message for the principal researcher if any concerns arose. This phone line was not used.

Determination of measurement format. This step occurred simultaneously with the

generation of initial items to ensure compatibility. The wording of the initial items appeared

to fit declarative statements, so a Likert scale was selected, where response options formed a

continuum where the respondent could report the extent to which they agreed with each

statement. Although the number of response options was not thought to affect reliability and

validity of a scale (Matell & Jacoby, 1971), a six-point Likert scale was used as it can provide higher reliability values than a five-point scale (Chomeya, 2010).

Generation of initial items and domains. The procedure of item generation has frequently been overlooked in literature developing measures of determinants and barriers to physical activity for OP. Resnick (2005) reported that it was based on "*qualitative findings*", whilst others relied upon combining other standardised scales (Vlachopoulos & Gigoudi, 2008) or combining qualitative and quantitative studies (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). A combination of inductive and deductive approaches was used to generate the initial item pool.

An inductive approach was taken during the elicitation interviews, as initial items were generated from individual responses (Hinkin, 1995). Initial items were generated by applying the six phases of thematic analysis (TA) recommended by Braun and Clarke (2006), as they appeared congruent to the stages of scale development recommended by DeVellis (2017). TA is not a term for a singular approach, but rather it is regarded as an umbrella term that encapsulates many approaches sharing common assumptions (Clarke & Braun, 2018).

The audio recordings were transcribed, and re-read multiple times whilst noting patterns, to follow '*Phase 1*' of '*familiarising yourself with the data*'. '*Phase 2*' was '*generating initial codes*', where relevant quotations were highlighted in the transcripts. This process was considered congruent with the stage recommended by DeVellis (2017) of '*generating an initial item pool*'. Once relevant quotations were identified, preliminary items were generated next to the text, with some combined where there appeared to be a shared meaning to form initial items. DeVellis (2017) recommends a large pool to allow for some having poor internal consistency, with Kline (2003) recommending it being twice as large as the final scale.

A deductive approach was used to supplement the initial item pool with items from pre-existing scales (Hinkin, 1995). Literature was deemed appropriate if it developed, or validated, a measure of the determinants and/or barriers to exercise for OP, with a sample consistent with the present study's inclusion criteria (outlined in '*participants*' section).

Where applicable, wording was amended in order to avoid exceptionally lengthy items, in line with Oppenheim's (1992) recommendation that they should be 20 words or fewer. Items should not be double-barrelled (Bowling, 1997), so some initial items were amended to reflect this.

'*Phase 3*' of TA was '*searching for themes*', where the analysis shifted to sorting codes, or initial items, into the broader level of themes. For the current analysis, the focus was on identifying initial domains that appeared to reflect determinants and/or barriers to walking. This was completed in collaboration with the two research supervisors by sorting the initial items into separate domains. This was followed by '*Phase 4*: *reviewing themes*', where in traditional TA themes are collapsed owing to similarity, or broken down into separate themes. The review of domains was completed as part of the preliminary piloting procedure. This was deemed sufficient, as a further evaluation of the initial domains will be undertaken with a more robust psychometric evaluation as part of a future research project. '*Phase 5: defining and naming themes*' appeared to be more relevant to the future research project, and '*Phase 6*' was '*producing the report*'.

Reduction of items. Initial items should be reviewed by one or more groups of experts to assess quality (Worthington, & Whittaker, 2006). The initial item pool was reviewed by the two research supervisors to maximise content validity of the scale. The second review of the initial items was undertaken by OP as part of the piloting procedure. This was consistent with the recommendation that the review of items should be undertaken by both experts and the target population (Boateng, Neilands, Frongillo, Melgar-Quińonez, & Young, 2018).

Administering items to a development sample. The preliminary piloting procedure consisted of two parts, which are outlined below.

Preliminary piloting part one: initial item pool. The preliminary scale was piloted with a sample of OP. A purposive sample of $n = 13$ participants from the elicitation interviews were selected to participate in the first part of the preliminary piloting procedure. A further $n = 10$ OP were recruited who did not take part in the elicitation interviews. The inclusion criteria and recruitment procedure for these participants were the same as the elicitation interviews.

Participants were sent the piloting form (Appendix H) through their choice of the post, with a pre-paid envelope to return the form, or via e-mail. The form requested participants to complete the preliminary scale, before completing free text response boxes that featured questions related to ease of completion, wording and relevancy of the items, and whether any important areas were omitted. The inclusion of free text response boxes can be especially useful in scale development, as they can identify items for future inclusion and poorly worded items (Rattray & Jones, 2007).

Preliminary piloting part two: review of domains. Guidelines for piloting primarily focus upon the initial items rather than initial domains of the scale. However, Carpenter (2018) recommends using a panel to review the wording, and the extent to which they agree with, the domains. Participants from the first part of preliminary piloting were asked if they were willing to participate in part two, with $n = 6$ consenting. They were sent the final list of initial items categorised under the initial domains and asked to comment on the wording of the domain, and to decide whether each initial item fitted under the domain, with response options being '*yes*', '*unsure*' or '*no*' (Appendix I). A free text box was provided following each item for the participant to report where they believed the item would better fit.

Results

This section will present results to be broadly consistent with the stages recommended by DeVellis (2017). An overview of the demographics and walking behaviour of participants from the elicitation interviews will be presented, before the stages of generating an initial item pool, determination of measurement format and rewording of items, item reduction and searching for domains, and the two-part preliminary piloting procedure featuring a review of the initial items and a review of the initial domains.

Generation of Initial Items and Domains

Elicitation interviews. The entirety of the elicitation interviews with OP were conducted over the telephone and ranged from 20-35 minutes in duration. The demographics of the $n = 19$ OP that participated in the elicitation interviews are displayed in Table 2.

Table 2: *Demographics of elicitation interview participants*

Gender	Male	9
	Female	10
Age M (SD)		70.21 (3.97)
Ethnicity	White British	19

The participants were recruited from $n = 7$ different walking groups. Participants were asked about the walking group they were a member of, and the approximate distance they tended to walk with the group. Table 3 displays the distance each participant walked and the frequency of group attendance.

Table 3: *Walking group membership of elicitation interview participants*

Distance walked*1*	0-2 miles	0
	3-5 miles	4
	6-10 miles	7
	11-15 miles	3
	16-20 miles	0
	Over 20 miles	1
Frequency of attendance*2*	Weekly	3
	Every other week	4
	Twice monthly	0
	Monthly	8
	Rarely	2

1 If participants provided a range, the larger number was used for analysis.
2 If participants were members of two groups, frequency of attendance was measured by combing the two groups.

Despite recruitment taking place through walking groups, one participant stated that they were no longer a member of any walking group, whilst another, despite being a member, chose not to attend scheduled walks. Distance walked was not provided by two participants.

The generation of the initial item pool. The elicitation interviews were transcribed by the principal researcher and read multiple times for familiarisation with the data. Quotations within the transcriptions that appeared to be relevant to determinants and/or barriers to walking were highlighted within the text, with preliminary items drafted in a column next to the text. An example of this process was generating the preliminary item '*I am aware of available support to help me walk more*' from an excerpt from the transcript stating "*I know that if I wanted to go on more group walking that there's loads around, health walks and ramblers' groups et cetera*". A full transcript is available in Appendix J.

Once all of the transcripts were analysed the preliminary items were extracted and put into a spreadsheet to facilitate further analysis (Appendix K). This stage resulted in $n = 323$ preliminary items, but those that appeared to share meaning were combined, resulting in initial items. An example of this process is displayed in Table 4.

Table 4: *Example of the combination of items*

Preliminary items	Initial item
Walking can be linked to my other interests	Walking should be linked to an activity that I enjoy
Walking should be enjoyable	
I walk as part of other activities	
I enjoy looking at architecture while I walk	
Whilst walking I like the freedom to do other activities	
Having dogs makes walking more enjoyable	
Walking is secondary to other activities	
It is enjoyable having an activity linked to walking	
I like to take photographs during a walk	
I enjoy looking at gardens	

Following the generation of the initial item pool from the elicitation interviews, this was supplemented with items derived from literature that appeared relevant to determinants and/or barriers to walking for OP. Literature was selected where the participants met the inclusion criteria for the current research. Table 5 provides an overview of these additional initial items and the measure from which they were sourced.

Table 5: *Items from relevant literature used in the initial item pool*

Author(s)	Measure	Item
Vlachopoulos & Gigoudi (2008)	Amotivation Towards Exercise Scale	I am absolutely convinced that exercise will not make me feel better
		I am absolutely convinced that I will not manage to cope with the requirements of an exercise programme
		I do not wish to coordinate my life to regularly attend an exercise programme
		I do not see any value in exercise
Victor, Ximenes, & Almeida (2011)	Exercise Benefits / Barriers Scale	Exercise improves my cardiovascular system
		My spouse does not encourage exercise
		Exercise is a good way for me to meet people
André & Dishman (2012)	French Self-Motivation Inventory-10	When I achieve a goal, I set a higher one
		I have a lot of self-motivation
		I have a lot of willpower
Starnes et al. (2014)	Neighbourhood Environment Walkability Scale Abbreviated	There are many places to go within easy walking distance of my home
		There are many interesting things to look at while walking in my neighbourhood
Resnick (2005)	Outcome Expectations for Exercise Scale-2	Exercise helps me feel less tired
		Exercise helps to strengthen my bones
		Exercise is something I avoid because it causes me to be short of breath

These initial items derived from literature that specified theoretical frameworks.

These included social learning theory (Bandura, 1977; 1997) in the Exercise

Benefits/Barriers Scale (Victor, Ximenes, & Almeida, 2011), self-efficacy theory (Bandura,

1977; 1997) from items featured in the Outcome Expectations for Exercise Scale-2 (Resnick,

2005), self-determination theory (Ryan & Deci, 2000) and amotivation (Pelletier, Dion, Tuson, & Green-Demers, 1999) from the Amotivation Towards Exercise Scale (Vlachopoulos & Gigoudi, 2008), self-motivation (André & Dishman, 2012), and environmental factors (Starnes et al., 2014).

Determination of measurement format and rewording of items. Following a review of the initial items, it appeared that they tended to fit declarative statements, which indicated that a Likert scale was an appropriate measurement format. The initial items were reviewed to ensure that they fitted the response options of '*strongly disagree*', '*moderately disagree*', '*mildly disagree*', '*mildly agree*', '*moderately agree*' and '*strongly agree*', and those that did not appear to fit were reworded. An important stage in scale development is the specified time frame for the items (DeVellis, 2017). As behavioural change is a dynamic process, with an individual oscillating between stages (Sutton, 2005), the current scale requested OP to respond based upon their present beliefs or experiences, as walking appeared to be a transient phenomenon.

The wording of each initial item was amended to ensure that it was no longer than 20 words (Oppenheim, 1992) with minimal polysyllabic words (DeVellis, 2017). Initial items deriving from the elicitation interviews and relevant literature were part of this procedure. An example rewording of an initial item to appropriate language, and to reflect the purpose of the scale, was amending the original initial item '*I am absolutely convinced that I will not manage to cope with the requirements of an exercise programme*' to '*I would not manage to cope with a walking programme*'.

A large initial item pool is recommended by DeVellis (2017), as this will allow for some items having poor internal consistency. The initial item pool consisted of $n = 121$ items.

Item reduction and searching for domains. The initial item pool consisting of $n = 121$ items was then reviewed in collaboration with the two research supervisors to maximise

content validity of the scale, with two purposes to this stage of the development. The two supervisors were asked to review the '*relevancy to the construct*', '*clarity*' and '*conciseness*' of the initial items (DeVellis, 2017). Where there appeared to be an overlap of meaning, multiple initial items were collapsed into a single item, which is congruent with the '*Phase 2: Generating initial codes*' stage of TA (Braun & Clarke, 2006). One item was removed, as it did not appear to reflect the purpose of the scale. This stage resulted in the initial item pool being reduced from $n = 121$ to $n = 69$.

The second purpose was to meet the '*Phase 3: searching for themes*' stage of TA (Braun & Clarke, 2006). All initial items were printed on cards and manually sorted into piles of initial domains. These were provisionally reviewed by considering Patton's (2002) recommendations of '*internal homogeneity*', where the data within a theme should fit together meaningfully, and '*external heterogeneity*', where there should be a clear distinction between the themes. Table 6 displays this stage of item reduction and search for initial domains. The original items and amended items are grouped together to display where original items were collapsed into the resultant amended items.

Table 6: *Initial items and initial domains following elicitation interviews*

Initial domains	Original items (n = 121)	Amended items (n = 69)
Conflicting priorities	1. I have a lot of time available for myself	1. I have control over my own time
	2. I have control over my own time	
	3. I have the freedom to pursue activities that I enjoy	
	4. I am being selfish if I do something for my own pleasure	2. I am being selfish if I do something for my own pleasure
	5. I have other interests that take priority over walking	3. Other parts of my life take priority over walking
	6. Other parts of my life take priority over walking	
	7. I do not wish to coordinate my life to regularly attend a walking programme	
	8. I am too busy to add activities to my week	4. I have too many responsibilities to start something new
	9. I have too many responsibilities to start something new	
	10. I have to consider others before I do something for myself	5. I have to consider others before I do something for myself
	11. Caring responsibilities make it hard to make time for myself	
Concerns about safety	12. I do not feel safe when I am out alone	6. I do not feel safe when I am out alone
	13. I feel safer in a group of people	
	14. I am worried about verbal abuse in my community	7. I am worried about who I might meet when I am out alone

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Energy as a barrier	15. As I get older I have to reduce my physical activity	8. I am aware of my energy declining as I age
	16. I am aware of my energy declining as I age	
	17. I am not fit enough to increase my physical activity	9. I do not have the energy to increase my walking
	18. I run out of energy quickly	
	19. I do not have the energy to increase my walking	
	20. I am absolutely convinced that I will not manage to cope with a walking programme	10. I would not manage to cope with a walking programme
General motivation	21. I am an adventurous person	11. I like taking on new challenges
	22. I like new challenges	
	23. I like to set myself targets to achieve	
	24. I like the feeling I get when completing a challenge	12. I like the feeling I get when completing a challenge
	25. I have a lot of self-motivation	13. I have a lot of self-motivation
	26. I have a lot of willpower	
	27. I am determined to complete a task even when met with a barrier	14. I try to complete a task even when met with a barrier
	28. I own appropriate clothing to walk more	
	29. I do not like being outside in bad weather	
	30. When I achieve a goal, I set a higher one	15. When I achieve a goal, I set a higher one

	31. I do not do activities that I used to enjoy	16. I do not do activities that I used to enjoy
	32. I am more likely to complete a task if somebody else suggests it	17. I am more likely to complete a task if somebody else suggests it
Need for tranquillity	33. I do not like being in busy places	18. I do not like being in busy places
	34. I like walking in inner city locations	
	35. I enjoy being out in the fresh air	19. I enjoy being out in the fresh air
	36. I enjoy being surrounded by nature	
	37. I enjoy peace and quiet	20. I enjoy peaceful environments
	38. I enjoy peaceful environments because they give me time to think	
Need to keep busy	39. Walking would help to keep me active	21. Walking would help to keep me active
	40. I have always been an active person	22. I am somebody who likes to be on the move
	41. I like to keep myself busy	
	42. I am somebody who likes to be on the move	
	43. I believe that I am walking enough	23. I believe that I am walking enough at present
	44. I used to walk more than I do now	24. I used to walk more than I do now
	45. I try to go for a walk whenever I can	25. I try to go for a walk whenever I can

	46. I would prefer to walk rather than use transport	26. I would prefer to walk rather than use transport
	47. You should walk at a certain pace to get any benefits	27. You should walk at a certain pace to get any benefits
	48. I find the idea of walking long distances off-putting	28. I find the idea of walking off-putting
	49. I do not see the benefit of walking short distances	
Outcome expectations positive mood	50. I feel better after I have been active	29. When I walk I find that it lifts my mood
	51. I notice that I feel good after walking	
	52. When I walk I find that it lifts my mood	
	53. Physical activity improves my mood	
	54. Walking could provide an escape from day-to-day life	30. Walking provides an escape from my responsibilities
	55. Walking helps me to clear my mind	
	56. Walking helps me to manage stress	
	57. I am able to relax in my spare time	*Item deleted – too broad*
	58. Exercise helps me to feel less tired	31. Walking helps me to feel less tired
	59. I am absolutely convinced that exercise will not make me feel better	32. Walking will not make me feel better
	60. I have always enjoyed walking	33. I have always enjoyed walking
	61. I find the idea of exercise to be boring	

Perceived control for walking	62. There are many interesting things to look at while walking in my neighbourhood	34. There are many interesting things to look at while walking locally
	63. I can easily get to places to walk	35. I can easily get to places I would like to walk in
	64. I can get to places I would like to walk in	
	65. I do not know of any places to walk locally	36. I do not know of any places to walk
	66. There are many places to go within easy walking distance of my home	37. I can easily think of places to walk
	67. I do not enjoy walking locally	
Physical expectations negative	68. Walking is something I avoid because it makes me short of breath	38. I avoid walking because it makes me short of breath
	69. I am worried about falling	39. I am worried that I might hurt myself whilst walking
	70. I am worried I might hurt myself whilst walking	
	71. Walking might be painful	
	72. My health restricts what I can do	40. My health restricts what I can do
Physical expectations positive	73. Walking improves my cardiovascular system	41. I would like to improve my physical fitness
	74. I would like to improve my physical fitness	
	75. I would describe myself as physically fit	
	76. Walking would help to keep me fit	42. Walking would help to keep me fit

	77. Regular physical activity helps me to sleep better	43. Regular physical activity helps me to sleep better
	78. I am concerned about letting my body decline	44. I am concerned about letting my body decline
	79. As I get older I would like to preserve my health	45. As I get older I am becoming more health conscious
	80. As I age I am becoming more health conscious	
	81. It is important for me to prolong my active life	
	82. It is important for me to maintain my mobility	46. It is important for me to maintain my mobility
	83. It is important to keep using my muscles	
	84. Walking helps to strengthen my bones	47. Walking helps to strengthen my bones
	85. Managing my weight is important to me	48. Managing my weight is important to me
	86. Walking more could help me recover from aches and pains	49. Walking more could help me recover from aches and pains
Perceived support for walking	87. My spouse does not encourage walking	50. My spouse does not encourage walking
	88. I am aware of available support to help me walk more	51. I am aware of available support to help me walk more
	89. I feel more confident if I do a task with others	52. Support from others is important when I start a new task
	90. Support from others is important when I begin something new	

Spontaneity	91. It is important to have structure to my week	53. It is important to have structure to my week
	92. It is important for me to plan activities	54. I like to know the plans of an activity in advance
	93. I like to know the plans of an activity in advance	
	94. I find it difficult to commit to plans in advance	
	95. If I make plans I stick to them	55. If I make plans I stick to them
Walking needs a purpose	96. I do not see any value in exercise	56. I do not see any value in walking
	97. If I go for a walk there should be a specific purpose to it	57. If I walk there should be a specific purpose to it
	98. An enjoyable activity should have an end product	
	99. Walking should be linked to an activity that I enjoy	58. Walking should be linked to an activity that I enjoy
	100. It is important to enjoy my surroundings during a walk	59. It is important to enjoy my surroundings during a walk
	101. I would like to meet like-minded people	60. I would like to meet more people in my community
	102. I would like more opportunities to talk to people	
	103. I would like to meet more people in my local community	
	104. I do not know many people in my local community	
	105. Walking is a good way for me to meet new people	61. Walking is a good way to meet new people

	106. I enjoy being with a group of people	62. I enjoy sharing experiences with other people
	107. I enjoy an experience more if it is shared with somebody	
	108. Being around other people makes me feel good	
	109. I like meeting new people	63. I would describe myself as a social person
	110. I would describe myself as a social person	
	111. As I get older I find it harder to socialise	64. As I get older I find it harder to socialise
	112. I prefer walking alone rather than with others	65. I prefer walking alone rather than with others
	113. I get annoyed by other people that move slowly	
	114. Doing an activity with other people can feel restricting	
	115. Walking with other people slows me down	
	116. Walking by myself is boring	66. Walking by myself is boring
Walking as stimulation	117. I like to get out of the house	67. I like to get out of the house as often as I can
	118. I prefer to walk in familiar places	68. I like to walk in familiar places
	119. I like to discover new things	69. I like to discover new places
	120. I like to be in different environments	
	121. I like to see new places and new things	

Preliminary Piloting

  Part one: review of initial items. The initial version of the scale was then piloted on a sample of OP. It was sent to $n = 25$ OP, by preference of e-mail or post, with a response rate of $n = 23$ (92%). Of the respondents, $n = 13$ had participated in the elicitation interviews. Oppenheim (1992) has recommended that respondents in piloting procedures should be similar to those from the elicitation interviews, so the $n = 10$ new participants were recruited using the same recruitment procedure and inclusion criteria as the elicitation interviews (see '*method*' section). The demographics of the OP that took part in the first part of the preliminary piloting procedure are displayed in Table 7.

Table 7: *Demographics of participants in the first part of the piloting*

Gender	Male	10
	Female	13
Age*1 M* (*SD*)		69.16 (3.04)
Ethnicity	White British	23

1 Age was provided by 19 participants

  The gender of participants in the elicitation interviews ($n = 9$ male and $n = 10$ female) was relatively similar to those who took part in the first part of piloting ($n = 10$ male and $n = 13$ female). Age was not reported by $n = 4$ participants but they confirmed being aged 65 or older. One participant reported in their feedback: "*I think people may be reluctant to provide personal details such as age/marital status/health, etc*". The age of the $n = 19$ participants who provided this information in the first part of the piloting procedure ($M = 69.16$, $SD = 3.04$) was relatively similar to the elicitation interviews ($M = 70.21$, $SD = 3.97$).

  Of the $n = 23$ participants, $n = 19$ were current members of a walking group, $n = 3$ were no longer members, and $n = 1$ did not respond. Of the $n = 19$, $n = 5$ were members of two walking groups. Information regarding frequency of attendance and distance walked is displayed in Table 8.

Table 8: *Walking group membership of piloting part one participants*

Distance walked*1*	0-2 miles	0
	3-5 miles	6
	6-10 miles	7
	11-15 miles	5
	16-20 miles	0
	Over 20 miles	1
Frequency of attendance*2*	Weekly	6
	Every other week	4
	Monthly	7
	Rarely	2

1 If participants provided a range, the larger number was used for analysis.
2 If participants were members of two groups, frequency of attendance was measured by combing the two groups.

The first part of the preliminary piloting procedure requested participants to complete the preliminary scale, before providing feedback on the initial items in free text response boxes regarding relevancy to the construct, clarity and conciseness (DeVellis, 2017). Feedback was also requested on whether any relevant areas were omitted, and whether the scale was easy to complete.

Feedback from participants suggested that the preliminary scale represented a good measure of the determinants and barriers faced by OP that are looking to initiate walking, with one participant stating about the scale: "*In older age walking is a good way to maintain a good level of fitness. It could motivate someone thinking about a walking regime*". Feedback from participants also suggested that the preliminary scale used appropriate language. This was highlighted by one participant stating: "*A comprehensive set of clear and easy to understand questions. I see no need to change or omit any of them*". However, feedback was received pertaining to particular initial items. Table 9 displays the initial items, along with feedback from participants in the right-hand column.

Table 9: *Initial items and comments from participants*

Initial item	Feedback for initial item
6. I do not feel safe when I am out alone	"Feel safe in daytime – not so in middle of night!"
15. When I achieve a goal, I set a higher one	"Depends what it is!" "Depends on goal."
24. I used to walk more than I do now	"Strongly agree in terms of mileage strongly disagree in terms of frequency of walks."
26. I would prefer to walk rather than use transport	"Sometimes transport is an essential evil to get to a walk."
50. My spouse does not encourage walking	"No spouse or partner and perhaps this should be asserted at the beginning. The death of my spouse 14 years ago caused me to do less walking; too many other tasks in house and garden and always walked together, so felt safer and easier to explore new paths." "Don't have a spouse." "N/A no spouse." "Many older people are on their own, so having only option referring to spouse is sensitive. I lost my husband 4 years ago and still find referral to spouse difficult."
60. I would like to meet more people in my community	"Do you need 'in my community'?"
65. I prefer walking along rather than with others	"Either."

This feedback resulted in changes to the wording of some initial items and the addition of a further item to restrict ambiguity, with these amendments displayed in Table 10.

Table 10: *Amendments to initial items following the first part of piloting*

Initial item	*Amended item*
24. I used to walk more than I do now	24a. I used to walk further than I do now
	24b. I used to walk more often than I do now
50. My spouse does not encourage walking	50. People I am close to do not encourage walking
60. I would like to meet more people in my community	60. I would like to meet more people

Regarding relevancy to the construct, participants did not recommend that any initial items should be deleted, which meant that this stage resulted in no further item reduction. The addition of a further item was not problematic, as the majority of participants reported that the preliminary scale was not too time consuming to complete. Whilst one participant did report "*I feel it would be easier for most people over 65 if there were fewer questions*", it is anticipated that the *n* of items will be reduced following the psychometric evaluation undertaken in a future research study.

Some participants reported that they felt particular initial items were not relevant to them. A valuable attribute to a newly developed scale is a high level of variance within responses to discriminate between individuals (DeVellis, 2017). Although this will be explored with a comprehensive psychometric evaluation as part of a future research project, preliminary feedback received during the piloting procedure suggested a range of responses. One participant reported: "*I've noticed I haven't answered many questions in the 'mild' categories*". It is possible that as participants were already members of a walking group, they felt strongly towards the background construct of walking, resulting in more extreme responses than would be received in the general population.

Participants identified some areas that they felt were missing that were relevant to determinants and barriers to walking. Table 11 displays the feedback from participants where

new initial items were suggested, in addition to the new initial item that was developed from this feedback.

Table 11: *Feedback from participants resulting in new items*

Feedback from participants	New initial item
"Do you walk to the local shops, station, library, hairdresser or do you consider this too far?"	I choose to walk to the local shops when I can
"Asking whether suitable footwear is used."	I own appropriate clothing to walk more
"Do you engage in activities other than walking to keep fit?"	I do activities other than walking to keep fit

The initial domain that each new item fell under was decided in collaboration with the research supervisors. Although the item '*I own appropriate clothing to walk more*' was initially under the domain '*general motivation*' (see Table 6), it was felt to be a better fit under '*perceived control for walking*'. The amended scale contained $n = 73$ initial items.

Some further suggestions from participants broadly fell under initial items contained within the preliminary scale. Table 12 displays the areas suggested by participants and the initial item the principal researcher and research supervisors felt that it fell under.

Table 12: *Items suggested by participants and the initial item it falls under*

Recommended area	Relevant item
"Whether a partner/spouses' health effects the amount of walking achieved."	5. I have to consider others before I do something for myself
"Do you have any caring responsibilities that make it difficult to get out, e.g. caring for a spouse with a medical condition or looking after grandchildren?"	5. I have to consider others before I do something for myself
"Q on walking and weather – bad/too hot weather puts some people off very easily."	14. I try to complete a task even when met with a barrier
"The weather, as mentioned previously, but maybe you don't feel that is relevant."	14. I try to complete a task even when met with a barrier
"Q poss on how far people might be willing to travel by car/public transport to join a walk."	35. I can easily get to places I would like to walk in
"Is your local environment conducive to walking, e.g. are local parks, open spaces, or urban footpaths nearby?"	37. I can easily think of places to walk
"Injuries sustained by previous walking trips e.g. trips or falls."	39. I am worried that I might hurt myself whilst walking
"Do possible physical barriers deter you? If so, which?"	40. My health restricts what I can do
"Do you have any physical impediments that make walking difficult?"	40. My health restricts what I can do
"Asking whether walking poles are required."	40. My health restricts what I can do
"Does your medical practice encourage walking?"	51. I am aware of available support to help me walk more

The initial item pool contained within the preliminary scale following the first part of the piloting procedure featured $n = 58$ initial items that were developed from quotations in the transcripts of the elicitation interviews, $n = 11$ initial items that were developed solely from

relevant literature, and $n = 4$ initial items that were developed following part one of preliminary piloting. Further information regarding this process is provided in Appendix L. Table 13 displays the $n = 73$ preliminary scale initial items following the first part of the preliminary piloting procedure and the initial domain they were provisionally categorised under.

Table 13: Preliminary scale items following first part of the piloting procedure

Initial domain	Initial item
Conflicting priorities	1. I have control over my own time
	2. I am being selfish if I do something for my own pleasure
	3. Other parts of my life take priority over walking
	4. I have too many responsibilities to start something new
	5. I have to consider others before I do something for myself
	6. I do activities other than walking to keep fit
Concerns about safety	7. I do not feel safe when I am out alone
	8. I am worried about who I might meet when I am out alone
Energy as a barrier	9. I am aware of my energy declining as I age
	10. I do not have the energy to increase my walking
	11. I would not manage to cope with a walking programme
	12. I choose to walk to the local shops when I can
General motivation	13. I like taking on new challenges
	14. I like the feeling I get when completing a challenge
	15. I have a lot of self-motivation
	16. I try to complete a task even when met with a barrier
	17. When I achieve a goal, I set a higher one
	18. I do not do activities that I used to enjoy
	19. I am more likely to complete a task if somebody else suggests it
Need for tranquillity	20. I do not like being in busy places
	21. I enjoy being out in the fresh air
	22. I enjoy peaceful environments
Need to keep busy	23. Walking would help to keep me active
	24. I am somebody who likes to be on the move

	25. I believe that I am walking enough at present
	26. I used to walk further than I do now
	27. I used to walk more often than I do now
	28. I try to go for a walk whenever I can
	29. I would prefer to walk rather than use transport
	30. You should walk at a certain pace to get any benefits
	31. I find the idea of walking off-putting
Outcome expectations positive mood	32. When I walk I find that it lifts my mood
	33. Walking provides an escape from my responsibilities
	34. Walking helps me to feel less tired
	35. Walking will not make me feel better
	36. I have always enjoyed walking
Perceived control for walking	37. There are many interesting things to look at while walking locally
	38. I can easily get to places I would like to walk in
	39. I do not know of any places to walk
	40. I can easily think of places to walk
	41. I own appropriate clothing to walk more
Physical expectations negative	42. I avoid walking because it makes me short of breath
	43. I am worried that I might hurt myself whilst walking
	44. My health restricts what I can do
Physical expectations positive	45. I would like to improve my physical fitness
	46. Walking would help to keep me fit
	47. Regular physical activity helps me to sleep better
	48. I am concerned about letting my body decline
	49. As I get older I am becoming more health conscious
	50. It is important for me to maintain my mobility
	51. Walking helps to strengthen my bones
	52. Managing my weight is important to me
	53. Walking more could help me recover from aches and pains
Perceived support for walking	54. People I am close to do not encourage walking
	55. I am aware of available support to help me walk more
	56. Support from others is important when I start a new task
Spontaneity	57. It is important to have structure to my week

	58. I like to know the plans of an activity in advance
	59. If I make plans I stick to them
Walking needs a purpose	60. I do not see any value in walking
	61. If I walk there should be a specific purpose to it
	62. Walking should be linked to an activity that I enjoy
	63. It is important to enjoy my surroundings during a walk
Walking as a social activity	64. I would like to meet more people
	65. Walking is a good way to meet new people
	66. I enjoy sharing experiences with other people
	67. I would describe myself as a social person
	68. As I get older I find it harder to socialise
	69. I prefer walking alone rather than with others
	70. Walking by myself is boring
Walking as stimulation	71. I like to get out of the house as often as I can
	72. I like to walk in familiar places
	73. I like to discover new places

Part two: review of initial domains. The second part of the preliminary piloting procedure involved participants reviewing the initial items and deciding whether they fit within their allocated initial domain. This is consistent with the '*Phase 4: reviewing themes*' stage of TA (Braun & Clarke, 2006). Participants were also requested to comment on the wording of the initial domains.

Respondents from the first part of preliminary piloting were asked if they were willing to complete the second part. The pilot form was sent to $n = 7$ OP by e-mail, with a response rate of $n = 6$. Of those that responded, $n = 4$ had participated in the elicitation interviews. Fewer participants were required for part two of the preliminary piloting procedure, as a future research project will involve an in-depth analysis of the factor structure. The demographics of the participants from part two of the preliminary piloting procedure are displayed in Table 14.

Table 14: *Demographics of participants in the second part of piloting*

Gender	Male	2
	Female	4
Age *M* (*SD*)		69.5 (3.62)
Ethnicity	White British	6

The *M* age of participants was similar to the elicitation interview and piloting procedure part one stages. One of the participants was not a member of a walking group, with *n* = 4 recruited from different walking groups. Information regarding frequency of attendance and distance walked is displayed in Table 15.

Table 15: *Walking group membership of piloting part two participants*

Distance walked*1*	0-2 miles	0
	3-5 miles	3
	6-10 miles	1
	11-15 miles	1
	16-20 miles	0
	Over 20 miles	0
Frequency of attendance*2*	Weekly	1
	Every other week	2
	Monthly	2

1 If participants provided a range, the larger number was used for analysis
2 If participants were members of two groups, frequency of attendance was measured by combing the two groups.

Participants were asked whether the initial domains could be worded differently, and if so, how. This is consistent with Carpenter's (2018) recommendation for the review of initial domains. This stage resulted in the domain '*energy as a barrier*' being amended to '*lack of energy*' and '*need to keep busy*' changed to '*need to keep active*'.

Participants were asked to decide whether each initial item fit under the initial domain that it was provisionally categorised under. Of the *n* = 73 initial items, for *n* = 60 of them (82%) all participants agreed with their initial domain categorisation. For a further *n* = 9 initial items (12%), *n* = 5 out of *n* = 6 participants agreed with their categorisation, so it was

kept in its original initial domain. For $n = 4$ of initial items (6%) there was feedback that resulted in the domain categorisation being amended by the research team to the initial domain recommended by the participant. Table 16 displays these amendments.

Table 16: *Initial domains and comments from participants*

Initial item	Original domain	Recommended domain
12. I choose to walk to the local shops when I can	Lack of energy	General motivation
25. I believe that I am walking enough at present	Need to keep active	General motivation
26. I used to walk further than I do now	Need to keep active	Lack of energy
27. I used to walk more often than I do now	Need to keep active	Lack of energy

Preliminary Scale

The scale was named the Determinants and Barriers to Walking for Older People Scale (DABWOP-S), as this appeared to reflect the purpose of the measure. Table 17 displays the initial items categorised under the initial domains.

Table 17: *Initial items and initial domains of the DABWOP-S*

Initial domain	Initial item
Conflicting priorities (6)1	1. I have control over my own time
	2. I am being selfish if I do something for own pleasure
	3. Other parts of my life take priority over walking
	4. I have too many responsibilities to start something new
	5. I have to consider others before I do something for myself
	6. I do activities other than walking to keep fit
Concerns about safety (2)	7. I do not feel safe when I am out alone
	8. I am worried about who I might meet when I am out alone
Lack of energy (5)	9. I am aware of my energy declining as I age
	10. I do not have the energy to increase my walking

	11. I would not manage to cope with a walking programme
	12. I used to walk further than I do now
	13. I used to walk more often than I do now
General motivation (9)	14. I like taking on new challenges
	15. I like the feeling I get when completing a challenge
	16. I have a lot of self-motivation
	17. I try to complete a task even when met with a barrier
	18. When I achieve a goal, I set a higher one
	19. I do not do activities that I used to enjoy
	20. I am more likely to complete a task if somebody else suggests it
	21. I choose to walk to the local shops when I can
	22. I believe that I am walking enough at present
Need for tranquillity (3)	23. I do not like being in busy places
	24. I enjoy being out in the fresh air
	25. I enjoy peaceful environments
Need to keep active (6)	26. Walking would help to keep me busy
	27. I am somebody who likes to be on the move
	28. I try to go for a walk whenever I can
	29. I would prefer to walk rather than use transport
	30. You should walk at a certain pace to get any benefits
	31. I find the idea of walking off-putting
Outcome expectations positive mood (5)	32. When I walk I find that it lifts my mood
	33. Walking provides an escape from my responsibilities
	34. Walking helps me to feel less tired
	35. Walking will not make me feel better
	36. I have always enjoyed walking
Perceived control for walking (5)	37. There are many interesting things to look at while walking locally
	38. I can easily get to places I would like to walk in
	39. I do not know of any places to walk
	40. I can easily think of places to walk
	41. I own appropriate clothing to walk more
Physical expectations	42. I avoid walking because it makes me short of breath

negative (3)	43. I am worried that I might hurt myself whilst walking
	44. My health restricts what I can do
Physical expectations positive (9)	45. I would like to improve my physical fitness
	46. Walking would help to keep me fit
	47. Regular physical activity helps me to sleep better
	48. I am concerned about letting my body decline
	49. As I get older I am becoming more health conscious
	50. It is important for me to maintain my mobility
	51. Walking helps to strengthen my bones
	52. Managing my weight is important to me
	53. Walking more could help me recover from aches and pains
Perceived support for walking (3)	54. People I am close to do not encourage walking
	55. I am aware of available support to help me walk more
	56. Support from others is important when I start a new task
Spontaneity (3)	57. It is important to have structure to my week
	58. I like to know the plans of an activity in advance
	59. If I make plans I stick to them
Walking needs a purpose (4)	60. I do not see any value in walking
	61. If I walk there should be a specific purpose to it
	62. Walking should be linked to an activity that I enjoy
	63. It is important to enjoy my surroundings during a walk
Walking as a social activity (7)	64. I would like to meet more people
	65. Walking is a good way to meet new people
	66. I enjoy sharing experiences with other people
	67. I would describe myself as a social person
	68. As I get older I find it harder to socialise
	69. I prefer walking alone rather than with others
	70. Walking by myself is boring
Walking as stimulation (3)	71. I like to get out of the house as often as I can
	72. I like to walk in familiar places
	73. I like to discover new places

1 *Denotes the n of initial items categorised under each initial domain*

The preliminary version of the DABWOP-S, following item generation and both parts of the preliminary piloting procedure, is displayed in Figure 1.

The Determinants and Barriers to Walking for Older People Scale (DABWOP-S)

Below is a list of statements that people aged 65 and older have made about things that make it easier or harder to walk more. Please read each statement and then circle the response that is most similar to your own beliefs or experiences at present.

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
1. I have control over my own time	1	2	3	4	5	6
2. I am being selfish if I do something for my own pleasure	1	2	3	4	5	6
3. Other parts of my life take priority over walking	1	2	3	4	5	6
4. I have too many responsibilities to start something new	1	2	3	4	5	6
5. I have to consider others before I do something for myself	1	2	3	4	5	6
6. I do activities other than walking to keep fit	1	2	3	4	5	6
7. I do not feel safe when I am out alone	1	2	3	4	5	6
8. I am worried about who I might meet when I am out alone	1	2	3	4	5	6
9. I am aware of my energy declining as I age	1	2	3	4	5	6
10. I do not have the energy to increase my walking	1	2	3	4	5	6
11. I would not manage to cope with a walking programme	1	2	3	4	5	6
12. I used to walk further than I do now	1	2	3	4	5	6
13. I used to walk more often than I do now	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
14. I like taking on new challenges	1	2	3	4	5	6
15. I like the feeling I get when completing a challenge	1	2	3	4	5	6
16. I have a lot of self-motivation	1	2	3	4	5	6
17. I try to complete a task even when met with a barrier	1	2	3	4	5	6
18. When I achieve a goal, I set a higher one	1	2	3	4	5	6
19. I do not do activities that I used to enjoy	1	2	3	4	5	6
20. I am more likely to complete a task if somebody else suggests it	1	2	3	4	5	6
21. I choose to walk to the local shops when I can	1	2	3	4	5	6
22. I believe that I am walking enough at present	1	2	3	4	5	6
23. I do not like being in busy places	1	2	3	4	5	6
24. I enjoy being out in the fresh air	1	2	3	4	5	6
25. I enjoy peaceful environments	1	2	3	4	5	6
26. Walking would help to keep me busy	1	2	3	4	5	6
27. I am somebody who likes to be on the move	1	2	3	4	5	6
28. I try to go for a walk whenever I can	1	2	3	4	5	6
29. I would prefer to walk rather than use transport	1	2	3	4	5	6
30. You should walk at a certain pace to get any benefits	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
31. I find the idea of walking off-putting	1	2	3	4	5	6
32. When I walk I find that it lifts my mood	1	2	3	4	5	6
33. Walking provides an escape from my responsibilities	1	2	3	4	5	6
34. Walking helps me to feel less tired	1	2	3	4	5	6
35. Walking will not make me feel better	1	2	3	4	5	6
36. I have always enjoyed walking	1	2	3	4	5	6
37. There are many interesting things to look at while walking locally	1	2	3	4	5	6
38. I can easily get to places I would like to walk in	1	2	3	4	5	6
39. I do not know of any places to walk	1	2	3	4	5	6
40. I can easily think of places to walk	1	2	3	4	5	6
41. I own appropriate clothing to walk more	1	2	3	4	5	6
42. I avoid walking because it makes me short of breath	1	2	3	4	5	6
43. I am worried that I might hurt myself whilst walking	1	2	3	4	5	6
44. My health restricts what I can do	1	2	3	4	5	6
45. I would like to improve my physical fitness	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
46. Walking would help to keep me fit	1	2	3	4	5	6
47. Regular physical activity helps me to sleep better	1	2	3	4	5	6
48. I am concerned about letting my body decline	1	2	3	4	5	6
49. As I get older I am becoming more health conscious	1	2	3	4	5	6
50. It is important for me to maintain my mobility	1	2	3	4	5	6
51. Walking helps to strengthen my bones	1	2	3	4	5	6
52. Managing my weight is important to me	1	2	3	4	5	6
53. Walking more could help me recover from aches and pains	1	2	3	4	5	6
54. People I am close to do not encourage walking	1	2	3	4	5	6
55. I am aware of available support to help me walk more	1	2	3	4	5	6
56. Support from others is important when I start a new task	1	2	3	4	5	6
57. It is important to have structure to my week	1	2	3	4	5	6
58. I like to know the plans of an activity in advance	1	2	3	4	5	6
59. If I make plans I stick to them	1	2	3	4	5	6
60. I do not see any value in walking	1	2	3	4	5	6
61. If I walk there should be a specific purpose to it	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
62. Walking should be linked to an activity that I enjoy	1	2	3	4	5	6
63. It is important to enjoy my surroundings during a walk	1	2	3	4	5	6
64. I would like to meet more people	1	2	3	4	5	6
65. Walking is a good way to meet new people	1	2	3	4	5	6
66. I enjoy sharing experiences with other people	1	2	3	4	5	6
67. I would describe myself as a social person	1	2	3	4	5	6
68. As I get older I find it harder to socialise	1	2	3	4	5	6
69. I prefer walking alone rather than with others	1	2	3	4	5	6
70. Walking by myself is boring	1	2	3	4	5	6
71. I like to get out of the house as often as I can	1	2	3	4	5	6
72. I like to walk in familiar places	1	2	3	4	5	6
73. I like to discover new places	1	2	3	4	5	6

Figure 1: *Preliminary version of the DABWOP-S*

Discussion

The present study documented the development of a preliminary scale of the determinants and barriers of walking for OP. It has provided a comprehensive pool of initial items from interviews with OP, which have been reviewed by OP. It is hoped that development of such a measure could represent the first step to providing a scale that could inform social prescribing practices in the UK.

How Initial Items and Domains Correspond to the Literature

The current study considered walking to be multidimensional, with many domains that could be considered determinants or barriers. The DABWOP-S contained initial items, and initial domains, that could be consistent with several theoretical frameworks, such as the TPB (Ajzen, 1991). The '*perceived control for walking*' domain appeared consistent with PBC, which has been identified as a predictor of exercise intention in OP (Brenes, Strube, & Storandt, 1998). Three domains ('*outcome expectations positive mood*', '*physical expectations negative*' and '*physical expectations positive*') fit with ATB. These domains also appeared consistent with outcome expectations (Bandura, 1977; 1997), with two featuring positive and one featuring negative outcome expectations. A potential explanation for this unequal weighting is that participants appraised walking favourably as they were members of a walking group.

The '*spontaneity*' domain contained two items that appeared consistent with implementation intention (Gollwitzer, 1999) and explicitly referenced planning, which facilitated physical activity in people aged 55-64 (Scholz et al., 2007). OP placing a low value on physical activity in itself (Devereux-Fitzgerald et al., 2016) was featured in the '*walking needs a purpose*' domain.

There were domains that could be especially pertinent to an OP population. Vulnerabilities associated with aging could compromise a desire for autonomy (McGowan et al., 2018). This could be a motivating factor for the '*need to keep active*' and '*lack of energy*' domains and could also underpin '*concerns about safety*'. Additionally, whilst '*competing priorities*' was identified by Franco et al. (2015), it was the lone theme within their findings without any subthemes. This appeared more salient within the development of the DABWOP-S, as OP referenced caregiving responsibilities including caring for a spouse who experienced a stroke, a disabled spouse, grandchildren, and elderly parents. This appeared

consistent with literature that suggests that the life stage, and accompanying transitions, of OP affects physical activity (Prohaska et al., 2006).

The value of social interaction has been identified as the most important component of physical activity interventions for OP (Devereux-Fitzgerald et al., 2016). This was mirrored with the '*walking as a social activity*' domain. The social component might be of particular importance for OP, as approximately 1.2 million OP in England are chronically lonely (AGE UK, 2017) and social isolation can increase the risk of death by 29% (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). The item '*as I get older I find it harder to socialise*' is consistent with OP having fewer peripheral social partners (Fung, 2013). A further age specific barrier is fear of injury and falling (King, 2001), which was represented in the DABWOP-S.

A significant association has been found between depressive symptomatology and neighbourhood walkability for OP (Berke, Gottlieb, Moudon, & Larson, 2007). Although no domain explicitly related to environmental factors, items categorised under '*need for tranquillity*' and '*perceived control for walking*' appeared to allude to its importance.

Whilst the initial domains and items appeared consistent with relevant theory and literature, it should be noted that the DABWOP-S was not developed to fit exclusively within any single theoretical framework.

Development of the Scale

Despite a recent focus in the extant literature exploring factors associated with physical activity for OP, a frequent assumption is that the determinants and barriers are homogenous across types of physical activity, such as literature reviews by Franco et al (2005) and Devereux-Fitzgerald et al. (2016). This is also true for the development of scales, such as the Amotivation Towards Exercise Scale (Vlachopoulos & Gigoudi, 2008) and the Outcome Expectations for Exercise Scale 2 (Resnick, 2005). A strength of the DABWOP-S

is the specific focus on walking, which could represent the most appropriate physical activity to promote for OP.

In measures of the determinants and barriers to physical activity for OP, a deductive method of item generation is frequently exclusively used (Resnick et al., 2000; Resnick, 2005; Vlachopoulos & Gigoudi, 2008). The initial item pool of the DABWOP-S was generated based upon the experiences of OP themselves, and also featured their input throughout development. A strength of the development of the DABWOP-S is the use of a combination of inductive and deductive approaches; considered to be best practice in scale development (Boateng et al., 2018).

Content validation was measured with several steps including linking the domains to literature, expert reviews, and the inclusion of OP throughout the development to ensure that determinants and barriers were adequately represented. A limitation is that the two research supervisors acted as experts during the review stages, as ideally experts should be independent of the research (Boateng et al., 2018).

Limitations

Initiation vs. maintenance of walking behaviour. The DABWOP-S was developed for OP not meeting the recommended level of physical activity. Determinants and/or barriers to physical activity for OP have been found to be phase specific, with factors differing between the initiation and maintenance stages (van Stralen et al., 2009). A limitation of the current study could be the reliance upon OP in the maintenance stage to inform item generation. Because they were members of a walking group, the determinants and/or barriers reported potentially could have differed to OP within the initiation stage.

Lack of diversity. The current research was undertaken within a relatively affluent part of the UK, which might have affected responses, as physical activity is positively correlated with higher income (King, 2001). A further limitation was that all participants

classified themselves as White British. However, a study exploring OP perspectives on physical activity from seven ethnic minority groups within the United States found more common themes than culture specific variations (Belza et al., 2004). Although significant variations exist within the UK between the health of OP based upon ethnicity (Government Office for Science, 2016), the variation in amount of walking between race or socioeconomic status is the smallest amongst any type of physical activity (NICE, 2012). It is possible that this limitation might not have resulted in the omission of many culturally, or ethnically specific factors.

Recruitment. A limitation of the current study was the reliance upon e-mail to facilitate recruitment. OP can lack both the motivation, or knowledge, to use computers (Sengpiel, & Dittberner, 2008), with further barriers including cognitive limitations and frustration (Gatto, & Tak, 2008). It is possible that the reliance upon electronic methods as a singular recruitment method excluded a range of OP with differing experiences and viewpoints.

Age group. Definitions of OP have been criticised for their lack of nuance, often grouping several generations into an assumed homogenous population (Neugarten, 1974). The definition of OP as somebody aged 65 or over was selected to be consistent with the NHS (2018a), to improve future clinical utility within the UK. It is possible that the broad age range contained within this definition will simplify the experiences of a wide range of OP and assume homogeneity within a sample where significant heterogeneity, owing to factors relating to aging, is present.

Future Directions

The present study represents the initial developmental stage of the DABWOP-S, with a more detailed psychometric evaluation required in a future research study. The provisional proposal for the psychometric evaluation includes the recruitment of a large and diverse

sample of OP, and computation of internal consistency, factor structure, and convergent validity.

Psychometric evaluation. Prior to the evaluation, the structure of the initial items should be amended, as grouping similar items together can result in a response bias (White, Ashton, & Law, 1978). Despite some debate about their utility (Perinelli, & Gremigni, 2016), it is recommended that the validation scale includes a social desirability scale (DeVellis, 2017). The inclusion of a brief measure, such as the 10 item Marlow-Crowne Social Desirability Scale (Strahan & Gerbasi, 1972), could identify scores that could be excluded.

Internal consistency could be evidenced with Chronbach's alpha, with an α of 0.7 or greater being sought, as this would suggest that 70% of the variance of a score is systematic (Nunally & Bernstein, 1994). Construct validity explores how responses correlate with scores on a similar measure (Bollen, 1990), so the DABWOP-S should be administered alongside an existing measure of determinants and barriers to physical activity for OP. Exploratory factor analysis should be used for the initial stages of scale development (Byrne, 2009), with participants anticipated to score high and those anticipated to score low represented (Gorsuch, 1997). As such, the evaluation should include OP who are members of a walking group and those who are not. Velicer and Fava (1998) propose that there should be three participants per initial item, suggesting that the psychometric evaluation should strive for $n = 219$ participants.

The preliminary scale contains six domains containing three items or less. It has been suggested that factors containing three items or less should be discarded (Tabachnick, & Fidell, 2001), though if highly correlated they can be retained (Worthington, & Whittaker, 2006). This should be explored in the psychometric evaluation. Further item reduction could be achieved by using principal-components analysis (Worthington, & Whittaker, 2006).

Conclusion

Within the UK approximately just 44% of OP meet the recommended guidelines for physical activity (Scholes, 2017). Recent initiatives have focused upon the promotion of walking, with this becoming more accessible through social prescribing referral from health professionals. Owing to the aging population, there is a need to utilise low-cost and easily-accessible interventions to reduce demand on healthcare settings. Walking appears to be an appropriate physical activity to promote for OP, as a lack of confidence can result in a reticence in initiating a new form of physical activity (Newsom et al., 2004).

Despite NICE (2012) recommending that barriers to walking programmes should be addressed, this represents the first study that has attempted to develop a measure of determinants and barriers to the initiation of walking for OP in the UK. The preliminary version of the DABWOP-S benefits from a comprehensive process of development that has frequently been overlooked in pre-existing scales measuring determinants and barriers to physical activity for OP. Perhaps the greatest benefit was the initial item pool being generated from interviews with 19 OP. Involvement from OP also included amendments to the wording of the initial items, the addition of items based upon areas that were omitted, changes to the wording of the domains, and a re-classification of the domains that items fell under.

It is hoped that in the future, following a full psychometric evaluation, the DABWOP-S could be used within UK healthcare settings to help shape walking programmes and/or to determine the type of referral or programme that is appropriate to OP based upon their individual needs. This could help to support OP to initiate and maintain walking, potentially helping to decrease the large proportion that are currently unable to meet the guidelines for physical activity.

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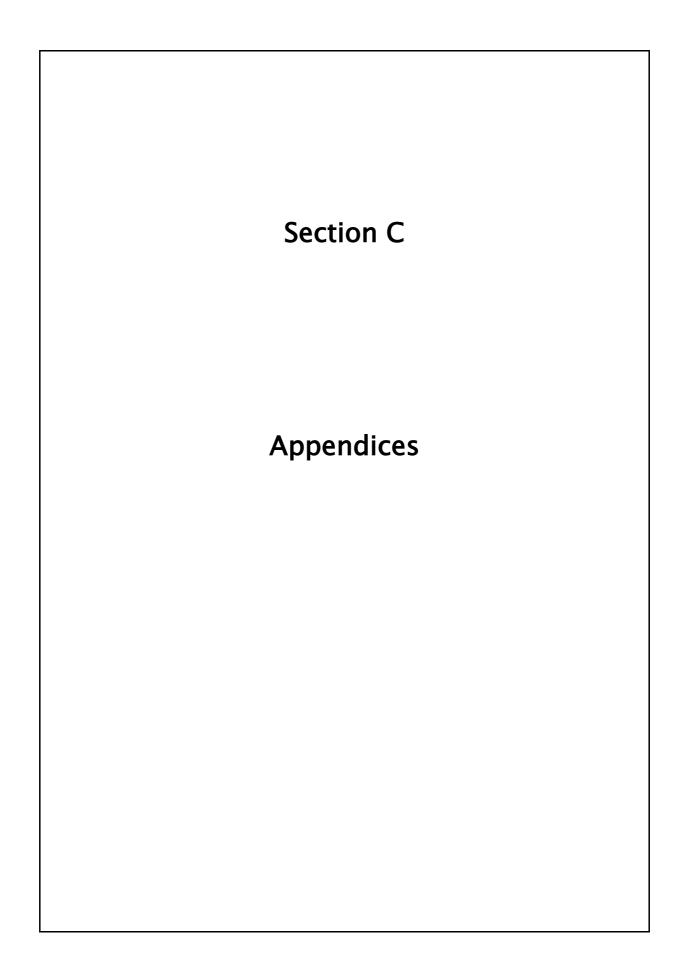
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Section C

Appendices

Appendix A: Semi-structured interview schedule

1. What do you think about the idea of taking a walk, or walking every day? Some people like the idea and some don't. What are your thoughts or feelings about the idea?

Prompts if a brief response is provided:

- *You like that idea. Can you tell me a bit more? What is it about the idea that you like?*
- *You don't like that idea. Can you say more about your thoughts or feelings about it?*

2. What positives do you associate with regularly walking?

3. What negatives do you associate with regularly walking?

4. What factors or circumstances may or do make it easier for you to engage in regular walking? [*initially unprompted*]

Prompts:

- *Beliefs of other people*
  [friends / family / peers]

- *Participation of other people*
  [friends / family / walking group]

- *Past exercise behaviour*

- *Expected outcomes*
  [improvement in physical or mental health / social contact]

5. What factors or circumstances may make it harder for you to engage in regular walking? – or have made it harder? [*initially unprompted*]

Prompts:

- *Practical issues*
  [accessibility / caregiving responsibilities]

- *Beliefs of other people*
  [friends / family / peers]

- *Participation of other people*
  [friends / family / walking group]

- *Physical limitations*

o *Perceived ability to regularly walk*

o *Expected outcomes*
    [Negative or neutral outcomes; deterioration in physical / mental health]

o *Affective characteristics*
    [low mood / anxiety / low self-confidence]

6. How might your current beliefs about regularly walking compare to those you had at a different time of your life? [*as an adolescent / younger adult*]

7. How might the amount of walking you currently undertake compare to the amount of walking you did at a different time of your life? [*as an adolescent / younger adult*]

o *What might have influenced this change?*

8. Is there anything that you feel may be important that we have not discussed?

Age:
Sex:
Ethnicity:

Are you a member of a walking group:
    If so, how frequently do you attend and what is the distance of the walks:

Approximately when did you join?:

How long have you been retired?:

Are you willing to be contacted to review the draft measure?:
    o *Preferred method of contact:*

Would you like to receive an information sheet outlining the key findings of the study?
    o *Preferred method of contact:*

[Thank the participant for their time. Clarify how the researcher can be contacted if any issues arise.]

Appendix B: Ethical approval letter

This has been removed from the electronic copy.

Appendix C: Declaration of the completion of the study

This has been removed from the electronic copy.

The development of the Determinants and Barriers to Walking for Older People Scale (DABWOPS): A summary of findings

Why was the research study done?

The aim of the research study was to develop a questionnaire for people aged 65 and older about why they might or might not walk regularly. Walking is free and easy compared to other types of exercise, and has many known health benefits. Despite this, many people aged 65 and older find it hard to regularly walk.

As there was no suitable scale (also commonly known as a questionnaire) that looked at what makes it easier or harder for people aged 65 and older to walk more (also known as determinants and barriers), the research study aimed to develop one.

What were the stages involved in developing the scale?

There were two stages to the research study.

Stage one involved interviewing people on the telephone about what makes it easier, and what makes it harder, to walk. In total, 19 people took part in this stage. These interviews were recorded and transcribed. The transcripts were then read, and any quotations that contained potential determinants and barriers were highlighted and turned into items for the scale (items are commonly referred to as questions).

Once all the items were reviewed by the research team, they were sent to people aged 65 and older to review. In total, 23 people reviewed the items and suggested changes to the wording and also told us any areas that we missed, which resulted in some new items.

Stage two of the research involved putting the items into domains (commonly referred to as themes). This was initially done by the research team, but these domains were again sent to people aged 65 and older to review. In total, six people reviewed the themes. This resulted in some changes to the wording of the domains, and some items were moved to different domains.

The scale was given the name of the Determinants and Barriers to Walking for Older People Scale (DABWOP-S).

What is contained in the DABWOP-S?

In total, there are 73 different items in the DABWOP-S. These items covered lots of different factors that might make it easier or harder for people over 65 to walk more. The broad areas that these items cover can best be summarised by the 15 domains. These domains are: *conflicting priorities*, *concerns about safety*, *lack of energy*, *general motivation*, *need for tranquillity*, *need to keep active*, *outcome expectations positive mood*, *perceived control for walking*, *physical expectations negative*, *physical expectations positive*, *perceived support for walking*, *spontaneity*, *walking needs a purpose*, *walking as a social activity* and *walking as stimulation*.

What do these domains mean?

The results show that there are lots of things that make it easier or harder for people 65 and older to walk more. These range from the social benefits of walking, to the number of responsibilities that people aged 65 or older have that make it challenging to make the time to walk more. It would appear that these domains are broadly consistent with literature that looks at the determinants and barriers to walking for people aged 65 and older.

What is next?

Now that a preliminary version of the DABWOP-S has been completed, the next stage is for it to be tested in a future research study. This will be done by a future trainee clinical psychologist at Canterbury Christ Church University, who organised, and funded, the study. This future research study will involve a further review of the items and domains of the DABWOP-S, and it is expected that the number of items will be reduced from 73, and the number of domains will also be reduced from 15. This will make the final version shorter and easier to complete.

In summary

The research project has resulted in the development of the DABWOP-S, which is a scale that looks at what makes it easier, and harder, for people aged 65 and older to walk more. At present, it is a preliminary version, as it will be tested in a future research study. It might then be used in routine settings such as GP surgeries to help people think with their doctor about what might make it easier or harder to walk regularly.

Thank you for your help with the research study. It could not have been developed without your time and your considerable input. If you have any further questions do not hesitate to contact me, Daniel Bird, at d.c.bird555@canterbury.ac.uk.

Information about the research
22.02.2018

Provisional study title: Developing a measure of the determinants of walking for older people: Phase one

Hello. My name is Daniel Bird and I am a trainee clinical psychologist at Canterbury Christ Church University. I would like to invite you to take part in a research study. Before you decide it is important that you understand why the research is being done and what it would involve for you.

Talk to others about the study if you wish.

Part 1 tells you the purpose of this study and what will happen to you if you take part.
Part 2 gives you more detailed information about the conduct of the study.

Part 1 of the information sheet

What is the study about?

The aim of the research study is to look at why some people over 65 walk regularly and others find it difficult even though they are physically able to. Walking is free and easy compared to some other ways of getting exercise, and has many health benefits. There are also a number of ways in which walking could improve psychological wellbeing, including feelings of anxiety or depression.

The study will involve the design of a questionnaire to measure factors that may make it easier, or harder, for people over 65 to walk regularly. This study is hoped to be part of a larger project and upon the completion of the questionnaire in 2019 it may be tested in a separate study which you will not be required to participate in. At the moment, there is no suitable questionnaire that assesses how people over 65 feel about walking, what helps them to walk, and what might get in the way. This research will eventually produce one, with the help of people such as yourself.

Who can take part?

I am inviting people aged 65 or older who are physically able to walk to complete an interview over the telephone. You will be asked questions about what you think makes it easier to regularly walk and what makes it harder. Participation is entirely voluntary, but the more people take part, the more useful the study will be, whatever the results. Your views are important.

If you are diagnosed with a neurological condition then unfortunately you will not be able to participate in this study.

Do I have to take part?

It is up to you to decide whether to join the study. If you agree to take part, I will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason.

What will happen to me if I take part?

If you decide to participate we will arrange a telephone conversation at a time convenient to you, so that I can explain the study and you can ask any questions that you may have. After we talk, you will have at least 24 hours to decide whether or not to take part. You will not be expected to decide immediately.

If you choose to participate we will arrange an interview over the telephone at a time that is convenient for you. The questions will be aimed towards understanding what might make walking easier for you and what might make it more challenging. The interview may last anywhere between approximately 20 minutes and an hour.

This telephone conversation will be recorded and stored electronically. The reason it will be recorded is that the information you provide is important and we want to make sure that nothing is forgotten or misunderstood. The audio will be typed out in its entirety before it is analysed. Both the audio of the recording, and the transcription, will be stored confidentially.

Once the interviews for everyone have been completed and analysed, a questionnaire will be designed based upon the responses. This will be made into a draft version of the questionnaire and at this stage you may be invited to review it to look at how clear it is, how relevant you feel the questions may be, and whether there is anything important that you feel might have been missed. The questionnaire will be either e-mailed or posted to you, depending upon your preference.

What will I be asked to do?

- Talk to me prior to commencement of the study to ensure that you are happy to take part and understand what is involved.
- If you decide to proceed, you will be interviewed for approximately 20 minutes to an hour about your attitudes towards walking.
- When a draft questionnaire has been designed, you may be asked to review the clarity of the document, how relevant the questions are, and if there is anything that you feel may have been missed out. It is only necessary that a few people who took part in the study review the document. People will be selected based upon things such as sex, ethnicity, and where they live. This will mean that the questionnaire will be reviewed by a diverse range of people.

What are the possible disadvantages and risks of taking part?

The main disadvantage is the use of a little of your time, which you may wish to use for something else. If you find the topic of exercise distressing then you may experience discomfort during the interview, but mainly I will ask questions in such a way that you can answer them freely in your own way, and I will be interested in your experience – it is not a test and there are no right or wrong answers.

What are the possible benefits of taking part?

The current study is unlikely to directly help you, as the focus is on designing a questionnaire to be used in the future. Your involvement, however, might help develop future ways to help people aged 65 and over.

What if there is a problem?

Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The detailed information on this is given in Part 2.

Will information from or about me from taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. The details are included in Part 2.

This completes part 1.

If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision.

Part 2 of the information sheet

What will happen if I don't want to carry on with the study?

Your participation is voluntary and you are free to withdraw at any time without giving any reason. You will have the right to request that all data is withdrawn and destroyed, thus removing it from the data analysis procedure.

Complaints

If you have a concern about any aspect of this study, you should ask to speak to me and I will do my best to address your concerns. You can contact me on a 24-hour voicemail phone line at 01227 92 7070. Please say that the message is for Daniel Bird and leave a contact number and I will get back to you as soon as possible.

If you remain unhappy and wish to complain formally, you can do this by contacting Professor Paul Camic, Research Director, Salomons Centre for Applied Psychology, Canterbury Christ Church University, 1 Meadow Road, Tunbridge Wells, TN1 2YG – paul.camic@canterbury.ac.uk.

Will information from or about me from taking part in the study be kept confidential?

If you take part in the study your responses will be completely confidential. You will be provided with a unique participant identification number, which will be used on all the forms that you complete.

All information which is collected from you during the course of the research will be kept strictly confidential. Privacy will be ensured with the data being stored securely on a password-protected document that is only accessible to me. Your information will not be passed on to any other individuals. Additionally, anything that might make you identifiable, such as your name, address, or where you live will be removed from the transcripts. Your telephone number and contact information will be stored securely and not passed to anybody else.

Regulatory authorities may require access to anonymous information to monitor the quality of the research.

Your data will be retained in its private form in a secure location for ten years following the completion of the research project. If the study is submitted to an academic journal for publication, the data will be retained for a following five years post-publication. Once these ten years have passed it will be disposed of securely.

The one limit to confidentiality would be in the event that the research team were concerned that either you, or somebody else, may be at risk of harm. In this instance, we would be obliged to pass on information to a third party.

Involvement of the General Practitioner/Family doctor (GP)

Your GP does not need to be notified of your participation.

What will happen to the results of the research study?

Following the analysis of data, an information sheet will be provided containing an overview of the research findings. Once the research has been finalised it will be made available to all stakeholders.

It is possible that the research will be sent for publication in an academic journal. We will use only anonymous quotes from participants. There will be no identifiable information contained within the published report.

Who is organising and funding the research?

Canterbury Christ Church University is organising, and funding, the research.

Who has reviewed the study?

This study has been reviewed and given favourable opinion by Canterbury Christ Church University Research Ethics Committee.

Further information and contact details

If you would like to speak to me and find out more about the study, want specific information about the research project, or require advice as to whether you should participate, you can e-mail me at d.c.bird555@canterbury.ac.uk.

Alternatively, you can leave a message for me on a 24-hour voicemail phone line at 01227 92 7070. Please say that the message is for Daniel Bird and leave a contact number so that I can get back to you.

If you have any concerns during the study, please do not hesitate to contact me either via e-mail or the above telephone number.

Each participant will be provided with a copy of this information sheet, and a signed consent form, to keep for their own records.

Appendix F: Research poster

WHAT MAKES IT EASIER FOR PEOPLE OVER 65 TO REGULARLY WALK?

RESEARCH STUDY

WHAT IS THE STUDY ABOUT?

I am looking for people to interview on the telephone for approximately an hour to look at why some people walk regularly and others might find it difficult. At the moment, there is no suitable questionnaire that assesses how people over 65 feel about walking, so the research will eventually produce one, with the help of people such as yourself.

Photograph removed from electronic copy.

WHO CAN TAKE PART?

If you are 65 or older and physically able to walk then you might be eligible to participate in the study. Unfortunately, if you have a diagnosed neurological condition then you will not be eligible to participate.

WHAT NEXT?

If you are interested in participating, please contact me at the e-mail address below, or complete the slip and return in the pre-paid envelope, both attached. I will then send you more information about the research. **Thank you** for your time!

Canterbury Christ Church University

DANIEL BIRD
d.c.bird555@canterbury.ac.uk

Appendix G: Consent form

Participant Identification Number for this study:

Title of Project: Developing a measure of the determinants of walking for older people: Phase one

Name of Researcher: Daniel Bird

Please initial the following boxes

1. I confirm that I have read and understand the information sheet dated 22.02.2018 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I do not have a diagnosed neurological condition and I am unaware of any physical health problems that may prevent me from walking.

4. I understand that data collected during the study may be looked at by the research supervisors, Dr Michelle Levy and Dr Sue Holttum. I give permission for these individuals to have access to my anonymous data.

5. I agree that anonymous quotes can be used in publications.

6. I agree for my anonymised interview data to be used in a follow-up research project, as another project may be required to develop and test the questionnaire. The data would only be shared with the specific researcher undertaking the project and no personal details would be passed on.

7. I agree to take part in the above study.

Name of Participant_____ Date_____

Signature _____

Name of Person taking consent _____ Date_____

Signature _____

What makes it easier for people over 65 to regularly walk? A research study

Background to the research

My name is Daniel Bird. Thank you for agreeing to take part in my research. I am a Trainee Clinical Psychologist at Canterbury Christ Church University and I have been undertaking research as part of my training. The aim of my research is to develop a questionnaire to find out what makes it easier, and what makes it harder, for people aged 65 and over to walk more.

This research project has two stages. In the first stage I interviewed people aged 65 and over to find out their thoughts about what makes it easier or harder to walk more. For the second stage of the research project, I am asking people aged 65 and over for their thoughts on the questionnaire that I have made from the responses in the first stage.

What am I being asked to do?

The stage of the research I am asking you to participate in has two parts. For Part One I ask that you complete the questionnaire. For Part Two, you are being asked to give your view of the questionnaire.

Completion of each stage should take about 10-15 minutes.

If possible, please could you complete and return this form within **two weeks** of the date that you receive it.

Thank you very much for your time.

Your help with the research project is greatly appreciated.

A little about you

Your age: **Your gender:**

Ethnicity (please circle): White British, White Other, Indian, Pakistani, Bangladeshi, Asian
Other, Black Caribbean, Black African, Black Other, Chinese,
Other, prefer not to say.

Do you belong to a walking group?

If yes, which one:

How often do you attend:

Approximately how far do you walk during any visit to the walking group:

Part One: Completing the questionnaire

Below is a list of statements that people aged 65 and over have made about things that might
make it easier, or harder, for them to walk more. Please read each statement and then circle
the response that is most similar to your own experiences or beliefs at present. Feel free to
make notes on any part of the questionnaire as you complete it, because in Part Two we will
be asking for your thoughts.

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
1. I have control over my own time	1	2	3	4	5	6
2. I am being selfish if I do something for my own pleasure	1	2	3	4	5	6
3. Other parts of my life take priority over walking	1	2	3	4	5	6
4. I have too many responsibilities to start something new	1	2	3	4	5	6
5. I have to consider others before I do something for myself	1	2	3	4	5	6
6. I do not feel safe when I am out alone	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
7. I am worried about who I might meet when I am out alone	1	2	3	4	5	6
8. I am aware of my energy declining as I age	1	2	3	4	5	6
9. I do not have the energy to increase my walking	1	2	3	4	5	6
10. I would not manage to cope with a walking programme	1	2	3	4	5	6
11. I like taking on new challenges	1	2	3	4	5	6
12. I like the feeling I get when completing a challenge	1	2	3	4	5	6
13. I have a lot of self-motivation	1	2	3	4	5	6
14. I try to complete a task even when met with a barrier	1	2	3	4	5	6
15. When I achieve a goal, I set a higher one	1	2	3	4	5	6
16. I do not do activities that I used to enjoy	1	2	3	4	5	6
17. I am more likely to complete a task if someone else suggests it	1	2	3	4	5	6
18. I do not like being in busy places	1	2	3	4	5	6
19. I enjoy being out in the fresh air	1	2	3	4	5	6
20. I enjoy peaceful environments	1	2	3	4	5	6
21. Walking would help to keep me active	1	2	3	4	5	6
22. I am somebody who likes to be on the move	1	2	3	4	5	6
23. I believe that I am walking enough at present	1	2	3	4	5	6
24. I used to walk more than I do now	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
25. I try to go for a walk whenever I can	1	2	3	4	5	6
26. I would prefer to walk rather than use transport	1	2	3	4	5	6
27. You should walk at a certain pace to get any benefits	1	2	3	4	5	6
28. I find the idea of walking off-putting	1	2	3	4	5	6
29. When I walk I find that it lifts my mood	1	2	3	4	5	6
30. Walking provides an escape from my responsibilities	1	2	3	4	5	6
31. Walking helps me to feel less tired	1	2	3	4	5	6
32. Walking will not make me feel better	1	2	3	4	5	6
33. I have always enjoyed walking	1	2	3	4	5	6
34. There are many interesting things to look at while walking locally	1	2	3	4	5	6
35. I can easily get to places I would like to walk in	1	2	3	4	5	6
36. I do not know of any places to walk	1	2	3	4	5	6
37. There are many places to go within easy walking distance of my home	1	2	3	4	5	6
38. I avoid walking because it makes me short of breath	1	2	3	4	5	6
39. I am worried that I might hurt myself whilst walking	1	2	3	4	5	6
40. My health restricts what I can do	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
41. I would like to improve my physical fitness	1	2	3	4	5	6
42. Walking would help to keep me fit	1	2	3	4	5	6
43. Regular physical activity helps me to sleep better	1	2	3	4	5	6
44. I am concerned about letting my body decline	1	2	3	4	5	6
45. As I get older I am becoming more health conscious	1	2	3	4	5	6
46. It is important for me to maintain my mobility	1	2	3	4	5	6
47. Walking helps to strengthen my bones	1	2	3	4	5	6
48. Managing my weight is important to me	1	2	3	4	5	6
49. Walking more could help me recover from aches and pains	1	2	3	4	5	6
50. My spouse does not encourage walking	1	2	3	4	5	6
51. I am aware of available support to help me walk more	1	2	3	4	5	6
52. Support from others is important when I start a new task	1	2	3	4	5	6
53. It is important to have structure to my week	1	2	3	4	5	6
54. I like to know the plans of an activity in advance	1	2	3	4	5	6
55. If I make plans I stick to them	1	2	3	4	5	6
56. I do not see any value in walking	1	2	3	4	5	6

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree
57. If I walk there should be a specific purpose to it	1	2	3	4	5	6
58. Walking should be linked to an activity that I enjoy	1	2	3	4	5	6
59. It is important to enjoy my surroundings during a walk	1	2	3	4	5	6
60. I would like to meet more people in my community	1	2	3	4	5	6
61. Walking is a good way to meet new people	1	2	3	4	5	6
62. I enjoy sharing experiences with other people	1	2	3	4	5	6
63. I would describe myself as a social person	1	2	3	4	5	6
64. As I get older I find it harder to socialise	1	2	3	4	5	6
65. I prefer walking alone rather than with others	1	2	3	4	5	6
66. Walking by myself is boring	1	2	3	4	5	6
67. I like to get out of the house as often as I can	1	2	3	4	5	6
68. I like to walk in familiar places	1	2	3	4	5	6
69. I like to discover new places	1	2	3	4	5	6

Thank you for completing this questionnaire. Please move to Part Two.

	Strongly disagree	Moderately disagree	Mildly disagree	Mildly agree	Moderately agree	Strongly agree

Part Two: Your thoughts on the questionnaire

We would now like to know how the statements in the questionnaire fit with your own experiences.

Do you have any thoughts about the wording of the questionnaire?
E.g. Was it easy to read? Did any statements not make sense [if so, please give question number]? Was anything unclear? How would you change the wording?

Does the questionnaire provide a good overview of what makes it easier and what makes it harder for you to walk more?

Was the questionnaire easy to complete?
E.g. How is the length of the questionnaire? Is it too time consuming to complete?

Is there anything you think is important that is missing?

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Were there any statements that could be left out?

E.g. Were there any that did not feel relevant? Did any of the statements appear too similar? If so, which ones?

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If you have any other comments about the questionnaire, please share them below

E.g. How good do you think this questionnaire would be if, say you or someone you know filled it in? Would it give a clear view of the sort of things that would help or hinder you or your friend in relation to walking?

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Thank you very much for taking the time to complete this form.

Please return all pages of this completed form back to me in the provided pre-paid self-addressed envelope.

What makes it easier for people over 65 to regularly walk? A research study

Background to the research

My name is Daniel Bird. Thank you for agreeing to take part in my research. I am a Trainee Clinical Psychologist at Canterbury Christ Church University and I have been undertaking research as part of my training. The aim of my research is to develop a questionnaire to find out what makes it easier, and what makes it harder, for people aged 65 and over to walk more.

This research project has two stages. In the first stage I interviewed people aged 65 and over to find out their thoughts about what makes it easier or harder to walk more. For the second stage of the research project, I am asking people aged 65 and over for their thoughts on the questionnaire that I have made from the responses in the first stage.

What am I being asked to do?

The statements now have to fit under themes that are relevant to what might make it easier or harder for people over 65 to walk more.

I am asking for you to read the themes and comment on their wording. I am also asking you to read each statement and answer whether you think that it fits under the theme that it is listed under.

Completion should take about 10-15 minutes.

Please could you complete this form and return it to me by e-mail to d.c.bird555@canterbury.ac.uk.

Thank you very much for your time.

Completing the questionnaire

Below is a list of statements that people aged 65 and over have made about things that might make it easier, or harder, for them to walk more. Each statement about walking is placed under one of 15 themes, which are as follows:

Theme 1: Conflicting priorities
Theme 2: Concerns about safety
Theme 3: Energy as a barrier
Theme 4: General motivation
Theme 5: Need for tranquillity
Theme 6: Need to keep busy
Theme 7: Outcome expectations positive mood
Theme 8: Perceived control for walking
Theme 9: Physical expectations negative
Theme 10: Physical expectations positive
Theme 11: Perceived support for walking
Theme 12: Spontaneity
Theme 13: Walking needs a purpose
Theme 14: Walking as a social activity
Theme 15: Walking as stimulation

In the listing below, please could you:
  a) Comment on the wording of each theme in the place shown,
  b) Answer "yes", "unsure" or "no" as to whether you think each statement fits the theme named above it,
  c) Suggest which of the other themes it might belong to if not in the one where it is shown.

Theme 1. Conflicting priorities				Could this theme be worded differently? If so, how?
Statements under Theme 1	*Does this statement fit under Theme 1. Conflicting priorities?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
1. I have control over my own time				
2. I am being selfish if I do something for my own pleasure				
3. Other parts of my life take priority over walking				

4. I have too many priorities to start something new				
5. I have to consider others before I do something for myself				
6. I do activities other than walking to keep fit				

Any other comments about this theme?

Theme 2. Concerns about safety			**Could this theme be worded differently? If so, how?**	
Statements under Theme 2	*Does this statement fit under Theme 2. Concerns about safety?*			
	Yes	**Unsure**	**No**	**Any comments on where it might fit better?**
7. I do not feel safe when I am out alone				
8. I am worried about who I might meet when I am out alone				

Any other comments about this theme?

Theme 3. Energy as a barrier			**Could this theme be worded differently? If so, how?**	
Statements under Theme 3	*Does this statement fit under Theme 3. Energy as a barrier?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
9. I am aware of my energy declining as I age				
10. I do not have the energy to increase my walking				
11. I would not manage to cope with a walking programme				
12. I choose to walk to the local shops when I can				

Any other comments about this theme?

Theme 4. General motivation				Could this theme be worded differently? If so, how?
Statements under Theme 4	*Does this statement fit under Theme 4. General motivation?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
13. I like taking on new challenges				
14. I like the feeling I get when completing a challenge				
15. I have a lot of self-motivation				
16. I try to complete a task even when met with a barrier				
17. When I achieve a goal, I set a higher one				
18. I do not do activities that I used to enjoy				
19. I am more likely to complete a task if someone else suggests it				
Any other comments about this theme?				
Theme 5. Need for tranquillity				Could this theme be worded differently? If so, how?
	Does this statement fit under Theme 5. Need for tranquillity?			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
20. I do not like being in busy places				
21. I enjoy being out in the fresh air				
22. I enjoy peaceful environments				
Any other comments about this theme?				
Theme 6. Need to keep busy				Could this theme be worded differently? If so, how?
Statements under theme 6	*Does this statement fit under Theme 6. Need to keep busy?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**

	Yes	Unsure	No	
23. Walking would help to keep me active				
24. I am somebody who likes to be on the move				
25. I believe that I am walking enough at present				
26. I used to walk further than I do now				
27. I used to walk more often than I do now				
28. I try to go for a walk whenever I can				
29. I would prefer to walk rather than use transport				
30. You should walk at a certain pace to get any benefits				
31. I find the idea of walking off-putting				

Any other comments about this theme?

Theme 7. Outcome expectations positive mood	**Could this theme be worded differently? If so, how?**			
Statements under theme 7	*Does this statement fit under Theme 7. Outcome expectations positive mood?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
32. When I walk I find that it lifts my mood				
33. Walking provides an escape from my responsibilities				
34. Walking helps me to feel less tired				
35. Walking will not make me feel better				

36. I have always enjoyed walking				

Any other comments about this theme?

Theme 8: Perceived control for walking			Could this theme be worded differently? If so, how?	
Statements under Theme 8	*Does this statement fit under Theme 8. Perceived control for walking?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
37. There are many interesting things to look at while walking locally				
38. I can easily get to places I would like to walk in				
39. I do not know of any places to walk				
40. I can easily think of places to walk				
41. I own appropriate clothing to walk more				

Any other comments about this theme?

Theme 9: Physical expectations negative			Could this theme be worded differently? If so, how?	
Statements under Theme 9	*Does this statement fit under Theme 9. Physical expectations negative?*			
	Yes	**Unsure**	**No**	**Any comments on where it might fit better?**
42. I avoid walking because it makes me short of breath				
43. I am worried that I might hurt myself whilst walking				
44. My health restricts what I can do				

Any other comments about this theme?

Theme 10: Physical expectations positive				Could this theme be worded differently? If so, how?
Statements under Theme 10	*Does this statement fit under Theme 10. Physical expectations positive?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
45. I would like to improve my physical fitness				
46. Walking would help to keep me fit				
47. Regular physical activity helps me to sleep better				
48. I am concerned about letting my body decline				
49. As I get older I am becoming more health conscious				
50. It is important for me to maintain my mobility				
51. Walking helps to strengthen my bones				
52. Managing my weight is important to me				
53. Walking more could help me recover from aches and pains				
Any other comments about this theme?				
Theme 11: Perceived support for walking				Could this theme be worded differently? If so, how?
Statements under Theme 11	*Does this statement fit under Theme 11. Perceived support for walking?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
54. People I am close to do not encourage walking				
55. I am aware of available support to help me walk more				

56. Support from others is important when I start a new task				
Any other comments about this theme?				

Theme 12: Spontaneity			**Could this theme be worded differently? If so, how?**		
Statements under Theme 12	*Does this statement fit under Theme 12. Spontaneity?*				
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**	
57. It is important to have structure to my week					
58. I like to know the plans of an activity in advance					
59. If I make plans I stick to them					
Any other comments about this theme?					

Theme 13: Walking needs a purpose			**Could this theme be worded differently? If so, how?**		
Statements under theme 13	*Does this statement fit under Theme 13. Walking needs a purpose?*				
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**	
60. I do not see any value in walking					
61. If I walk there should be a specific purpose to it					
62. Walking should be linked to an activity that I enjoy					
63. It is important to enjoy my surroundings during a walk					
Any other comments about this theme?					

Theme 14: Walking as a social activity			**Could this theme be worded differently? If so, how?**		
Statements under theme 14	*Does this statement fit under Theme 14. Walking as a social activity?*				
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**	

64. I would like to meet more people				
65. Walking is a good way to meet new people				
66. I enjoy sharing experiences with other people				
67. I would describe myself as a social person				
68. As I get older I find it harder to socialise				
69. I prefer walking alone rather than with others				
70. Walking by myself is boring				
Any other comments about this theme?				

Theme 15. Walking as stimulation			Could this theme be worded differently? If so, how?	
Statements under Theme 1	*Does this statement fit under Theme 15. Walking as stimulation?*			
	Yes	**Unsure**	**No**	**Any comment on where it might fit better?**
71. I like to get out of the house as often as I can				
72. I like to walk in familiar places				
73. I like to discover new places				
Any other comments about this theme?				

Thank you very much for taking the time to complete this form.

Please return the form to me by e-mail to d.c.bird555@canterbury.ac.uk

Appendix J: Example interview transcript

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Appendix K: Example of preliminary items

Below is a screen shot of the first page of the spreadsheet that contained the preliminary items that was used to facilitate analysis.

	Preliminary item	Participant	Quotation from transcript
6	I would prefer to walk rather than use transport	1.1.	I walk everywhere I can that it's feasible to do so, into the high street, the bank, wherever I go, I will always walk if it's
35	I would like to improve my physical fitness	1.1.	Well, getting fit mainly, that's my, my main reason
	I noticed peers put on weight after retirement	1.10.	Um, and the interesting thing was, all the chaps who retired, cause they went, they would then drive to work. And drive home in an evening and they, they put weight on.
7	I enjoy being out in the fresh air	1.11.	Umm, when it, well it's just being out in the fresh air that helps you **laughs**. I mean, aside from the actual physical exertion, I think actually being out in the fresh air, seeing the countryside, seeing the animals, and so on.
32	I like to be in different environments	1.11.	I think it's got a calming influence on you, a lot of your worries you sort of, worry about during the day, disappear when you're walking out there in the country because you're in a different sort of environment totally
37	I have always been an active person	1.11.	And I used to play badminton as well. That was the main thing that helped.
	My worries disappear while I am walking	1.11.	Yes, I think your worries disappear, I think that's one of the great things, you tend to not think about them
74	It is important to have structure to my week	1.4.	I mean, as far as I'm concerned everything is positive, because, aside from getting fit, there's structure to my week
88	I am too busy to add more activities to my week	1.4.	I mean, if that clashes with something, so it does occasionally, like meeting up with retired colleagues for lunch once a year, that kind of thing
94	I like to know the plans of an activity in advance	1.4.	The group issues a programme four, a period of four months, so I know four months ahead which dates I will be walking on, umm, and where those walks will be and where we will meet at the starting point
3	I have good access to transport	1.5.	I've got the transport facilities, and that everything is fine.
69	Being around other people makes me feel good	1.5.	I mean, you know, being sociable is of course nice cause I think it's good for your mental well-being, mixing with other
	Walking has helped me to develop other skills	1.5.	It does give me the benefit of being able to read a map or using a compass if I'm ever in the countryside on my own
43	As I get older I have to reduce my physical activity	1.6.	So, as people get older, and I'm sure as I get older, I will probably stop doing the longer walks and move down to the
106	I enjoy being with a group of people	1.6.	And the sociability, it's nice to walk in a group, I do like walking in a group
	If I had to stop driving it would be problematic to walk	1.6.	And, of course, if I had to strop driving that would be a problem, because we... getting by car is the easiest way of getting to the starting point. Occasionally we do start walks from station, umm, people still arrive by car usually when we're starting from a, from a railway station, because it's so much easier to get there and you don't need to worry about
2	I can get to places I would like to walk in	1.7.	So if the worst came to worst, I could walk from my doorstep and do lots of lovely country walks just on my own, I guess, within my ability as I get older
11	I have always enjoyed walking	1.7.	Well, I've always enjoyed walking
	I used to be too busy to walk	1.8.	In the middle part of my career I got a bit stuck, because I was so busy I obviously couldn't walk in the week, and I was away a lot in weekends as well
	If I cannot walk I will do other forms of exercise	10.1.	if I am unable to, uhh, go on a sort of designated walk, then I would try to get in a, um, quite a reasonable amount of, um, normal exercise anyway
55	As I get older I would like to preserve my health	10.10.	it's, uhh, a self preservation thing really as much as anything else

Appendix L: Initial items of the scale and how they were developed

The following table provides an overview of each of the initial items contained within the DABWOP-S, in addition to the where the information that informed the development of the initial item was derived. Note that the following provides an example of a lone quotation that informed the initial items. However, some initial items featured multiple quotations following the stages of development that resulted in reduction of the item pool, as some preliminary items were collapsed where there appeared to be a shared meaning.

Item of the DABWOP-S	Where item derived	Quotation or further information
I have control over my own time	Interviews	*"Put it this way, I have quite a lot of control over my own time."*
I am being selfish if I do something for my own pleasure	Interviews	*"It's basically being very selfish and just pleasing myself, what I do, where I go, when I decide to change the route, or anything like that."*
Other parts of my life take priority over walking	Interviews	*"I haven't got the time, I don't, erm, there are good things in my life besides walking."*
I have too many responsibilities to start something new	Interviews	*"Domestic responsibilities, with my children or grandchildren doing the odd jobs for them in their houses, and looking after the grandchildren restricted my walking sometimes."*
I have to consider others before I do something for myself	Interviews	*"Commitment would make it harder. Um, I have a disabled daughter and I, I do things for."*
I do activities other than walking to keep fit	Part one of piloting	*"Do you engage in activities other than walking to keep fit?"*
I do not feel safe when I am out alone	Interviews	*"And it gets her out. She doesn't wanna go on her own because she doesn't feel quite safe."*

I am worried about who I might meet when I am out alone	Interviews	*"And feel fears about going out on their own because of abuse, verbal abuse."*
I am aware of my energy declining as I age	Interviews	*"My energies are not what they used to be when I was kind of younger, I suppose so."*
I do not have the energy to increase my walking	Interviews	*"I do a morning at um, at, at, at an animal centre and that wears me out so I haven't got the energy to go walking."*
I would not manage to cope with a walking programme	Literature	Amotivation towards exercise scale (Vlachopoulos & Gigoudi, 2008)
I choose to walk to the local shops when I can	Part one of piloting	*"Do you walk to the local shops, station, library, hairdresser or do you consider this too far?"*
I like taking on new challenges	Interviews	*"In fact to be perfectly honest, in some cases it represents a challenge."*
I like the feeling I get when completing a challenge	Interviews	*"I quite like to do a particular trail, um, and quite enjoy the fact that when we've achieved it, and got to the end of it."*
I have a lot of self-motivation	Literature	French self-motivation inventory (André & Dishman, 2012)
I try to complete a task even when met with a barrier	Interviews	*"I mean still go out, even if its wet, we'll still go out in the rain anyway."*
When I achieve a goal, I set a higher one	Literature	French self-motivation inventory (André & Dishman, 2012)
I do not do activities that I used to enjoy	Interviews	*"I, I used to play tennis, but because my wrist is too sore it won't hold the racket anymore."*
I am more likely to complete a task if somebody else suggests it	Interviews	*"Um, oh if someone suggests it, if someone's proactive. You know, someone says 'oh, lets go for a walk' then that helps, that certainly helps."*
I do not like being in busy places	Interviews	*"I wouldn't choose to do an all urban walk, no. Apart from anyone else it's, it's um, you've got more people to get past and also it's not as comfortable under foot."*
I enjoy being out in the fresh air	Interviews	*"Umm, when it, well it's just being out in the fresh air that helps you [laughs]. I mean, aside from the actual physical exertion, I think*

		actually being out in the fresh air, seeing the countryside, seeing the animals, and so on."
I enjoy peaceful environments	Interviews	*"In a peaceful environment, it's quite a good thinking time."*
Walking would help to keep me busy	Interviews	*"Walking keeps me active and allows me to do lots of other things I suppose is the answer."*
I am somebody who likes to be on the move	Interviews	*"Um, and so, it wasn't so much being lazy, but always conscious that there was always something that you could be doing."*
I believe that I am walking enough at present	Interviews	*"Yes. I do tend to achieve the target every day."*
I used to walk further than I do now	Interviews	Feedback from preliminary piloting part one resulted in the initial item *"I used to walk more than I do now"* being amended owing to ambiguity.
I used to walk more often than I do now	Piloting stage one	Feedback from the initial item *"I used to walk more than I do now"* was *"Strongly agree in terms of mileage strongly disagree in terms of frequency of walks."* In addition to the wording of the initial item being amended, this ambiguity resulted in the development of an additional item.
I try to go for a walk whenever I can	Interviews	*"It's just down to the shops and back again, um, or walking my daughters dog, or whatever. Um, I'm out walking every day."*
I would prefer to walk rather than use transport	Interviews	*"I walk everywhere I can that it's feasible to do so, into the high street, the bank, wherever I go, I will always walk if it's feasible to do so."*
You should walk at a certain pace to get any benefits	Interviews	*"But then you do have to walk at certain pace for it to merit some sort, but I guess some exercise is better than no exercise at all."*
I find the idea of walking off-putting	Interviews	*"I don't belong to the ramblers now because, well, partly because they seem to do very long walks that start early, earlier than I'd want to start, if you see what I mean."*
When I walk I find that it lifts my mood	Interviews	*"Um, it's good to get exercising, but also it lifts your mood."*

Walking provides an escape from my responsibilities	Interviews	*"And, it just helps you rationalise things I would say, to be honest with you. It just. It helps, you just stand outside of the sort of pressure cooker environment."*
Walking helps me to feel less tired	Literature	Outcome expectations for exercise scale-2 (Resnick, 2005)
Walking will not make me feel better	Literature	Amotivation towards exercise scale (Vlachopoulos & Gigoudi, 2008)
I have always enjoyed walking	Interviews	*"Well, I've always enjoyed walking."*
There are many interesting things to look at while walking locally	Literature	Neighbourhood environment walkability scale abbreviated (Starnes et al., 2014)
I can easily get to places I would like to walk in	Interviews	*"So if the worst came to worst, I could walk from my doorstep and do lots of lovely country walks just on my own, I guess, within my ability as I get older."*
I do not know of any places to walk	Interviews	*"I joined the group so that I would know where to walk."*
I can easily think of places to walk	Literature	Neighbourhood environment walkability scale abbreviated (Starnes et al., 2014)
I own appropriate clothing to walk more	Piloting stage one	*"Asking whether suitable footwear is used."*
I avoid walking because it makes me short of breath	Literature	Outcome expectations for exercise scale-2 (Resnick, 2005)
I am worried that I might hurt myself whilst walking	Interviews	*"I had trouble with my knees quite a few years ago and they, you know, they're really good now."*
My health restricts what I can do	Interviews	*"Physical health is an important thing in terms of what are the limits that I can do in terms of walking."*
I would like to improve my physical fitness	Interviews	*"Well, getting fit mainly, that's my, my main reason."*
Walking would help to keep me fit	Interviews	*"I find that I usually enjoy it and that it keeps me uh, keeps me a bit fitter, so it's uhh good exercise and I usually enjoy doing it."*
Regular physical activity helps me to sleep better	Interviews	*"Well I sleep, I sleep better, when I, when I have been for a walk or done something active during the day. If I don't have any exercise*

		I'm not a good sleeper at the best of times. If I don't have any exercise during the day I struggle to go to sleep."
I am concerned about letting my body decline	Interviews	*"There's nothing worse than you know, letting your body decline into useless muscle."*
As I get older I am becoming more health conscious	Interviews	*"Probably, as you get older, and you start to realise that life is not going to last forever and nor is good health."*
It is important for me to maintain my mobility	Interviews	*"Um, just to maintain people's mobility, getting out, the purpose of doing it."*
Walking helps to strengthen my bones	Literature	Outcome expectations for exercise scale-2 (Resnick, 2005)
Managing my weight is important to me	Interviews	*"Became conscious of the fact that I certainly had put on quite a lot of weight. And so, I got to the point where I thought that I had to do something about this, and I went to a local weight management service, um, provided by the NHS."*
Walking more could help me recover from aches and pains	Interviews	*"I had trouble with my knees quite a few years ago and they, you know, they're really good now."*
People I am close to do not encourage walking	Literature	Original item of *"My spouse does not encourage walking"* from the exercise benefits/barriers scale (Victor, Ximenes, & Almeida, 2011) was amended following the feedback *"No spouse or partner and perhaps this should be asserted at the beginning. The death of my spouse 14 years ago caused me to do less walking; too many other tasks in house and garden and always walked together, so felt safer and easier to explore new paths."*
I am aware of available support to help me walk more	Interviews	*"I know that if I wanted to go on more group walking that there's loads around, health walks and ramblers groups et cetera."*
Support from others is important when I start a new task	Interviews	*"I do walks with other people where we go a bit further afield, but most of the walks I do now are based locally."*
It is important to have structure to my week	Interviews	*"I mean, as far as I'm concerned everything is positive, because, aside from getting fit, there's structure to my week."*

I like to know the plans of an activity in advance	Interviews	*"The group issues a programme four, a period of four months, so I know four months ahead which dates I will be walking on, umm, and where those walks will be and where we will meet at the starting point."*
If I make plans I stick to them	Interviews	*"Because that spurs you on, if you've made, or said we're going to walk on Wednesday then you generally do, because somebody else is going with you."*
I do not see any value in walking	Literature	Amotivation towards exercise scale (Vlachopoulos & Gigoudi, 2008)
If I walk there should be a specific purpose to it	Interviews	*"Go to the library, stop and have coffee maybe walk back. But um, somethings happening, there's a purpose to it. It's highly unlikely that I would just walk, and just go out and walk without a purpose."*
Walking should be linked to an activity that I enjoy	Interviews	*"The walking is secondary because I'm going to look at something and to get there I have to walk."*
It is important to enjoy my surroundings during a walk	Interviews	*"Um, I mean I guess the downside is, um, the surroundings are always, not always so attractive."*
I would like to meet more people	Interviews	*"I didn't know anybody before I went but I know a lot of them now."*
Walking is a good way to meet new people	Interviews	*"Uhh, I think one of the benefits of group walks, umm, as we do, um, is, uhh, is you spend a lot of time chatting to people you wouldn't normally spend a lot of time chatting to."*
I enjoy sharing experiences with other people	Interviews	*"In a group, I mean it's nice to talk to people, and share what you see. You know, you can say 'oh look, isn't that a lovely view' and you feel a bit silly saying that to yourself."*
I would describe myself as a social person	Interviews	*"I mean sometimes it takes me a long long time to get to the village and back if I meet people en route so, you know, you are socialising with people at the same time."*
As I get older I find it harder to socialise	Interviews	*"I think as you get older it's a bit more of an effort socialising."*
I prefer walking alone rather than with others	Interviews	*"One hundred percent by myself. I don't reckon you can get away from it all with a group of thirty or forty."*

Walking by myself is boring	Interviews	*"Um, company I guess. Um, I think, I think to walk along the countryside on my own I would actually find very boring."*
I like to get out of the house as often as I can	Interviews	*"I actually like to get out of the house and walk."*
I like to walk in familiar places	Interviews	*"Certainly, when I'm by myself, yes. I mean it's a different matter if I'm on holiday with somebody."*
I like to discover new places	Interviews	*"Discovering new things, which you do when you're walking."*

Appendix M: Research diary

The following overview of the research diary contains excerpts of handwritten notes that were taken throughout the duration of the research process. A selection of three excerpts are provided below.

Wednesday 25th July 2018

I just finished my second interview. The first one, although it went well, I feel that I came across as slightly robotic in my responses, which perhaps shows that I was more uncomfortable with these interviews than I anticipated. The interview tonight felt completely different. I recall that during my ethics proposal, I acknowledged that the interviews could be emotive to some individuals, as they may recall elements of their past. However, I am not sure that I really anticipated that the interviews would contain emotive content.

The interview tonight was with a lady who made multiple references to the death of her husband, and the walks that they would enjoy together. It didn't appear that she found talking about this particularly emotive; she may have even enjoyed reminiscing about it. However, I do not think that I anticipated this content and I found it more challenging than I perhaps would have in other contexts, such as being a therapist on placement. I found myself really making an effort to respond appropriately, as I was now a '*researcher*' and not a '*therapist*'. I think that it is possible that this detracted from the quality of the interview itself, and that perhaps a greater comfort that could have come from more thorough preparation could have resulted in more rich data, as I could have attended fully to the content.

Friday 25th January 2019

I have now started writing up Section B, despite not feeling particularly close to the end of the research. I have noticed that I had become particularly keen for the study to be '*explorative*' in nature, following my Section A which appeared to suggest that theoretical frameworks did not account for all the variance in exercise behaviour, and therefore believing that the same would hold true for walking behaviour. I think this had resulted in me seeing myself as somewhat of a revolutionary, who did not need to rely upon any theoretical framework to develop an appropriate measure. However, prompts provided within the semi-structured interview were taken from literature, and I am all too aware, having written about it in Section A, that a developed measure should have a theoretical underpinning. I am not entirely sure why this escaped me; perhaps the idea of developing something fed into my ego. Now that the theoretical underpinning is back at the forefront of my mind, I am wondering whether I could have used the prompts based in literature more frequently than I did. Perhaps, once this MRP has been finished, the items in the measure would have been more consistent with literature if I held this in mind a bit more.

February 18th 2019

Now that the MRP is heading to the final stages, and it feels like it has taken over my life, I have started to reflect upon why it was that I selected this particular research project. Previously, if anybody had asked me, I would have responded by saying that I like the idea of helping to develop an easily-accessible, cost-effective intervention, as that is similar to my MSc dissertation. However, I don't think it's than simple. Because of my arthritis, I use regular walking as a way of managing mobility difficulties and accompanying pain and

discomfort. This means that I view the benefits of walking very favourably, perhaps more so than my peers. This has perhaps meant that I approached analysis from a very clear perspective of intending to help people to walk more, which may have meant that I had more focus upon the positives associated with walking, rather than the negatives. Narratives around difficulties with walking for older people, particularly those owing to physical limitations, may have been overlooked more than they should have been owing to a defence from thinking about my own future. This potential discomfort might have contributed to the selection of recruiting older people from walking groups only, as I would be more likely to be exposed to positive narratives. In retrospect, perhaps the development of the scale would have benefitted from including people who do not regularly walk as this could have resulted in a more appropriate measure for the intended population.

Appendix N: Instructions for submission to journal

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Appendix O: MRP timeline

The following represents a timeline of the MRP process.

April 2018   Received ethical clearance from Canterbury Christ Church's Salomons
ethics panel.

May 2018   Recruitment commenced by contacting chair people of walking groups
that welcome people aged 65 and over.

May 2018   Elicitation interviews commenced. Transcription of the elicitation
interviews occurred alongside the interview process.

November 2018   Literature search for Section A was undertaken.

December 2018   Draft of Section A provided to internal and external supervisors for
review.

January 2019   Elicitation interviews complete.

January 2019   Analysis of interview transcripts commenced.

January 2019   Recruitment for the first part of preliminary piloting commenced.
Participants were also asked if they were willing to participate in part two of the preliminary
piloting process.

February 2019   Initial items, and initial domains, reviewed with the internal and external supervisors. This resulted in the initial item pool that was ready for the preliminary piloting part one stage.

February 2019   Preliminary piloting part one form created, and sent to participants by their choice of post or e-mail.

March 2019   Amendments made to the initial item pool following feedback from participants. This resulted in the final item pool.

March 2019   Preliminary piloting part two form developed, and sent to participants.

March 2019   Amendments made to the scale based upon feedback received from preliminary piloting part two. The preliminary version of the scale was finalised.

March 2019   Final draft of MRP sent to internal and external supervisors for review.

April 2019   MRP submitted.