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**An exploration of the relationship between attitudes and expectations  
regarding ageing and health behaviours in older adults: A thesis  
portfolio**

Ashley L. McColl

May 2016

*Submitted in part fulfilment of the degree of Doctorate in Clinical Psychology  
at The University of Edinburgh.*

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Word count: 18,530.

## DClinPsychol. Declaration of Own Work

**Name:** Ashley L. McColl

**Title of Work:** *An exploration of the relationship between attitudes and expectations regarding ageing and health behaviours in older adults: A thesis portfolio*

*I confirm that this work is my own except where indicated, and that I have:*

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  - Composed and undertaken the work myself
  
  - Clearly referenced/listed all sources as appropriate
  - Referenced and put in inverted commas any quoted text of more than three words (from books, web, etc.)
  - Given the sources of all pictures, data etc. that are not my own
  - Not made undue use of essay(s) of any other student(s), either past or present (or where used, this has been referenced appropriately)
  
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  - Not submitted the work for any other degree or professional qualification except as specified
  - Acknowledged in appropriate places any help that I have received from others (e.g. fellow students, technicians, statisticians, external sources)
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  - Received ethical approval from the School of Health in Social Science, University of Edinburgh
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- Received ethical approval from an approved external body and registered this application and confirmation of approval with the School of Health in Social Science's Ethical Committee

**Signature** .....

**Date** .....

## **Acknowledgements**

There are so many people that have helped and supported me on this journey, but firstly I would like to thank all the participants who agreed to take part – I really couldn't have done it without you all.

A huge thank you must go to my supervisors Dr Paul Morris and Dr Kirsty MacLennan for their endless patience and expertise as they guided me on my way towards producing a piece of work that I am extremely proud of. Special thanks to my submission and viva buddy Hannah, for her co-rating expertise.

I'd also like to thank all the staff from local GP practices, and the JJR MacLeod Centre in Aberdeen that made this study possible by welcoming me into your services, letting me use your clinic rooms, and pointing me in the direction of the kettle!

Most of all, I'd like to thank my family and friends for their patience while I turned into a thesis hermit, and for letting me vent my frustrations at various points over a scone or two. To my fiancé Michael, I cannot say enough how much it means to have your support in all my endeavours, here's to our next big adventure!

### *Dedication*

This thesis is dedicated to my Gran (Sheila) who sadly didn't get to see me complete my training, or have the opportunity to show my thesis to everyone and their dog. She would have loved that.

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## List of abbreviations

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<b>AAQ</b>	Attitudes to Ageing Questionnaire
<b>BIPQ</b>	Brief Illness Perceptions Questionnaire
<b>CIB</b>	Clock-in-the-Box Test
<b>EF</b>	Executive function
<b>ERA</b>	Expectations regarding ageing
<b>HADS</b>	Hospital Anxiety and Depression Scale
<b>LTC</b>	Long-term condition
<b>PA</b>	Physical activity
<b>SCI-R</b>	Self-Care Inventory Revised
<b>SIMD</b>	Scottish Index of Multiple Deprivation
<b>TMT</b>	Trail Making Test

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## **Overview of Thesis**

This thesis is written in portfolio format and the contents of the chapters are summarised below:

Chapter 1 is a systematic review of the research literature relating to the relationship between expectations regarding ageing and physical activity levels in older adults. Chapter 2 is an empirical study exploring the relationships between attitudes to ageing, executive function, glycaemic control and self-management adherence in older adults with Type 2 Diabetes. Both chapters are written in accordance with author guidelines for the British Journal of Health Psychology (Appendix 1). A complete reference list is contained in Chapter 3; followed by a number of Appendices containing additional information regarding ethical approval, study protocols and resources used.



## Thesis Abstract

**Background:** With life expectancies continuing to rise and more people living beyond the age of 65, health services are under increasing pressure to provide effective care for an ageing population. Increased life expectancy increases the risk of long-term conditions like Type 2 Diabetes and cardiovascular disease that require self-management – something that poses a challenge for many people, and for older adults there may be additional barriers. Identifying modifiable factors that impede self-management is an ongoing focus in the literature; and in recent years increasing attention has been paid to the impact of individuals' attitudes to their own ageing.

**Aims:** The first part of this thesis portfolio is a systematic review of the literature that aims to answer the question "*Are lower expectations regarding ageing associated with lower levels of physical activity in older adults?*" The second is an empirical study that aims to explore the relationships between attitudes to ageing, executive function, glycaemic control and self-management adherence in older adults with Type 2 Diabetes.

**Method:** A systematic literature search was undertaken to identify studies reporting quantitative analyses of the relationship between expectations regarding ageing and physical activity. Methodological quality of the studies was appraised and synthesized, and clinical and research implications discussed. In the empirical study; 77 older adults completed self-report measures of attitudes to ageing and self-management adherence, and two brief measures of executive function. HbA1c; a biological measure of glycaemic control was also recorded for each participant. Correlations and multiple linear regressions tested the relationships between attitudes to ageing, EF, self-management and glycaemic control.

**Results:** 8 studies (derived from 9 papers) were eligible for the systematic review, and were in consensus in their support of lower expectations regarding ageing being associated with lower levels of physical activity. The findings of the empirical study indicated that more negative attitudes to ageing in relation to physical changes predicted poorer self-management; and more negative attitudes to ageing in relation to psychosocial loss predicted poorer glycaemic control.

**Conclusion:** The current findings are in line with an emerging evidence base supporting a relationship between attitudes to ageing, and physical health outcomes and behaviours; with more negative attitudes and perceptions of old age acting as a barrier to health promoting behaviours. Therefore, interventions targeting those cognitions could help to promote better health outcomes for older populations, as well as promoting healthy ageing and valuing older people – a current focus in policy and strategy.

## **Chapter 1: Systematic review journal article.**

### **A systematic review of the relationship between expectations regarding ageing and physical activity in older adults.**

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Word count (excluding references, tables and figures): 4,598.

Written in accordance with the author guidelines for British Journal of Health Psychology (Appendix 1).

**Abstract** (185 words)

**Purpose:** Physical activity (PA) can reduce the risk of chronic disease as individuals age. With our ever-growing and ageing population, preventative health behaviours like PA are vital to improving future health outcomes and reducing pressure on health services. However, many adults do not engage in regular PA, and lower expectations for successful ageing have been proposed as a barrier to this. This systematic review aimed to evaluate the quality and strength of the existing evidence for a relationship between expectations regarding ageing (ERA) and PA.

**Methods:** A search of electronic databases identified studies reporting quantitative relationships between ERA and PA levels. 45 potentially relevant papers were identified, and further screening led to data being extracted from 8 eligible studies (9 papers). **Results:** All studies reported a significant relationship between ERA and PA. However, the results may be limited in their generalisability due to a lack of robust sampling methods and reduced representativeness of samples. **Conclusions:** Available evidence suggests that lower ERA is associated with lower PA levels in older adults. Further longitudinal and intervention-based research is needed to explore this relationship with more representative samples.

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## Statement of Contribution

### *What is already known on this subject?*

- Physical activity (PA) can reduce the risk of chronic disease as individuals age. However, many adults do not engage in regular PA despite the known benefits.
- Several studies have identified statistically significant associations between expectations regarding ageing and PA levels; but there has been no systematic review of the strength of this evidence.

### *What does this study add?*

- This review highlights a consensus in the available evidence supporting a relationship between lower ERA and lower PA levels. This evidence is based on studies of mixed, but adequate methodological quality.
  - The findings may inform longitudinal and intervention-based research that could help to elucidate directionality in this relationship, and evaluate the efficacy of modifying expectations regarding ageing in physical activity interventions.
-

## **Introduction**

With life expectancies increasing, it is predicted that, the population aged 65 and over in the UK will reach 16 million over the next 17 years – an increase of 40% (Office for National Statistics, 2015). In Scotland alone, by 2039, the population aged over 75 in Scotland will increase by 85% to 370,000 (NRS, 2014). Furthermore, globally, the oldest-old (those aged 85 and older) now make up 8% of the population of 65 and overs (WHO, 2011). However, living longer doesn't equal living healthily, and with increased life expectancies comes increased prevalence of long-term conditions (LTCs) like cancer, cardiovascular disease, diabetes, and musculoskeletal diseases. In the UK, 58% of people aged over 60 have an LTC; and 25% of that population have two or more LTCs (Department of Health, 2012). Furthermore, such non-communicable conditions account for over two thirds of all deaths in those aged 60-69 in the UK (WHO, 2014). Increases in LTCs are partly due to the increasing age of the population, but also to modern lifestyle and diet. Lifestyle risk factors such as physical inactivity, sedentary behaviour, smoking, alcohol consumption, hypertension, and obesity increase with age (WHO, 2011). Therefore, the risk of LTCs can be reduced with lifestyle changes across the lifespan; like increasing physical activity and following a healthy diet. Physical inactivity in particular is a major global risk factor for morbidity and mortality (WHO, 2004), but is also modifiable.

Physical activity (PA) can take many forms; from walking, cycling, and gardening to attending the gym and playing group sports. Regardless of age, engaging in regular PA is one of the most beneficial measures that individuals can take to improve their physical, mental and cognitive health. Even small increases in PA levels can reduce the risk of LTCs later in life (WHO, 2010), and therefore, the promotion of a more physically active population is a key target for UK government (Department of Health, 2011). Current UK guidelines recommend that individuals of all ages engage in daily PA adding up to at least 150 minutes of moderate intensity activity per week (Department of Health, 2011). Despite the benefits, it is estimated that around half of men and women aged 65 -74 in the UK do not meet these recommendations; and this decreases even further for those aged 75 and over (BHF, 2015).

Preventing LTCs remains crucial as individuals age, as their onset can lead to functional decline and loss of independence.

Evidence suggests that it is never too late or early to adopt, and benefit from, a more physically active lifestyle since the benefits apply across the lifespan; even for sedentary older adults. Interventions to increase PA have had varied success with adults. Behavioural techniques, such as monitoring and goal-setting (Talbot *et al.* 2003), and cognitive interventions promoting self-efficacy and including motivational interviewing have led to improvements in PA levels (Brodie & Inoue, 2005; Pinto *et al.* 2005; Barnason *et al.* 2009). However, recent reviews caution that behavioural techniques alone may not be as effective for older adults as they are with younger populations, and highlight instead the efficacy of cognitive and cognitive-behavioural interventions (Chase, 2013; French *et al.* 2014). The lack of evidence supporting long-term maintenance of increased PA following intervention (van der Bij *et al.*, 2002; Hobbs *et al.* 2013), further emphasises the gap that remains in the PA literature (Chase, 2013).

Several barriers to PA in older adults have been proposed; ill health and pain (Booth *et al.* 2000; Cohen-Mansfield *et al.* 2003); fear of falls (Bruce *et al.* 2002; Yardley & Smith, 2002), neighbourhood and environmental limitations (Booth *et al.* 2000; Justine *et al.* 2013); and physician advice (Balde *et al.* 2003). However, it is not always possible to modify such factors, and targeting personal motivational factors has been suggested as a more effective route to influencing health behaviours. Motivational factors fit within a social cognitive framework (Bandura, 1986) and encompass constructs such as self-efficacy and outcome expectancies which have been linked to PA (Resnick, 2001; Brassington *et al.* 2002). Social cognitive theory can also be seen to encompass perceptions and beliefs regarding ageing. Indeed, more positive perceptions of ageing have been associated with positive health outcomes in older adults; including higher ratings of functional health (Levy, Slade & Kasl, 2002), physical and mental health (Bryant *et al.* 2012), and increased longevity (Levy *et al.* 2002). Establishing a clear link between specific age-related cognitions and PA could inform the development of interventions that lead to more sustained outcomes by targeting those modifiable cognitions.

Rowe and Kahn (1997, 1998) conceptualise 'successful ageing' as being free of disease and disability, physically and cognitively intact, and socially engaged. However, not all individuals hold such positive expectations for their own ageing; with some perceiving old age as a time of loss and decline. Stereotype embodiment theory (Levy, 2009) offers a model of how such expectations regarding ageing impact on PA behaviours. Levy proposes that negative age-stereotypes are socially constructed and reinforced across the lifespan, and become self-stereotypes as individuals approach old age and salient events activate those stereotypes e.g. ill health, functional limitations. These self-stereotypes exert an influence through several pathways; psychologically through the development of self-maintaining expectations of reduced self-efficacy, and behaviourally through reduced motivation as a result of lower expectancies of positive outcomes. In other words; individuals with lower expectations for successful aging are more likely to hold beliefs that they are not capable of engaging in PA, and that outcomes such as improved functional health are unlikely. Therefore, they are less motivated to engage in PA.

In recent years a growing number of studies have explored the relationship between ERA and PA levels. However, no systematic reviews have been conducted to evaluate the strength and quality of the findings. This review aims to synthesise and evaluate existing evidence relating to the relationship between ERA and PA in older adults; to inform interventions and further research. The current review aims to answer the question of whether lower expectations for ageing are associated with lower levels of physical activity in older adults.

## **Method**

### ***Literature search***

Prior to literature searches, a protocol was published online on PROSPERO ([http://www.crd.york.ac.uk/PROSPERONew2/display\\_record.asp?ID=CRD42016035544](http://www.crd.york.ac.uk/PROSPERONew2/display_record.asp?ID=CRD42016035544)); summarizing key details of the methodology, to promote

transparency and reduce bias. Systematic searches were carried out on online databases (EMBASE, Medline, PsycINFO, PubMed, Cochrane Library, CINAHL). All databases were searched with no date restriction up to the date of the searches (18<sup>th</sup> February 2016). Reference lists of eligible papers were scanned for additional studies, and authors contacted regarding unpublished work or other relevant studies. A search of an online dissertation database (ProQuest) was carried out to identify unpublished studies. Combinations of the following keywords were used; (attitude\* **or** expectation\* **or** self-perception\*) **and** (age\* **or** aging), **and** (physical activit\* **or** exercis\* **or** activit\*).

### ***Study inclusion and exclusion criteria***

*Inclusion:* Studies that involved older adults (>60 years old) were included. Eligible studies had to include at least one measure of ERA, and one measure of PA; and have reported or were able to provide data from a quantitative analysis of the relationship between those measures. ERA was defined as any measure of future expectancies regarding components of successful ageing e.g. physical and cognitive capacity, social engagement, and physical health. PA was defined as any measure of activity levels within a defined time period e.g. duration and frequency of PA in the previous week.

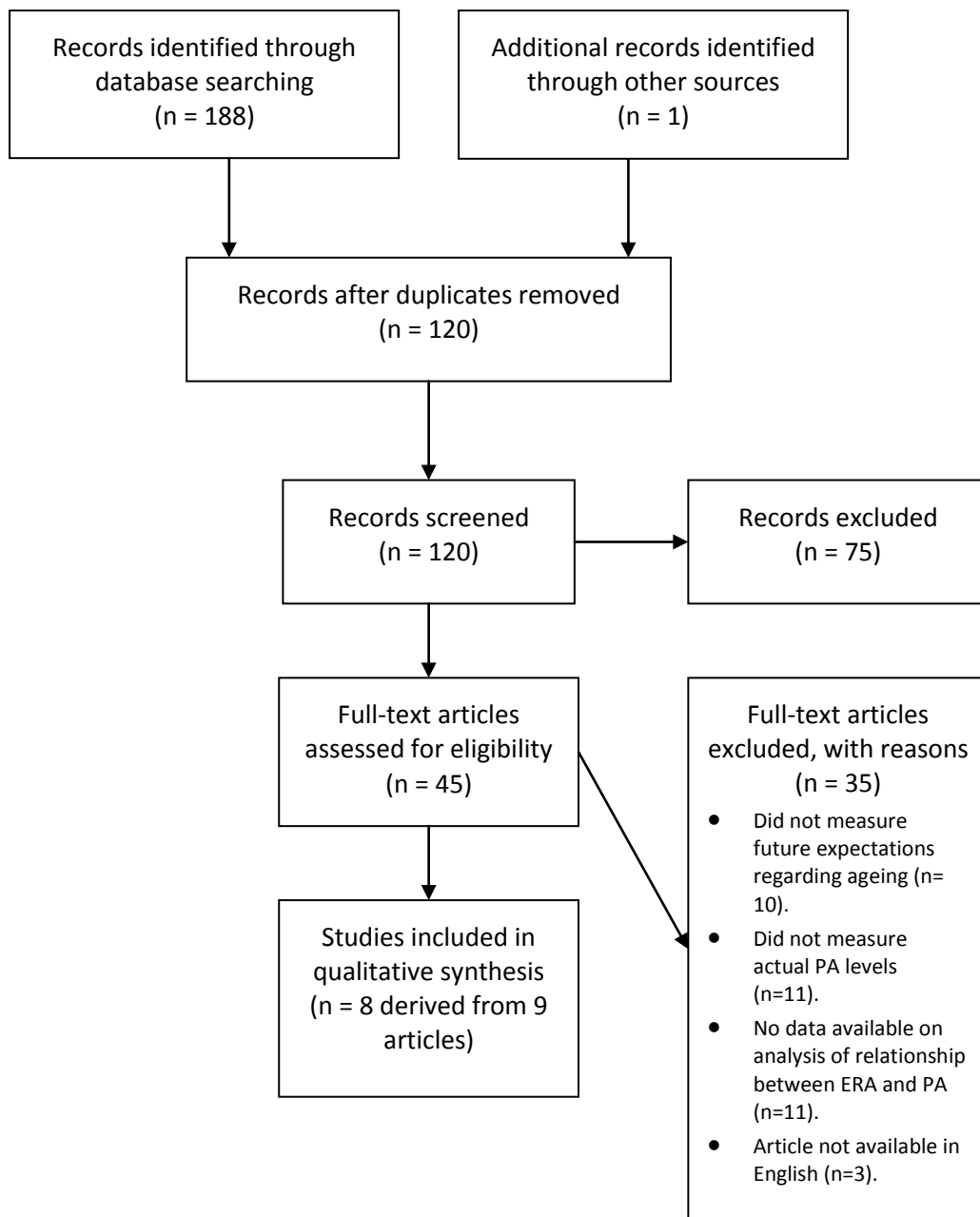
*Exclusion:* Studies that could not be sourced in English were excluded.

### ***Data extraction and quality assessment***

188 potential papers were identified in the database search, 120 papers remained once duplicates were removed. One paper was identified in correspondence with an author of one of the reviewed studies. Screening of abstracts left 45 papers that were read in full to assess eligibility. At the final stage, 8 studies (9 papers) were included for full review. Figure 1 shows the PRISMA flow-diagram of the systematic search process.

Methodological quality was assessed using criteria developed by the first author (AM) in consultation with the second author (PGM), for the purpose of the review (Appendix 2).





**Figure 1.** Systematic search strategy

Those criteria were based on an existing tool for assessing observational studies (STROBE; von Elm *et al.* 2007); but adapted to focus on methodological quality of studies rather than reporting quality. This process was also informed by guidance and literature regarding systematic appraisal of risk of bias in observational studies (Sanderson, Tatt & Higgins, 2007; Centre for Reviews and Dissemination, 2009).

Seven items were used to assess five dimensions of methodological quality (sampling, representativeness, power, outcome measurement, and statistical analysis). Ratings on each dimension included *well addressed*, *partially addressed*, *poorly addressed* and *unclear*.

The first author (AM) rated all papers. Five papers (50%) were independently rated by a blind co-rater (HW); and moderate agreement was indicated ( $k = .730$ ,  $p < .001$ ).

## **Results**

### ***Included studies***

Key characteristics of included studies are presented in Table 1. One study was accessed as a PhD thesis comprising two unpublished papers (Freelove, 2008a, Freelove, 2008b), and the rest as peer-reviewed journal articles. Six of the eight studies were cross-sectional (Sarkisian, Prohaska *et al.* 2005; Freelove, 2008a, 2008b; Sanchez Palacios *et al.* 2009; Wurm *et al.* 2010; Li *et al.* 2013; Dogra *et al.* 2015); one was a randomized controlled trial (Wolff *et al.* 2014), and the last a cohort non-randomized pilot study (Sarkisian *et al.* 2007). In total, the reviewed studies sampled 4342 community dwelling older adult participants. Two studies sampled participants aged 60 and over (Li *et al.* 2013; Dogra *et al.* 2015); and the remaining six studies involved those aged 65 and over (Sarkisian, Prohaska *et al.* 2005a; Sarkisian *et al.* 2007; Freelove, 2008a, 2008b; Sanchez Palacios *et al.* 2009; Wolff *et al.* 2014). Percentages of females in samples ranged from 49% (Wurm *et al.* 2010) to 89% (Sarkisian *et al.* 2007).

**Table 1.** Characteristics of reviewed studies

Study	Sample (n=, population)	Study design	Mean age (SD)	Gender (% female)	Expectations regarding ageing measure	Physical activity measure	Key findings
1. Sarkisian, Prohaska <i>et al.</i> (2005)  USA	636, community dwelling older adults (>65y).	Cross-sectional	77.5 (6.3)	76.4	Expectations Regarding Aging Questionnaire (38 item)  (Sarkisian <i>et al.</i> 2002)	Lorig Self-Management Behavior Exercise Survey  (Lorig <i>et al.</i> 1996)  (minutes of exercise in the previous week)	Lower ERA were associated with higher likelihood of reporting low levels of physical activity (OR = 2.6; CI=1.5-4.5).
2. Sarkisian <i>et al.</i> (2007)  USA	46, sedentary community dwelling older adults (>65y).	Longitudinal cohort non-randomized pilot study.	77(SD not reported)	89.0	Expectations Regarding Aging Questionnaire (38 item)  (Sarkisian <i>et al.</i> 2002)	Pedometer  (steps per week)	Changes in ERA were correlated with changes in levels of walking $r = 0.36$ (CI 95% = 0.08-0.59; $p = .01$ ).
3. Freelove (2008a, 2008b) 2 papers  USA	459, older adults (>65y).	Cross-sectional	78.1 (7.2)	72.0	Expectations Regarding Aging Questionnaire (38 item)  (Sarkisian <i>et al.</i> 2002)	Physical Activity Scale for the Elderly (PASE)  (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999; Washburn, Smith, Jette, & Janney, 1993)  (PA frequency and duration over previous 7 days).	<b>Paper a:</b> ERA-38 total score was positively correlated with physical activity level ( $r=0.25$ , $p<.001$ ).  <b>Paper b:</b> Higher ERA-38 total score predicted higher levels of PA ( $\beta = 1.38$ , $p<.0001$ ).  ERA partially mediated the relationship between neighbourhood environment and PA ( $z=2.47$ , $p = .0068$ ).

Study	Sample (n=, population)	Study design	Mean age (SD)	Gender (% female)	Expectations regarding ageing measure	Physical activity measure	Key findings
4. Sanchez Palacios <i>et al.</i> (2009)  Spain	757 community dwelling older adults (>65y)	Cross-sectional	Not reported.	53.0	Negative Aging Stereotypes Assessment (CENVE; Blanca <i>et al.</i> 2005).	Single question regarding frequency of PA rated on a scale from <i>almost inactive</i> to <i>usually</i> .	Participants who reported the lowest PA levels had significantly more negative scores on the health (F (3,752) = 2.669, p=.04) and motivational-social (F (3,752) = 8.121, p<.001) domains of ageing stereotypes than those who reported more frequent PA.
5. Wurm <i>et al.</i> (2010)  Germany	1490 community dwelling older adults (>65 years).	Cross-sectional	72.55 (5.85)	48.7	Bespoke scale developed by Wurm <i>et al.</i> (2007) measuring representations of ageing as involving ongoing personal growth and development; rated on 4-point scale.	Single questions regarding frequency of walking, and sporting activity e.g. hiking, football, swimming. Rated on a 6 –point Likert Scale from <i>never</i> to <i>daily</i> .	More positive views of ageing predicted higher levels of sporting activity (B=.20, p<.001) and walking (B=.11, p<.001).
6. Li <i>et al.</i> (2013)  China	550 older adults (>60y).	Cross-sectional	66.3 (6.1)	51.3	Expectations Regarding Aging Questionnaire (12 item)  (Sarkisian, Steers <i>et al.</i> 2005)	Godin Leisure Time Exercise Questionnaire  (Godin & Shephard, 1985).  (Average frequency of PA over typical 7 days).	ERA were positively associated with leisure time PA levels (r=.144, p= .001).  SEM indicates that ERA affects PA in a causal pathway ( $\beta = .47$ ).

Study	Sample (n=, population)	Study design	Mean age (SD)	Gender (% female)	Expectations regarding ageing measure	Physical activity measure	Key findings
7. Wolff <i>et al.</i> (2014) Germany	234 community dwelling older adults (>65y).	Longitudinal (RCT).	70.0 (4.9)	75.0	German Aging Differential scale  (Gluth <i>et al.</i> 2010)	PRISCUS physical activity questionnaire (Trampisch <i>et al.</i> 2010)  (PA frequency and duration over previous 7 days).	Increased perceptions of integrity in old age predicted increased PA (B= .20; p= .01; 90% CI = .01-.07).  For change of integrity in the upper level of 95% CI PA is predicted to increase by 1.1hr per week. In the lower level, it is predicted to increase by 0.3h per week.
8. Dogra <i>et al.</i> (2015) Canada	170, community dwelling, low SES older adults (>60y).	Cross-sectional	70.9 (6.8)	79.8	Expectations Regarding Aging Questionnaire (12 item)  (Sarkisian, Steers <i>et al.</i> 2005)	Healthy Physical Activity Participation Questionnaire  (CSEP, 2004).	ERA were positively associated with PA levels (B= .04, SE= .01, p = .003).

### ***Methodological quality of included studies***

Methodological quality of each study has been summarised in Table 2; split across seven categories.

#### ***Sampling***

Sampling methods were rated as *partially addressed* for seven studies. This was due to the use of sampling methods that could have introduced bias; including convenience and volunteer sampling. Such sampling methods have been associated with higher rates of females, higher education levels and higher cognitive abilities; compared to random samples (Ganguli *et al.* 1998; Pruchno *et al.* 2008). However, inclusion criteria were appropriate to the hypotheses being tested, and applied appropriately across studies. Only one study (Wurm *et al.* 2010) received a *well addressed* rating due to the use of a probability sampling technique stratified by age, gender and place of residence.

Two studies excluded participants on the basis of PA levels leading to a more sedentary sample (Sarkisian *et al.* 2007; Wolff *et al.* 2014), and others excluded those deemed incapable of PA (Freelove, 2008a, 2008b; Dogra *et al.* 2015). Sarkisian *et al.* (2007) had the most stringent exclusion criteria; which may have biased their sample towards those most willing to share medical information and dedicate time to attending sessions.

#### ***Representativeness***

Representativeness across studies was rated as *partially addressed*. Gender and age were consistently reported, however, other characteristics such as ethnicity and education level were not. This made it difficult to assess the representativeness of samples in comparison to their target populations, and this was further hampered by a lack of analysis of the representativeness of the sample within the journal articles reviewed. Analysis of differences between those that were eligible to take part and did, and those that opted not to or dropped out was not available for any of the studies. Females were over-represented in five studies; with only Sanchez Palacios *et al.* (2009), Li *et al.* (2013) and Wurm *et al.* (2010) reporting more proportionate

gender splits, despite evidence that females tend to report lower levels of PA than men (Crespo *et al.* 1999; Simons-Morton *et al.* 2000; Steffen *et al.* 2006).

Furthermore, Sarkisian, Prohaska *et al.* (2005) note that their results may only generalise to sedentary older adult populations.

Socioeconomic status (SES) has been linked with PA (Giles-Corti & Donovan, 2002; Gidlow *et al.* 2006; Farrell *et al.* 2013); however, most of the reviewed studies either reported a skewed sample in terms of SES (Sanchez Palacios *et al.* 2009; Dogra *et al.* 2015) or their use of volunteer sampling methods lends to a potential bias towards higher SES participants. Education level has also been associated with PA (Borodulin *et al.* 2008; Hamer *et al.* 2012), and ERA (Sarkisian, Hays & Mangione, 2002). Self-selected samples, such as those in this review, tend to be biased towards higher education levels; which was acknowledged as a limitation by Freelove (2008a, 2008b).

Evidence supports cross-cultural differences in ERA (Kim, Jang & Chiriboga, 2009; Laditka *et al.* 2009) and PA (Dogra *et al.* 2010; Williams *et al.* 2011). However, two studies comment on the limited generalisability of their findings due to the narrow geographical regions from which they sampled (Sarkisian, Prohaska *et al.* 2005a; Li *et al.* 2013). Meanwhile, Freelove (2008a, 2008b) notes an over-representation of white individuals in their sample. It is important that samples are representative of the cultures and ethnicities present in the target population. No cross-cultural studies were eligible for the current review, but future research could look to adopt this design in order to explore any cultural differences in this relationship.

**Table 2.** Methodological quality of reviewed studies

Study	Sampling method	Representativeness of sample	Power	Measurement of expectations regarding ageing	Measurement of physical activity levels	Statistical analyses	Missing data
1. Sarkisian, Prohaska <i>et al.</i> (2005a)	Partially addressed	Partially addressed	Unclear	Well addressed	Well addressed	Well addressed	Unclear
2. Sarkisian <i>et al.</i> (2007)	Partially addressed	Partially addressed	Well addressed	Well addressed	Well addressed	Partially addressed	Unclear
3. Freelove (2008a, 2008b)	Partially addressed	Partially addressed	Well addressed	Well addressed	Well addressed	Partially addressed	Unclear
4. Sanchez Palacios <i>et al.</i> (2009)	Partially addressed	Partially addressed	Well addressed	Partially addressed	Partially addressed	Well addressed	Unclear
5. Wurm <i>et al.</i> (2010)	Well addressed	Partially addressed	Well addressed	Well addressed	Partially addressed	Well addressed	Partially addressed
6. Li <i>et al.</i> (2013)	Partially addressed	Partially addressed	Well addressed	Well addressed	Partially addressed	Well addressed	Unclear
7. Wolff <i>et al.</i> (2014)	Partially addressed	Partially addressed	Well addressed	Well addressed	Well addressed	Well addressed	Well addressed
8. Dogra <i>et al.</i> (2015)	Partially addressed	Partially addressed	Well addressed	Well addressed	Poorly addressed	Well addressed	Well addressed



## **Power**

Power calculations were not commonly reported in the reviewed studies; only two (Freelove, 2008a, 2008b; Li *et al.* 2013) reported an a-priori power calculation. Both achieved power of at least 0.8 and received a rating of *well addressed*. Post-hoc power calculations were conducted for the purpose of the review; with five further studies receiving a *well addressed* rating (Sarkisian *et al.* 2007; Sanchez Palacios *et al.* 2009; Wurm *et al.* 2010; Wolff *et al.* 2014; Dogra *et al.* 2015). Sarkisian, Prohaska *et al.* (2005) did not provide sufficient data for their logistic regression to facilitate a post-hoc calculation and therefore was rated *unclear*.

## **Statistical analysis and missing data**

Robust analyses were used across studies to explore the statistical relationship between ERA and PA. Six studies received *well addressed* ratings (Sarkisian, Prohaska *et al.* 2005; Sanchez Palacios *et al.* 2009; Wurm *et al.* 2010; Li *et al.* 2013; Wolff *et al.* 2014; and Dogra *et al.* 2015); having used appropriate statistical methods and controlled for confounding variables. Two studies received a *partially addressed* rating (Sarkisian *et al.* 2007; Freelove, 2008a, 2008b) as they hadn't controlled for confounding variables.

Treatment of missing data was rated *unclear* for five studies due to authors not reporting the level of missing data, or how it was treated. This could lead to unrealistic estimates of the relationship between ERA and PA; and therefore, inaccurate conclusions being drawn. One study (Wolff *et al.* 2014) used the Full Information Maximum Likelihood method to control for missing data; and the level of missing data did not exceed 20%. Therefore, the study was rated *well addressed*. Dogra *et al.* (2015) were contacted for further details regarding their treatment of missing data, and were subsequently rated *well addressed* due to missing data being below 20% and cases with missing data being excluded from subsequent analyses. Wurm *et al.* (2010) report using expectation maximization imputation method; but the level of missing data was unclear, and therefore the study was rated *partially addressed*.

## **Measurement of outcomes**

### *Expectations regarding ageing*

Seven studies were rated *well addressed* (Sarkisian, Prohaska *et al.* 2005; Sarkisian *et al.* 2007; Frelove, 2008a, 2008b; Wurm *et al.* 2010; Li *et al.* 2013; Wolff *et al.* 2014; and Dogra *et al.* 2015). The long and short form of the Expectations Regarding Aging questionnaire (ERA-38, Sarkisian *et al.* 2002; ERA-12, Sarkisian, Steers *et al.* 2005) were most commonly used. Both versions reported adequate validity and reliability at the full scale (Cronbach's  $\alpha$  ranging from .86 to .95) and sub-scale level (Cronbach's  $\alpha$  ranging from .73 to .89) in reviewed studies, and have been validated for use with older adults. Wolff *et al.* (2014) used the German Aging Semantic Differential scale (ASD; Gluth *et al.* 2010) which measures subjective expectations of old age by rating how strongly adjectives reflecting successful ageing are associated with older adults. Wolff *et al.* (2014) report internal consistency for individual subscales ranging from good to acceptable (Cronbach's  $\alpha$  ranging from 0.85 to 0.72); which is in line with previous reports of good internal consistency (Gluth *et al.* 2010). Wurm *et al.* (2010) used a bespoke measure of cognitions regarding ongoing growth and development in old age previously used by the author and colleagues in research with older adults, and reported adequate reliability (Wurm *et al.* 2007). Sanchez Palacios *et al.* (2009) were rated *partially addressed* for using their adaptation of a measure (Negative Aging Stereotypes Assessment, CENVE; Blanca *et al.* 2005) for which they reported questionable levels of validity at the subscale level.

### *Physical activity*

Four studies received a *well addressed* rating for using valid measures of PA (Sarkisian, Prohaska *et al.* 2005; Sarkisian *et al.* 2007; Frelove, 2008a, 2008b; Wolff *et al.* 2014). The Physical Activity Scale for the Elderly (PASE; Washburn *et al.* 1993; 1999) was used in one study (Frelove, 2008a, 2008b); the PRISCUS physical activity questionnaire (Trampisch *et al.* 2010) in one study (Wolff *et al.* 2014); and Sarkisian, Prohaska *et al.* (2005) used the Lorig Self-Management Behaviour Exercise Survey (Lorig *et al.* 1996).

Three studies were rated *partially addressed*; Li *et al.* (2013) used the Godin Leisure-time Physical Activity Questionnaire (Godin & Shephard, 1985), which has not been validated with older populations but has been found to be significantly associated with scores on the PASE in community dwelling older adults (White *et al.* 2009). Sanchez Palacios *et al.* (2009) and Wurm *et al.* (2010) measured PA using single questions with a scale rating frequency of PA; although no validity or reliability data was available for those measures, previous research has indicated that such measures are reliable and valid with older populations (Gill *et al.* 2012). Dogra *et al.* (2015) was rated as *poorly addressed*, and used a measure (Healthy Physical Activity Participation Questionnaire; CSEP, 2004) with poor internal consistency values (Cronbach's  $\alpha = .597$ ).

The variability in PA measures used can make comparisons between studies difficult; however, many of the PA measures captured the same constructs – frequency and duration of PA, which improves consistency. Seven studies used self-report measures, which could introduce recall bias; particularly in older populations where memory difficulties may impact on the accuracy of retrospective responses required by such measures. However, measures such as PRISCUS report correlations with accelerometers ( $r = .28$ ) and acceptable reliability (Trampisch *et al.* 2010; 2012). PASE also reports good reliability (Forsen *et al.* 2010) and has been validated using the Doubly Labeled Water method of measuring energy expenditure ( $r=.58$ ) (Schuit *et al.* 1997). Only one study used an objective measure of PA; Sarkisian *et al.* (2007) measured steps per week using a pedometer. Two measures had been specifically designed for use with older adults (PASE and PRISCUS), while others (Lorig Self-Management Behaviour Exercise Survey) have been found to be valid with older populations (Lorig *et al.* 1996).

### ***Main findings from reviewed studies***

All eight studies reported that lower expectations for old age were significantly associated with lower levels of PA, even amongst those that controlled for age, gender, education, ethnicity and physical and mental health. Frelove (2008b) also reports that ERA mediated the relationship between perceptions

of social and physical environments being 'exercise friendly', and PA levels; suggesting that higher expectations can buffer against the effects of less facilitative environments.

Sarkisian, Prohaska *et al.* (2005) found a non-linear relationship; with only particularly high ERA associated with increased PA levels, and suggest that there may be a threshold above which higher ERA can promote PA. However, the results may be limited by a more sedentary sample than the general older adult population, and the use of a PA measure that doesn't capture lighter activities that older adults may engage in. Two studies highlight the potential for domain specificity in this relationship; with Sarkisian, Prohaska *et al.* (2005) finding that only ERA related to physical changes was associated with PA and. Wolff *et al.* (2014) that only ratings of integrity in old age were associated with PA levels.

Correlational associations between ERA and PA in the reviewed studies tended to be weak but significant (ranging from  $r=.14$  to  $.36$ ). Cross-sectional designs preclude any causal effects being ascertained in six of the nine reviewed studies. However, Wolff *et al.* (2014)'s longitudinal, intervention study supports a causal relationship between ERA and PA; with their finding that change in ERA predicts change in PA and not the reverse.

## **Discussion**

The reviewed studies were in consensus in their support of a statistically significant relationship between ERA and PA levels. Two studies (Sarkisian, Prohaska *et al.* 2005; Wolff *et al.* 2014) found relationships between specific dimensions of ERA and PA, suggesting that the relationship may be domain specific. This is supported by existing evidence highlighting the specificity of age-related cognitions in relation to health behaviours (Steverink *et al.* 2001; Kornadt & Rothermund, 2011). However, the current findings may be due to chance as different domains in each of the three reviewed studies were found to be related to specific aspects of PA. Future research could look to replicate the finding of a specific relationship between domains of ERA and PA.

No one study was methodologically superior, and quality in the main was mixed but adequate; with four studies (50%) rated highly on their measurement of both ERA and PA. Limitations included samples lacking in representativeness to older populations, and the use of PA measures with poor psychometrics or limited validity for the population sampled. Strengths were seen in the use of valid and reliable ERA measures. Although PA measures used were variable, they purported to measure the same construct. The use of retrospective, subjective measures of PA in seven of eight studies means that the results could be affected by recall bias. Future research should look to incorporate both objective and subjective measures of PA.

### ***Implications for practice and research***

The findings support a relationship between lower ERA and lower PA levels; including two longitudinal studies reporting a causal relationship between ERA and PA. The findings from these intervention studies support the feasibility of promoting higher ERA to improve PA. The findings fit with existing literature supporting a relationship between attitudes and beliefs regarding current ageing experiences, and engagement in health behaviours including eating healthily, weight management, limiting alcohol and seeking healthcare (Goodwin *et al.* 1999; Levy & Myers, 2004; Kim, 2009; Huy *et al.* 2010). ERA are potentially unhelpful cognitions that could be targeted in existing PA interventions combining CBT techniques with exercise programmes, which have been evidenced as efficacious with older populations (Rejeski *et al.* 2003; Brawley *et al.* 2000). Lower ERA could be seen to lead to ambivalence towards PA; and therefore, techniques promoting health behaviour change, like motivational interviewing (Miller & Rollnick, 2002), could incorporate methods of challenging those expectations in order to reduce ambivalence. There is a need for further research employing longitudinal, intervention designs to explore directionality in the relationship between ERA and PA, and the efficacy of interventions targeting those expectations.

Societal and environmental-level interventions may be warranted; given the social construction and reinforcement of ERA proposed by Levy's (2009) stereotype embodiment theory. The findings support the psychological and behavioural pathways proposed by Levy (2009). The association between ERA and PA reflects expectations of reduced physical capacity in old age becoming self-fulfilled through reduced engagement in behaviours such as PA, and being maintained by poorer expectations for positive outcomes further reducing motivation. Through promoting positive stereotypes of ageing where older adults are viewed as active and valued members of communities, we can challenge the pessimistic expectancies that can lead people to disengage from health promoting behaviours as they age. This is pertinent to current government strategy endorsing 'active ageing' in Scotland (NHS Health Scotland, 2014). Key to promoting active ageing is consideration of the needs, attitudes and aspirations of older adults, promotion of positive images of old age, and ongoing emphasis on health promotion opportunities for this age group.

### ***Strengths and limitations of the review***

This review is the first to systematically synthesise and appraise available evidence for a relationship between ERA and PA. Studies utilised robust statistical methodology in general, and a common method of measuring ERA increased coherence between study results. Measures were chosen on the basis of measuring an underlying construct relating to older adults' future perspectives or views of ageing being successful; with the ERA-38 and ERA-12 being the most common in the field at present.

The review has several limitations; the first being that the reviewed studies may lack generalisability due to sample characteristics and sampling methods potentially introducing bias. Five studies under-represented males in their samples, and others acknowledged limitations to generalisability due to specific geographical regions being sampled, and samples being skewed by SES or education level. Ethnic diversity was lacking across studies meaning that results may not be applicable to other cultures. Future studies may wish to incorporate cross-cultural designs to explore this further. Only one study

used an objective measure of PA; with the rest relying upon self-report measures that could introduce response bias. Furthermore, quality of measurement of PA was not adequate across all studies; with four studies (50%) employing measures with limited validity and reliability with the target population.

It is possible that other factors not measured in the reviewed studies may have been related to PA levels. The reviewed studies only included community dwelling participants; however, there is evidence to suggest that those with more pessimistic views of old age are more likely to be living in sheltered housing (Bodner *et al.* 2011). It would be useful to sample populations from varying living arrangements in future research on the impact of ERA on PA. Furthermore, six (75%) of the reviewed studies utilized cross-sectional analyses, where directionality cannot be inferred. However, the two longitudinal, intervention studies support a causal relationship with higher ERA linked with higher PA levels.

A strength of this review is the specificity with which it was conducted. Research focused on age-related cognitions has become more abundant in recent years, particularly in the field of health behaviour. However, at times there can be overlap in the terminology used to describe what is being measured; with some studies purporting to measure future ERA in fact measuring perceptions of current ageing experiences. This review analyses a specific relationship between future expectancies and PA; lending support to the psychological pathway proposed by Levy (2009)'s stereotype embodiment theory where self-fulfilling expectancies influence health behaviours. Future expectations for ageing may be relevant to the health behaviours of older adults, and could be targeted as part of preventative PA interventions to reduce the risk of chronic illness.

## **Conclusions**

Physical activity is a modifiable health behaviour that can reduce the risk of chronic illness; however, despite the known benefits, many adults do not engage in regular PA. The current review indicates that lower expectations for

successful ageing are related to lower physical activity levels. Although methodological quality is mixed across the studies; there is consensus in support for this relationship, and this is reinforced by the use of valid and reliable measures ERA in the majority of studies. Future research exploring the efficacy of interventions aimed at increasing PA through promoting more optimistic expectations for ageing is warranted, and would benefit from the use of more robust and valid PA measures than were used in reviewed studies. This would be in line with the recent focus in research and government policy on the promotion of successful and positive ageing.

### **Conflicts of interest**

None known.

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## Chapter 2: Empirical study journal article.

### **Attitudes to ageing and Type 2 Diabetes in older adults: An exploration of the relationships between attitudes to ageing, executive function, glycaemic control and self-management.**

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Word count: 5,350(excluding abstract, figures and references).

Written in accordance with the author guidelines for British Journal of Health Psychology (Appendix 1).

## **Abstract (180 words)**

**Objective:** To explore whether executive function (EF), and attitudes to ageing predict levels of self-management and glycaemic control in older adults with Type 2 Diabetes. **Method:** Individuals aged >65 years from a community/primary care sample completed questionnaires measuring attitudes to ageing, self-management adherence, emotional distress and illness perceptions. Participants also completed brief measures of EF (Trail Making Test and Clock-in-the-Box Test). Multivariate analyses explored the predictive power of attitudes to ageing and EF in relation to self-management adherence and glycaemic control. **Results:** 77 participants took part in the study. Attitudes to physical changes in old age significantly predicted self-management adherence ( $\beta = .409$ ,  $p = .001$ ). Attitudes to psychosocial loss in old age significantly predicted glycaemic control ( $\beta = .631$ ,  $p = .032$ ). EF measures did not significantly predict self-management adherence or glycaemic control. **Conclusion:** More negative attitudes towards ageing in relation to physical change and psychosocial loss are associated with poorer self-management adherence and glycaemic control respectively. This suggests that psychologically informed interventions promoting positive attitudes to ageing may have a beneficial effect on diabetes control in older adults.

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## **Statement of Contribution**

### *What is already known on this subject?*

- Older adults often struggle to self-manage their Type 2 Diabetes leading to poor glycaemic control, and factors such as executive function have been linked with such difficulties.
- Older adults' attitudes to their own ageing have been linked with a variety of health outcomes; with engagement in health behaviours proposed to underlie this relationship.

### *What does this study add?*

- This study is the first to analyse the predictive power of attitudes to ageing in relation to Type 2 Diabetes self-management and glycaemic control in older adults.
  - The findings indicate that more negative attitudes to physical change and psychosocial loss in old age predict poorer self-management and glycaemic control in older adults.
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## **Introduction**

### ***Type 2 Diabetes and an ageing population***

Type 2 Diabetes is highly prevalent in older adults, and it is estimated that around two thirds of the Type 2 Diabetes population in the UK is aged over 60 years (Diabetes UK, 2015). In Scotland, 140,182 older adults have Type 2 Diabetes (NHS Scotland, 2014; Scottish Diabetes Monitoring Group, 2015); constituting 14% of the total population of over 65s. With life expectancies continuing to rise, and more people in the UK living well beyond the age of 65 (COSLA, The Scottish Government & NHS Scotland, 2011; Office for National Statistics, 2015); services are likely to experience increasing pressure to provide effective diabetes care for an ever-growing and ageing population. First-line treatment for older adults with Type 2 Diabetes focuses on self-management in the form of lifestyle changes; with medication being incorporated should individuals struggle to achieve glycaemic control with those changes alone (Sinclair *et al.* 2011). However, older adults often struggle to effectively implement changes to well-established habits around activity levels and eating (Bell *et al.*, 2005; Skelly *et al.*, 2005), which can lead to poorer glycaemic control. Poor glycaemic control along with increasing age is associated with vulnerability to macro- and microvascular complications (Kirkman *et al.*, 2012); therefore, the identification of ways of promoting safe and effective self-management in older populations is key to managing this risk.

Glycaemic control (rated in terms of HbA1c levels; a measure of average blood glucose levels over a period of weeks or months) is used by health professionals as a proxy for self-management efficacy. Current guidelines (SIGN, 2010; NICE, 2015) recommend that individuals with Type 2 Diabetes aim for HbA1c levels below 7% (53 mmol/mol) to reduce the risk of complications. However, older adults are a heterogeneous group and often present with complex needs due to increased mortality risk factors including cardiovascular disease, polypharmacy, and frailty (ACCORD Trial, 2008) which must be considered when setting glycaemic targets. Clinicians must balance the impact of intensive HbA1c- lowering interventions and maintaining quality of life; alongside the likelihood of the individual living long

enough to benefit from interventions (Skyler *et al.* 2009). This is further complicated by the effect of increasing diabetes duration leading to gradual deterioration in insulin production with the consequence being poorer glycaemic control irrespective of how well individuals self-manage. For some individuals, targets can be relaxed, but lowering HbA1c remains vital to reducing the likelihood of complications (NICE, 2015; Kirkman *et al.* 2012).

It is acknowledged that achieving HbA1c targets can be challenging; and although it is recommended that diabetes self-management for older adults involves support from family or carers with healthy eating and medication compliance (Kirkman *et al.* 2012; Suhl & Bonsignore, 2006), the responsibility does mainly fall on individuals. Therefore, when promoting effective self-management, it is important to identify psychosocial factors that can act as barriers to individuals engaging in such behaviours; for example, emotional distress or cognitive impairment (McKellar *et al.* 2004; Munshi *et al.* 2006; Gonzalez *et al.* 2008).

### ***Cognitive function and management of Type 2 Diabetes***

Cardiovascular risk factors like raised blood pressure, cholesterol, and blood glucose are common in Type 2 Diabetes; and have been linked with cognitive decline and dementia (Kivipelto *et al.* 2006) with particular deficits in executive function reported (Yaffe *et al.* 2014). This leaves older adults with Type 2 Diabetes at increased risk of cognitive impairment (Cukierman, Gerstein & Williamson, 2005; Gregg *et al.*, 2000; Anstey *et al.* 2015; Tomlin & Sinclair, 2016). Furthermore, cognitive deficits have been linked with poorer glycaemic control in what may be a bidirectional relationship; with evidence indicating that poorer control contributes to cognitive ageing (Yaffe *et al.* 2012; Bordier *et al.* 2014), alongside reports of cognitive deficits in themselves being associated with poorer glycaemic control (Munshi *et al.* 2006; Sinclair, Girling & Bayer, 2000; Bordier *et al.* 2014). Either way, cognitive function is an important factor to consider in relation to glycaemic control in older populations.

Type 2 Diabetes has been associated with deficits in executive function (EF) (Vincent & Hall, 2015), which have been linked with difficulties in carrying out complex self-management activities including glucose monitoring, altering insulin doses and following dietary recommendations (Rosen *et al.* 2003; Thabit *et al.* 2009; Kirkman *et al.* 2012; Tomlin & Sinclair, 2016). EF deficits have also been associated with poorer glycaemic control in older adults (Nguyen *et al.* 2012; Munshi *et al.* 2012). EF encompasses a number of cognitive abilities including planning, organisation, attention shifting and mental flexibility. These specific areas of EF relate closely to diabetes self-management where individuals must plan and implement lifestyle changes, while inhibiting longstanding preferences and habits to promote effective diabetes control. However, with natural cognitive ageing comes significant frontal lobe atrophy leading to reduced EF (Dempster, 1992). Indeed, evidence supports a relationship between poorer performance on tests measuring areas of EF including planning and organisation, working memory and mental flexibility and diabetes outcomes including self-management adherence and glycaemic control in older adults (Munshi *et al.* 2006; Munshi *et al.* 2012).

### ***Attitudes to ageing in older adults***

While age-related, organic changes in the brain can impact on the cognitive abilities required for self-management; social cognitive theory (Bandura, 1986) proposes that attitudes and beliefs also play a part in motivating individuals to engage in such activities. Previous research looking at the impact of illness perceptions— that is an individual's attitudes, beliefs and emotional responses relating to illness, indicates that constructs such as a greater sense of personal control over illness are associated with glycaemic control (HbA1c levels) and self-management adherence (Keogh *et al.* 2007; McSharry & Morris, 2011). Furthermore, interventions targeting illness perceptions have been found to lead to improvements in glycaemic control (Keogh *et al.* 2007). Therefore, illness perceptions are relevant to the exploration of health behaviours and outcomes. In recent years, older adults' attitudes towards their own ageing have also emerged as a topic of interest in the domain of physical health. This reflects an individual's emotional and



cognitive responses to their own ageing; across a range of domains including physical and psychosocial functioning, and generativity and personal growth. More negative attitudes indicate representations of old age as a time of decline and loss of capacity (Sarkisian, Hays & Mangione, 2002).

The evidence base is growing with regards to the impact of attitudes to ageing on health outcomes in older adults. Negative attitudes have been associated with poorer subjective ratings of health (Ron, 2007), more pessimistic dispositions towards age-related changes in cognitive functioning (Schaffer and Shippee; 2010), difficulties with daily functioning (Moser, Spagnoli & Santos-Eggiman; 2011), and slower walking pace (Robertson *et al.* 2015). A recent study also reports that negative perceptions of ageing predict poorer performance on a range of cognitive functions; including EF (Robertson & Kenny, 2015). While positive attitudes to ageing have been linked to better functional health and increased longevity (Levy, Slade & Kasl, 2002), and higher subjective ratings of physical and mental health (Bryant *et al.* 2012).

Possible mechanisms underlying the relationship between attitudes to ageing and health outcomes have been explored. One such mediating factor identified in the literature is engagement in health promoting behaviours (Kim *et al.* 2009). Older adults with poorer attitudes towards ageing are less likely to seek health care (Sarkisian, Hays & Mangione, 2002), receive a physical examination (Goodwin *et al.* 1999) or participate in physical activity (Sarkisian *et al.* 2005; Li *et al.* 2013; Dogra *et al.* 2015). In contrast, positive attitudes have been associated with engagement in preventive health behaviours like physical activity, healthy eating and utilisation of health services (Levy & Myers, 2004; Quinn, Laidlaw & Murray, 2009; Wurm *et al.* 2010; 2013). The emerging evidence supports a model where attitudes towards ageing play a part in promoting or hindering health behaviours key to diabetes control.

### ***Conceptual framework***

Levy's (2009) stereotype embodiment theory offers a framework in which to understand the relationship between attitudes to ageing and health

behaviours. Levy proposes that socially constructed age-stereotypes are internalised and reinforced across the lifespan, and are activated by salient experiences such as physical or cognitive decline at a time when individuals begin to identify themselves as an older person. This leads to the development of self-stereotypes that shape the way individuals view their own ageing. Those self-stereotypes are proposed to exert an influence on health behaviours through multiple pathways; psychologically through self-perpetuating expectations regarding self-efficacy on cognitive and physical tasks (Levy, 2009); and behaviourally through expectancies regarding the outcome or efficacy of carrying out particular tasks or behaviours (Levy and Myers; 2004).

This could lead one to hypothesise that, attitudes to ageing in the Type 2 Diabetes population could present as a barrier to self-management, or a source of resilience depending on the valence of those attitudes. For older adults who hold negative attitudes towards old age, encountering cognitive or physical changes associated with Type 2 Diabetes could activate self-stereotypes that undermine their sense of self-efficacy, and optimism regarding the potential outcomes of carrying out self-management tasks. It is predicted that this would lead to reduced self-management adherence. Furthermore, it could be predicted that holding negative attitudes to ageing in the presence of EF deficits could lead older adults to experience more difficulty utilising those cognitive abilities to self-manage their diabetes, than individuals with more positive attitudes.

### ***The current study***

Research on the impact of cognitive function on diabetes control has indicated that EF deficits are associated with poorer diabetes control. No other study has explored the contribution that attitudes to ageing make to predicting self-management and glycaemic control in older adults with Type 2 Diabetes. If these attitudes are associated with self-management and glycaemic control, they might be considered in consultations with people with Type 2 Diabetes, and potentially targeted in self-management and education interventions.

The current study aimed to test the hypothesis that poorer performance on tests measuring planning, organisation and working memory, and mental flexibility (EF) predict poorer levels of self-management and glycaemic control in older adults with Type 2 Diabetes; independently of confounding variables including emotional distress, diabetes duration and illness perceptions. Furthermore, it was hypothesised that more negative attitudes towards ageing would predict poorer levels of self-management and glycaemic control in older adults with Type 2 Diabetes; independently of confounding variables such as emotional distress, diabetes duration and illness perceptions. It was also hypothesized that attitudes to ageing would moderate the relationships between EF and self-management, and glycaemic control; with more positive attitudes to ageing buffering against the effects of poorer EF levels.

## **Method**

### ***Participants***

Participants (n=78) were recruited between June and November 2015, through local primary (n = 67; 86 %) and secondary (n= 11; 14%) care services. Eligible participants were aged over 65, had a diagnosis (of at least 12 months) of Type 2 Diabetes, and were fluent in English. Participants were excluded if they had a current diagnosis of any cognitive, mental or physical disorder that could impede their ability to engage with test materials; or were currently misusing substances.

### ***Procedure***

Full ethical approval for the study was granted by the local research ethics committee (Ref: 15/NS/0012). Participants provided informed consent prior to any data being collected. Several self-report questionnaires were administered at a number of local NHS venues, in the presence of the first author, along with EF measures. Demographic information was gathered through verbal interview, along with information regarding diabetes duration and treatment regimen. Scottish Index of Multiple Deprivation (SIMD; 2012)

quintiles were calculated to describe the relative deprivation of those participating.

### **Measures**

Attitudes towards ageing were measured using the Attitudes to Ageing Questionnaire (AAQ-24; Laidlaw, Power & Schmidt, 2007). This 24-item measure, asks respondents to rate statements like “*There are many pleasant things about growing older*” and “*I am losing my physical independence as I get older*” on a five-point Likert scale. Items are placed across three domains; Psychosocial Loss, Physical Change and Psychological Growth, with acceptable psychometric properties reported for the sub-scales (Cronbach’s alpha ranging from .68-.84; Laidlaw *et al.* 2007; Bryant *et al.* 2016). Higher scores on the Physical Change and Psychological Growth scales indicate more positive attitudes, while the opposite is true for Psychosocial Loss. This measure has previously been used in the domain of physical health and ageing (Kalfoss *et al.* 2010; Lucas Carrasco *et al.* 2013; Thorpe *et al.* 2015; Trigg *et al.* 2012). In the current study Cronbach’s alpha was found to range from acceptable to good at the subscale level (Psychosocial loss;  $\alpha = .835$ ; Physical change;  $\alpha = .746$ ; Psychological Growth  $\alpha = .701$ ).

The Self-Care Inventory Revised (SCI-R; Weinger *et al.* 2005); a 14-item measure of subjective perceptions of adherence to individualised diabetes self-management recommendations was used to measure self-management adherence. Respondents rated how well they followed recommendations relating to diet, exercise, and medication compliance over the preceding 1-2 months, on a 5-point Likert scale; from 1 (“*never*”) to 5 (“*always*”). Only items relevant to the individual were scored, and were converted to a 0-100 point scale score as recommended by the measure authors; with higher scores indicating higher levels of adherence. This measure has been reported to be valid and reliable with older adult populations (Khagram *et al.* 2013), and used in previous research looking at diabetes self-management in older adults (Yi *et al.* 2008). In the current study Cronbach’s alpha at the full scale level was  $\alpha = .680$ .

*Executive function measures:* The Clock-in-the-Box test (CIB; Grande *et al.* 2011) is a modified clock-drawing task measuring planning, organisation and working memory; and has been used previously in research with older adults with Type 2 Diabetes (Munshi *et al.* 2006, 2012). Higher scores reflect higher levels of planning, organisation and working memory. The Trail Making Test (TMT; Reitan, 1958) measures attention shifting, mental flexibility, and processing speed. This pen and paper task is split into two parts; Part A connecting consecutive numbers, and Part B connecting numbers and letters in alternating order. B: A ratio scores were calculated for each participant to provide a purer measure of mental flexibility; by reducing the influence of processing and motor speed (Arbuthnott & Frank, 2000). Lower ratio scores indicate better mental flexibility.

*Biological measures:* The most recent HbA1c recording was collected from clinical databases for each participant as a measure of glycaemic control. This measure is often used as a proxy for self-management efficacy.

### ***Measuring potentially confounding variables***

Emotional distress was measured using the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983). HADS contains 14 items, scored on a scale from 0 -3 indicating severity or frequency of symptoms of anxiety and depression. This valid and reliable measure has been used with Type 2 Diabetes populations (Lloyd *et al.* 2000; Smarr & Keefer, 2011; Reddy *et al.* 2010; Gois *et al.*, 2002) and older adults (Spinoven *et al.* 1997). Cronbach's alpha at the full-scale level in the current study was found to be good ( $\alpha = .837$ ). This measure is also recommended as a screening tool in clinical services for Type 2 Diabetes (SIGN, 2010; Scottish Diabetes Group, 2006). Emotional distress has been linked to more negative attitudes to ageing (Chachamovich *et al.* 2008), poorer levels of glycaemic control (Lustman *et al.* 2000) and self-management adherence (Gonzalez *et al.* 2008) and to cognitive functioning (Biringner *et al.* 2005; Sachs-Ericsson *et al.* 2005).

Illness perceptions were measured with the Brief Illness Perceptions Questionnaire (BIPQ; Broadbent *et al.* 2006); a standardised measure of cognitive and emotional representations of illness consisting of nine items

scored on a scale from 0-10. Items measure several constructs; consequences, timeline, personal control, treatment control, identity, concern and emotional response with higher scores indicating more strongly held beliefs. The BIPQ was included as a measure of attitudes towards Type 2 Diabetes; to distinguish associations between negative attitudes towards illness and glycaemic control and self-management, from those between attitudes to ageing and the outcome variables. In order to differentiate illness specific self-efficacy from that related to the construct of personal agency captured by measures of attitudes to ageing; the personal control scale was included as a potential confounding variable as it has previously been linked to levels of glycaemic control and self-management in Type 2 Diabetes (Broadbent *et al.* 2006; McSharry & Morris, 2011). Previous studies report acceptable levels of internal consistency ( $\alpha = .77$ ; Khagram *et al.* 2013). In the current study the internal consistency of this measure was found to be poorer ( $\alpha = .596$ ).

Measures were administered in the same order to all participants; HADS, BIPQ, CIB, TMT-A, TMT-B, SCI-R and AAQ-24, and were completed in one session.

### **Statistical analyses**

A prospective power analysis with power set at 0.8 for a medium effect size ( $F^2 = 0.15$ ) with  $\alpha = 0.05$  indicated that a sample size of 77 was required to test the hypotheses. No previous study has looked specifically at the relationship between EF, attitudes to ageing, self-management and glycaemic control. Therefore, effect sizes from similar studies informed this calculation. Palta *et al.* (2014) reported that EF measures in Type 2 Diabetes achieve a medium effect size ( $d = -.33$ ). Furthermore, Kim (2009) reported a medium effect size ( $F^2 = 0.15$ ) in their study of age-related cognitions and health behaviours.

Statistical analyses were conducted using Statistical Package for the Social Sciences version 21 (SPSS v.21). Descriptive analyses were conducted on key demographic features of the sample. Preliminary correlational analysis

identified significant associations between variables. Multiple linear regression was undertaken to explore the predictive power of attitudes to ageing (in the domains of psychosocial loss, physical change, and psychological growth), mental flexibility (TMT B: A ratio score), and working memory, planning and organisation (CIB total score), in relation to glycaemic control (HbA1c) and self-management adherence (SCI-R total score). Confounding variables were controlled for by including emotional distress scores (HADS total score); illness perceptions (BIPQ Personal Control subscale score); and diabetes duration in regression models where relevant.

## **Results**

78 participants were recruited and attended a testing session. One participant was unable to complete testing, and their data was excluded from analyses. 41.6% of participants were female, and the mean age was 73.1 years (SD = 5.27). Mean duration of education was 12.65 years (SD = 3.14), and the majority of participants were married (59.7%) and retired (88.3%).

Demographic information (Table 1.) indicates that the sample is representative of the Scottish Type 2 Diabetes population (Scottish Diabetes Survey, 2014). The higher percentage of men is in line with the higher proportion of males diagnosed with Type 2 Diabetes in Scotland; and this is supported by a chi-square goodness of fit analysis ( $p > .05$ ). The mean HbA1c of 56.96 mmol/mol (7.4%) is close to the local regional average of 60 mmol/mol (7.6%) (Scottish Diabetes Survey, 2014). The majority of participants had no, or low levels of qualification as classified using the Scottish Census 2011 highest qualification grading system (National Records of Scotland, 2011); which is in line with that of the wider Type 2 population (Sacerdote *et al.* 2012). Participants were distributed across the 4 least deprived SIMD (2012) quintiles, which is consistent with local area statistics (Scottish Government, 2012).

**Table 1** Demographic characteristics of the sample.

<b>Gender</b>	Male	58.4	(%)
	Female	41.6	(%)
<b>Age</b>		73.1 (5.3)	(years)
<b>Ethnicity</b>	White Scottish	61.0	(%)
	White British	32.5	(%)
	White English	3.9	(%)
	White Other	2.6	(%)
<b>Level of education</b>		12.7 (3.1)	(years)
<b>Level of Qualification (Scottish Census, 2011)</b>	None	19.5	(%)
	Level 1	42.9	(%)
	Level 2	11.7	(%)
	Level 3	5.2	(%)
	Level 4 and above	20.8	(%)
<b>SIMD (2012) quintile</b>	1 (least deprived)	3.9	(%)
	2	16.9	(%)
	3	28.6	(%)
	4	31.2	(%)
	5	19.5	(%)
<b>Marital status</b>	Single	3.9	(%)
	Married	59.7	(%)
	Widowed	18.2	(%)
	Divorced	14.3	(%)
	Separated	2.6	(%)
<b>Retirement status</b>	Partner	1.3	(%)
	Retired	88.3	(%)
<b>Duration of diabetes</b>	Employed	11.7	(%)
		9.9 (6.3)	(years)
<b>HbA1c</b>		56.96 / 7.4 (11.39)	(mmol/mol / %)
<b>Diabetes treatment</b>	Medication	54.5	(%)
	Dietary control	28.6	(%)
	Insulin	13.0	(%)
	Medication & insulin	3.9	(%)
<b>Co-morbidities</b>		2.8 (1.3)	(no. conditions)
<b>Hypertension</b>		73.1	(%)
<b>Cardiovascular</b>		37.7	(%)
<b>High cholesterol</b>		36.4	(%)

( ) = SD's.



### ***Primary correlational analyses***

Pearson's correlational analyses were conducted to assess relationships between predictors and criterion variables (Table 2.). Bootstrapping was conducted with 1000 samples. Attitudes towards psychosocial loss in old age were found to be positively associated with glycaemic control ( $r = .257$ ,  $p = .024$ ). Longer diabetes duration was associated with poorer glycaemic control ( $r = .277$ ;  $p = .015$ ). Attitudes towards psychosocial loss and physical change in old age were associated with self-management adherence ( $r = -.295$ ;  $p = .009$ ;  $r = .425$ ,  $p < .001$ ); as were emotional distress ( $r = -.307$ ;  $p = .007$ ) and diabetes duration ( $r = .353$ ;  $p = .002$ ). All three subscales of the AAQ were significantly associated with emotional distress (HADS); psychosocial loss ( $r = .544$ ,  $p < .001$ ); physical change ( $r = -.335$ ,  $p = .003$ ) and psychological growth ( $r = -.300$ ,  $p = .008$ ). The two measures of EF were significantly correlated with each other ( $r = -.502$ ,  $p < .001$ ), but not with the outcome variables HbA1c or self-management adherence (SCI-R total).

### ***Regression analyses***

Preliminary analyses indicated no violations of the assumptions of multiple regression. Multiple linear regression analyses were conducted using the enter method (Table 3), and bootstrapping with 1000 samples. Preliminary correlational analyses identified potential confounding variables related to the two criterion variables (self-management adherence and glycaemic control). Only variables that were significantly associated with each of the criterion variables were entered into the relevant regression models.

**Table 2.** Primary correlational analyses

Measure	1	2	3	4	5	6	7	8	9	10
<b>1. HbA1c</b>	-	.174 (-.033-.363)	.257* (.031-.468)	-.128 (-.352-.133)	-.066 (-.271-.150)	.194 (.001-.382)	-.181 (-.365-.013)	-.198 (-.402-.001)	.074 (-.191-.326)	.277* (.054-.467)
<b>2. SCI-R</b>	.174 (-.033-.363)	-	-.295** (-.456-.113)	.425** (.212-.609)	.172 (-.012-.366)	.082 (-.123-.277)	.009 (-.243-.246)	.163 (-.456-.070)	-.307** (-.484-.130)	.353** (.136-.537)
<b>3. AAQ PsyLoss</b>	.257* (.031-.468)	-.295** (-.456-.113)	-	-.439** (-.596-.250)	-.564** (-.684-.406)	.316** (.133-.480)	-.155 (-.349-.039)	-.269* (-.094-.404)	.544** (.345-.706)	-.082 (-.274-.098)
<b>4. AAQ Phys</b>	-.128 (-.352-.133)	.425** (.212-.609)	-.439** (-.596-.250)	-	.529** (.361-.684)	-.149 (-.346-.077)	.137 (-.082-.337)	.255* (.048-.448)	-.335** (-.518-.103)	.038 (-.187-.266)
<b>5. AAQ Psych</b>	-.066 (-.271-.150)	.172 (-.012-.366)	-.564** (-.684-.406)	.529** (.361-.684)	-	-.147 (-.322-.059)	.026 (-.199-.242)	.125 (-.069-.309)	-.300** (-.501-.051)	.022 (-.201-.217)
<b>6. TMT B: A ratio</b>	.194 (.001-.382)	.082 (-.123-.277)	.316** (.133-.480)	-.149 (-.346-.077)	-.147 (-.322-.059)	-	-.502** (-.648-.320)	-.172 (-.369-.046)	.087 (-.166-.334)	.041 (-.148-.221)
<b>7. CIB</b>	-.181 (-.365-.013)	.009 (-.243-.246)	-.155 (-.349-.039)	.137 (-.082-.337)	.026 (-.199-.242)	-.502** (-.648-.320)	-	.202 (.003-.417)	-.048 (-.287-.157)	-.039 (-.289-.200)
<b>8. BIPQ Personal Control</b>	-.198 (-.402-.001)	.163 (-.456-.070)	-.269* (-.094-.404)	.255* (.048-.448)	.125 (-.069-.309)	-.172 (-.369-.046)	.202 (.003-.417)	-	-.231* (-.439-.005)	.188 (-.053-.396)
<b>9. HADS</b>	.074 (-.191-.326)	-.307** (-.484-.130)	.544** (.345-.706)	-.335** (-.518-.103)	-.300** (-.501-.051)	.087 (-.166-.334)	-.048 (-.287-.157)	-.231* (-.439-.005)	-	-.146 (-.349-.056)
<b>10. Diabetes duration</b>	.277* (.054-.467)	.353** (.136-.537)	-.082 (-.274-.098)	.038 (-.187-.266)	.022 (-.201-.217)	.041 (-.148-.221)	-.039 (-.289-.200)	.188 (-.053-.396)	-.146 (-.349-.056)	-

( ) = 95% confidence interval. \*p < .05, \*\*p < .01. SCI-R = Self-Care Inventory Revised total score; AAQ PsyLoss = Attitudes to Ageing Questionnaire Psychosocial Loss sub-scale score; AAQ Phys = Attitudes to Ageing Questionnaire Physical Change sub-scale score; AAQ Psych = Attitudes to Ageing Questionnaire Psychological Growth sub-scale score; TMT B: A ratio = Trail Making Test Part B : Part A ratio score; CIB = Clock-in-the-Box total score; BIPQ Personal Control = Brief Illness Perceptions Questionnaire Personal Control sub-scale score; HADS = Hospital Anxiety and Depression Scale total score.

**Table 3.** Multiple regression models.

Criterion variable	Predictor variable(s)	Standardized coefficient ( $\beta$ )	Bootstrapped Standard Error	t	p	CI (95%)		R <sup>2</sup>
						Lower	Upper	
<b>HbA1c</b>	Constant	38.165	14.303	2.198	.012	7.933	65.803	.115*
	AAQ PsyLoss	.631	.292	2.182	.030	.038	1.153	
	AAQ Phys	-.129	.279	-.456	.647	-.727	.376	
	AAQ Psych	.371	.342	.985	.287	-.309	1.241	
	CIB Total	-.876	1.006	-.731	.378	-2.781	1.302	
	TMT B: A Ratio	.635	1.602	.391	.669	-2.533	3.781	
	Diabetes duration	.533	.201	2.723	.009	.148	.931	
<b>SCI-R</b>	Constant	21.791	27.244	.755	.436	-30.804	75.881	.286**
	AAQ PsyLoss	-.186	.518	-1.325	..170	-1.763	.340	
	AAQ Phys	.409	.501	3.452	.003	.594	2.604	
	AAQ Psych	-.155	.689	-1.214	.272	-2.176	.494	
	CIB Total	.031	2.328	.274	.827	-3.893	5.340	
	TMT B: A Ratio	.189	2.688	1.614	.099	-.934	9.595	
	Diabetes duration	.306	.331	3.115	.002	.334	1.638	
	HADS	-.085	.465	-.720	.450	-1.424	.434	

\*p < .05, \*\*p < .01. SCI-R = Self-Care Inventory Revised total score; AAQ PsyLoss = Attitudes to Ageing Questionnaire Psychosocial Loss sub-scale score; AAQ Phys = Attitudes to Ageing Questionnaire Physical Change sub-scale score; AAQ Psych = Attitudes to Ageing Questionnaire Psychological Growth sub-scale score; TMT B: A ratio = Trail Making Test Part B : Part A ratio score; CIB = Clock-in-the-Box total score; BIPQ Personal Control = Brief Illness Perceptions Questionnaire Personal Control sub-scale score; HADS = Hospital Anxiety and Depression Scale total score.

### ***Models predicting glycaemic control***

Planning, organisation and working memory (CIB), mental flexibility (TMT) and attitudes to ageing were entered as predictor variables in a model with glycaemic control as the criterion variable; controlling for diabetes duration. The model was significant ( $F(6,70) = 2.649$ ,  $p = .023$ ) with an adjusted  $R^2$  of .115. Diabetes duration ( $\beta = .533$ ,  $p = .009$ ,  $CI = .148 - .931$ ) was a significant independent predictor in the model; predicting 8.6% of the variance. Attitudes to psychosocial loss in old age was also a significant predictor ( $\beta = .631$ ,  $p = .030$ ,  $CI = .053 - 1.153$ ) and predicted 5.5% of the variance in HbA1c.

### ***Models predicting self-management adherence***

Planning, organisation and working memory (CIB), mental flexibility (TMT) and attitudes to ageing in relation to physical change, psychosocial loss and psychological growth were entered as predictor variables in a model with self-management adherence as the criterion variable. Diabetes duration and emotional distress were controlled for. The model was significant ( $F(7,69) = 5.357$ ,  $p < .001$ ) with an adjusted  $R^2$  of .286. Diabetes duration ( $\beta = .306$ ,  $p = .002$ ,  $CI = .334 - 1.638$ ) and attitudes to ageing in the domain of physical change ( $\beta = .409$ ,  $p = .003$ ,  $CI = .594 - 2.604$ ) were significant independent predictors; predicting 9% and 11% of the variance respectively.

The hypothesis that more positive attitudes to ageing would moderate the relationships between planning, working memory, and mental flexibility (i.e. EF), and glycaemic control and self-management adherence was not tested, as EF was not found to be significantly associated with the criterion variables.

## **Discussion**

The results do not support the hypothesis that poorer EF levels in the domains of planning and working memory, and mental flexibility predict poorer levels of glycaemic control and self-management adherence. This is at odds with existing literature regarding self-management (Primozic *et al.* 2012;

Kirkman *et al.* 2012; Thabit *et al.* 2009), and glycaemic control (Nguyen *et al.* 2012; Munshi *et al.* 2012) in older adult samples.

However, EF encompasses a variety of cognitive abilities and no one pure measure exists; making it one of the most difficult areas to measure in neuropsychological assessment. The tests chosen in the current study measured domains considered most related to self-management, and had been used previously in similar research (Munshi *et al.* 2012; Gregg *et al.* 2000). TMT was felt to be a relatively strong test of EF with Type 2 Diabetes populations; with higher effect sizes reported for TMT-B performance compared to other common EF measures (Cohen's  $d = -0.39$ ) in a meta-analysis comparing Type 2 Diabetes samples with non-diabetic controls (Palta *et al.* 2014). However, the narrow range of TMT ratio scores collected in the current study (range = 3.52) may have limited the identification of correlational associations. Furthermore, Palta *et al.* (2014) along with other previous studies used different metrics when scoring the TMT; for example, TMT-B performance only, or the difference score (Munshi *et al.* 2012). The current study used the ratio score which is argued to be a purer index of mental flexibility (Arbuthnott & Frank, 2000; Oosterman *et al.* 2010) therefore, significant results in other studies may have captured other aspects of cognitive functioning measured by the test; like, processing speed.

The current sample appeared to be relatively well functioning in terms of their performance on EF measures compared to previous studies; which may be due to stringent exclusion criteria in this study contraindicating participation in the presence of any conditions that could impede cognitive function. Munshi *et al.* (2006) propose a cut-off for low performance on the Clock-in-the-Box test as scores <5; and report that this is associated with poorer glycaemic control, compared to scores above 5. Only three participants (4%) scored below this level, suggesting that the current sample were high performing, which may explain the discrepancy between the current findings and existing literature. Other samples also appear to have been low functioning with regards to normative data for TMT-B scores (Munshi *et al.* 2012); unlike the current sample, where the mean ratio score was superior to normative scores

reported for individuals of a similar age and education level (Drane *et al.* 2002). A volunteer sampling method may have biased the sample towards those with higher cognitive abilities, and this may have been compounded by sampling mainly from primary care; a population who may be functioning better than those with more complex needs that are cared for in secondary care. However, preliminary independent samples t-tests did not identify significant differences between participants recruited from primary and secondary care on any of the predictor or outcome measures in the current study. Although, only a small proportion of the sample (n=11; 14%) were recruited from secondary care, and this may have limited the statistical power to identify differences.

More positive attitudes to physical change in old age did predict better self-management in the current sample; which is in line with the second hypothesis. This fits with existing evidence suggesting that more positive attitudes to ageing are associated with higher levels of preventive health behaviours including healthy eating and physical activity in older adults (Levy & Myers, 2004; Sarkisian *et al.* 2005). These results fit within a stereotype embodiment framework (Levy, 2009) with negative attitudes towards physical change in old age undermining individuals' confidence in their ability to carry out self-management behaviours; leading to reduced engagement in such behaviours and hence, poorer outcomes.

More negative attitudes to ageing in relation to psychosocial loss predicted poorer glycaemic control. This indicates that older adults who represent old age as a time of loneliness, loss and exclusion are more likely to have poor glycaemic control. This may relate to existing evidence of a relationship between social support and glycaemic control; with support systems around individuals with Type 2 Diabetes helping with adjustment to and maintenance of lifestyle changes required for diabetes control that promote glycaemic control (Gilden *et al.* 1992; Trento *et al.* 2001; Barrera *et al.* 2008). However, it is also possible that those with poorer levels of glycaemic control are less able to engage with, or access social support due to the physical symptoms that may come as a result of poorly controlled diabetes. The correlational analyses

carried out in the present study do not allow for directionality to be ascertained.

Longer diabetes duration was associated with poorer glycaemic control and self-management adherence, which fits with existing evidence (Benoit *et al.* 2005; Khattab *et al.* 2010; Rogvi *et al.* 2012). Many variables impact on diabetes control (Munshi *et al.* 2012); as is supported by the current regression models explaining only 11.5% and 28.6% of the variance in glycaemic control and self-management adherence, respectively. Diabetes duration was a significant predictor for both outcome variables, but is also unchangeable. Attitudes to ageing are potentially modifiable factors that clinical services may wish to consider incorporating into existing intervention models.

The current results highlight a potential area of development in diabetes interventions for older adults. This study supports the hypothesis that incorporation of strategies focused on the attitudes that older adults hold about their own ageing could lead to improved self-management and glycaemic control. Existing research has highlighted implicit and explicit techniques for altering those attitudes; including priming with positive age stereotypes, leading to improved physical functioning (Wurm *et al.* 2013; Levy *et al.* 2014; Wolff *et al.* 2014). Cognitive behaviour therapy techniques to challenge negative attitudes have also been found to improve physical outcomes and promote more positive attitudes to ageing for older adults (Sarkisian, Prohaska & Weiner, 2007).

### ***Clinical implications***

At a service level, it may be useful to raise clinicians' awareness of the relationship between attitudes to ageing and diabetes self-management and glycaemic control. Older adults often look to clinicians for health promotion advice and support to change their behaviour (Little *et al.*, 2001; Whitlock *et al.* 2002). Clinicians, therefore, can serve as figures that reinforce or challenge negative attitudes to ageing. Positive attitudes could be promoted through clinicians highlighting opportunities for positive outcomes in old age,

and challenging nihilistic stereotypes of older adults as being too old to learn or take on new behaviours.

Research indicates that clinicians' own attitudes to ageing are important to consider; as more positive attitudes are associated with higher ratings of the importance of promoting preventive health behaviours with older patients (Davis *et al.* 2011). Reflecting upon and being mindful of how their own attitudes to ageing may impact on their approach with older patients, could help clinicians to avoid the more pessimistic treatment discussions that can lead to below-par treatment (Adelman *et al.* 2000). It is important that clinicians continue to make appropriate treatment adaptations for older adults, but this should be in line with the individual's actual abilities; rather than stereotypes of old age.

### ***Methodological considerations***

The current findings should be viewed within the context of several limitations. The volunteer sampling method could have led to bias; in that those who took part may have been more willing, able and available, and not necessarily the most representative sample. However, demographic features of the sample support its representativeness of the older Type 2 Diabetes population in Scotland. Furthermore, participants were sampled from primary and secondary care, and therefore the findings may not be applicable to individuals who are disengaged from services. Caution should also be taken when generalising to populations of lower functioning individuals, of different ethnicities, and those living in areas of higher deprivation.

A further limitation lies in the choice of EF measures, which may have been limited by their dependence on visual acuity with an elderly sample at risk of visual problems associated with Type 2 Diabetes. Other studies have made use of tests such as Tower of London, verbal fluency, attention and digit span tasks that do not rely heavily upon visual abilities (Thabit *et al.* 2009; Nguyen *et al.* 2012). It is also possible that other areas of EF not measured in the current study are more related to diabetes control. Other studies have used batteries of EF measures (Thabit *et al.* 2009) to measure a variety of EF



domains at one time. Future research should consider measuring several domains of EF with a brief measure to elucidate specific EF skills that are related to self-management and glycaemic control. Furthermore, effect sizes for the TMT in previous meta-analyses are modest (-0.324 for TMT-B in Vincent & Hall, 2015) and therefore, the current study may have failed to find the predicted relationship due to a lack of power owing to the small sample size.

### ***Future Research***

This study is novel in its analysis of the relationship between attitudes to ageing and diabetes control; therefore, further research could look to replicate these findings. The cross-sectional design prevents any conclusions being drawn about the direction of this relationship; therefore, this could be clarified using longitudinal designs where changes in attitudes, glycaemic control and self-management are tracked over time. Intervention studies testing the hypothesis that techniques for promoting positive attitudes improve self-management behaviours and glycaemic control, could lend further support to the evidence presented here.

### ***Conclusions***

The current results indicate that older adults' attitudes towards ageing are a potentially modifiable factor related to self-management and glycaemic control that has not been explored with Type 2 Diabetes populations before. Individuals who held more fatalistic attitudes towards physical and psychosocial changes in old age were less likely to adhere to self-management recommendations, and had poorer glycaemic control in this study. Promoting more positive attitudes to ageing through psychologically informed interventions, and at a wider service level, could help to promote more effective diabetes control in older populations. Further research is warranted to confirm the validity of this relationship, and to test the efficacy of interventions targeting attitudes towards ageing with Type 2 Diabetes populations.

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## Appendices

## **Appendix 1.** Author guidelines for the British Journal of Health Psychology.

### **Author Guidelines**

The aim of the British Journal of Health Psychology is to provide a forum for high quality research relating to health and illness. The scope of the journal includes all areas of health psychology as outlined in the Journal Overview.

The types of paper invited are:

- papers reporting original empirical investigations, using either quantitative or qualitative methods, including reports of interventions in clinical and non-clinical populations;
- theoretical papers which may be analyses or commentaries on established theories in health psychology, or presentations of theoretical innovations;
- we particularly welcome review papers, which should aim to provide systematic overviews, evaluations and interpretations of research in a given field of health psychology; and
- methodological papers dealing with methodological issues of particular relevance to health psychology.

All papers published in The British Journal of Health Psychology are eligible for Panel A: Psychology, Psychiatry and Neuroscience in the Research Excellence Framework (REF).

#### **1. Circulation**

The circulation of the Journal is worldwide. Papers are invited and encouraged from authors throughout the world.

#### **2. Length**

Papers should normally be no more than 5000 words (excluding the abstract, reference list, tables and figures), although the Editor retains discretion to publish papers beyond this length in cases where the clear and concise expression of the scientific content requires greater length.

#### **3. Editorial policy**

The Journal receives a large volume of papers to review each year, and in order to make the process as efficient as possible for authors and editors alike, all papers are initially examined by the Editors to ascertain whether the

article is suitable for full peer review. In order to qualify for full review, papers must meet the following criteria:

- the content of the paper falls within the scope of the Journal
- the methods and/or sample size are appropriate for the questions being addressed
- research with student populations is appropriately justified
- the word count is within the stated limit for the Journal (i.e. 5000 words)

#### **4. Submission and reviewing**

All manuscripts must be submitted via Editorial Manager. The Journal operates a policy of anonymous (double blind) peer review. We also operate a triage process in which submissions that are out of scope or otherwise inappropriate will be rejected by the editors without external peer review to avoid unnecessary delays. Before submitting, please read the terms and conditions of submission and the declaration of competing interests. You may also like to use the Submission Checklist to help you prepare your paper.

#### **5. Manuscript requirements**

- Contributions must be typed in double spacing with wide margins. All sheets must be numbered.
- Manuscripts should be preceded by a title page which includes a full list of authors and their affiliations, as well as the corresponding author's contact details. A template can be downloaded from [here](#).
- For articles containing original scientific research, a structured abstract of up to 250 words should be included with the headings: Objectives, Design, Methods, Results, Conclusions. Review articles should use these headings: Purpose, Methods, Results, Conclusions. As the abstract is often the most widely visible part of your paper, it is important that it conveys succinctly all the most important features of your study. You can save words by writing short, direct sentences. Helpful hints about writing the conclusions to abstracts can be found [here](#).
- Statement of Contribution: All authors are required to provide a clear summary of 'what is already known on this subject?' and 'what does this study add?'. Authors should identify existing research knowledge relating to the specific research question and give a summary of the new knowledge added by your study. Under each of these headings, please provide 2-3 (maximum)

clear outcome statements (not process statements of what the paper does); the statements for 'what does this study add?' should be presented as bullet points of no more than 100 characters each. The Statement of Contribution should be a separate file.

- Conflict of interest statement: We are now including a brief conflict of interest statement at the end of each accepted manuscript. You will be asked to provide information to generate this statement during the submission process.
- The main document must be anonymous. Please do not mention the authors' names or affiliations (including in the Method section) and always refer to any previous work in the third person.
- Tables should be typed in double spacing, each on a separate page with a self-explanatory title. Tables should be comprehensible without reference to the text. They should be placed at the end of the manuscript but they must be mentioned in the text.
- Figures can be included at the end of the document or attached as separate files, carefully labelled in initial capital/lower case lettering with symbols in a form consistent with text use. Unnecessary background patterns, lines and shading should be avoided. Captions should be listed on a separate sheet. The resolution of digital images must be at least 300 dpi. All figures must be mentioned in the text.
- For reference citations, please use APA style. Particular care should be taken to ensure that references are accurate and complete. Give all journal titles in full and provide doi numbers where possible for journal articles. For example:

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Author, A. (2013). Title of journal article. *Name of journal*, 1, 1-16. doi: 10.1111/bjep.12031

- SI units must be used for all measurements, rounded off to practical values if appropriate, with the imperial equivalent in parentheses.
- In normal circumstances, effect size should be incorporated.
- Authors are requested to avoid the use of sexist language.
- Authors are responsible for acquiring written permission to publish lengthy

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- Manuscripts reporting systematic reviews and meta-analyses are encouraged to submit in accordance with the PRISMA statement.
- Manuscripts reporting interventions are encouraged to describe them in accordance with the TIDieR checklist.

## **6. Supporting information**

Supporting Information can be a useful way for an author to include important but ancillary information with the online version of an article. Examples of Supporting Information include appendices, additional tables, data sets, figures, movie files, audio clips, and other related nonessential multimedia files. Supporting Information should be cited within the article text, and a descriptive legend should be included. Please indicate clearly on submission which material is for online only publication. It is published as supplied by the author, and a proof is not made available prior to publication; for these reasons, authors should provide any Supporting Information in the desired final format.

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### **10. Colour illustrations**

Colour illustrations can be accepted for publication online. These would be reproduced in greyscale in the print version. If authors would like these figures to be reproduced in colour in print at their expense they should request this by completing a Colour Work Agreement form upon acceptance of the paper.

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### **13. Early View**

British Journal of Health Psychology is covered by the Early View service on Wiley Online Library. Early View articles are complete full-text articles

published online in advance of their publication in a printed issue. Articles are therefore available as soon as they are ready, rather than having to wait for the next scheduled print issue. Early View articles are complete and final. They have been fully reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after online publication. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so they cannot be cited in the traditional way. They are cited using their Digital Object Identifier (DOI) with no volume and issue or pagination information. Eg Jones, A.B. (2010). Human rights Issues. *Journal of Human Rights*. Advance online publication. doi:10.1111/j.1467-9299.2010.00300.x

## Appendix 2. Quality criteria for systematic review.

### Sampling method

Well covered (2)	Partially addressed (1)	Poorly addressed (0)	Unclear (0)
<p>Participants are recruited from appropriate sources, using a robust sampling method.</p> <p>AND</p> <p>Inclusion/exclusion criteria are appropriate for the purposes of the study.</p>	<p>Sampling method could introduce bias.</p> <p>BUT</p> <p>Inclusion/exclusion criteria are appropriate for the purposes of the study.</p>	<p>Sampling method could introduce bias.</p> <p>AND</p> <p>Inclusion/exclusion criteria are not appropriate for the purposes of the study.</p>	<p>Recruitment strategy is not clearly defined.</p> <p>AND/OR</p> <p>Inclusion/exclusion criteria are not clearly defined.</p>

### Representativeness of the sample

Well covered (2)	Partially addressed (1)	Poorly addressed (0)	Unclear (0)
<p>Key demographic (age, gender, years of education, ethnicity) characteristics are collated and representative of the population studied.</p>	<p>At least two key characteristics are collated, out of: Age Gender Years of education Ethnicity</p> <p>BUT</p> <p>Characteristics are not representative of the population studied OR it is not clear if the characteristics are representative.</p>	<p>One or zero key characteristics are collated.</p> <p>AND</p> <p>Characteristics are not representative of the population studied.</p>	<p>Demographic characteristics of the sample are not clear.</p>

### Appropriate sample size

Well addressed (2)	Partially addressed (1)	Poorly addressed (0)	Unclear (0)
Sample size attained is sufficient to provide power of at least 0.8 for medium effect sizes and alpha of 0.5.	Sample size attained is sufficient to provide power of at least 0.7 for medium effect sizes and alpha of 0.5.	Sample size attained is sufficient to provide power of less than 0.7 for medium effect sizes and alpha of 0.5.	No power calculation is reported/not enough information is provided to facilitate a post-hoc calculation.

### Measurement of expectations regarding ageing

Well addressed (2)	Partially addressed (1)	Poorly addressed (0)	Unclear (0)
Valid and reliable measures of expectations regarding ageing are used (Cronbach's alpha > 0.7).	Measures have adequate validity and reliability (Cronbach's alpha > 0.6).	Measures are not valid or reliable with the population sampled (Cronbach's alpha < 0.6).	It is not clear which measures were used to measure expectations regarding ageing.

### Measurement of physical activity

Well addressed (2)	Partially addressed (1)	Poorly addressed (0)	Unclear (0)
Valid and reliable measures of physical activity are used (Cronbach's alpha > 0.7).  AND/OR  Objective measures of physical activity are used e.g. pedometers/ accelerometers.	Measures have adequate validity and reliability (Cronbach's alpha > 0.6).	Measures used are not valid or reliable with the population sampled (Cronbach's alpha < 0.6).  OR  Questions asked about physical activity, but general, vague or non-specific, with no form of rating scale used.	It is not clear which measures were used to measure physical activity.

### Appropriateness of statistical analysis

<b>Well addressed (2)</b>	<b>Partially addressed (1)</b>	<b>Poorly addressed (0)</b>	<b>Unclear (0)</b>
Method of statistical analysis is appropriate and robust for the data collected.  AND  Confounding variables are controlled for.	Method of statistical analysis is appropriate and robust for the data collected.  BUT  Confounding variables are not controlled for.	Method of statistical analysis is not appropriate or robust for the data collected.  AND/OR  Confounding variables are not reported or controlled for.	It is not clear which statistical analysis has been used.  AND/OR  It is not clear how confounding variables have been controlled for.

### Missing data

<b>Well addressed (2)</b>	<b>Partially addressed (1)</b>	<b>Poorly addressed (0)</b>	<b>Unclear (0)</b>
Missing data does not exceed 20% AND is appropriately treated e.g. appropriate imputation method used.	Missing data exceeded 20%, BUT, was appropriately treated e.g. appropriate imputation method used.  OR  Missing data did not exceed 20%, but was not appropriately treated.	Missing data exceeded 20%. AND was not appropriately treated e.g. appropriate imputation method used.	It is not clear how authors treated missing data, or what the level of missing data was.

## Appendix 3. Ethical approval letter for empirical study.

### **NRES Committees - North of Scotland**

Summerfield House  
2 Eday Road  
Aberdeen  
AB15 6RE

Telephone: 01224 558458  
Facsimile: 01224 558609  
Email: nosres@nhs.net



18 March 2015

Miss Ashley L McColl  
Trainee Clinical Psychologist  
NHS Grampian  
Department of Clinical Psychology  
Old Age Psychiatry Directorate,  
Block D, Clerkseat Building  
Royal Cornhill Hospital  
ABERDEEN  
AB25 2ZH

Dear Miss McColl

**Study title:** Exploring the relationship between executive function, attitudes to ageing, glycaemic control and self management of Type 2 diabetes in older adults.  
**REC reference:** 15/NS/0012  
**IRAS project ID:** 168055

Thank you for your letter of 17 March 2015, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact the REC Manager, Mrs Carol Irvine, nosres@nhs.net. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

### **Confirmation of ethical opinion**

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

### **Conditions of the favourable opinion**

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

#### Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact [hra.studyregistration@nhs.net](mailto:hra.studyregistration@nhs.net). The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from NRES. Guidance on where to register is provided on the HRA website.

**It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).**

#### **Ethical review of research sites**

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

#### **Approved documents**

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Copies of advertisement materials for research participants: Advertising Flyer	1	12 December 2014
Copies of advertisement materials for research participants: GP Poster	2.0	17 March 2015



<i>Document</i>	<i>Version</i>	<i>Date</i>
Covering letter on headed paper: REC Covering Letter		17 March 2015
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only): Certificate of Insurance		08 August 2014
GP/consultant information sheets or letters: GP Letter re Patient Participation	1	12 December 2014
GP/consultant information sheets or letters: GP Letter re Anxiety and Depression Score	1	12 December 2014
GP/consultant information sheets or letters: Invitation letter to GP practices	1.0	17 March 2015
IRAS Checklist XML: Checklist 18032015		18 March 2015
Letters of invitation to participant: Invitation Letter from GP to potential participants	2.0	17 March 2015
Dr Kirsty MacLennan CV (Clinical Supervisor)		05 February 2015
Participant Consent Form	2	17 March 2015
Participant Information Sheet (PIS)	2	02 March 2015
REC Application Form: REC Form 10022015		10 February 2015
Research protocol or project proposal	3	17 March 2015
Summary CV for Chief Investigator (CI): Ashley McColl		05 February 2015
Summary CV for student: Ashley McColl		05 February 2015
Summary CV for supervisor (student research): Paul Morris		05 February 2015
Summary, synopsis or diagram (flowchart) of protocol in non technical language: Care Protocol	1	14 January 2015
Summary, synopsis or diagram (flowchart) of protocol in non technical language: Recruitment Protocol	2	17 March 2015
Validated questionnaire: Self Care Inventory-Revised Version (SCI-r)		11 February 2015*
Validated questionnaire: Attitudes to Ageing (AAQ-24)		11 February 2015*
Validated questionnaire: Clock-in-the-box Test Participant Instruction Sheet		11 February 2015*
Validated questionnaire: Clock-in-the-box Test Participant Response Form		11 February 2015*
Validated questionnaire: Clock-in-the-box Investigator Scoring Form		11 February 2015*
Validated questionnaire: Trail Making Test (TMT) Parts A & B		11 February 2015*
Validated questionnaire: The Brief Illness Perceptions Questionnaire		11 February 2015*

\* Date received

#### **Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

#### **After ethical review**

#### Reporting requirements

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

#### **User Feedback**

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:

<http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/>

#### **HRA Training**

We are pleased to welcome researchers and R&D staff at our training days – see details at <http://www.hra.nhs.uk/hra-training/>

**15/NS/0012**

**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project.

Yours sincerely



**Professor Helen Galley  
Chair**

Enclosures: "After ethical review – guidance for researchers" SL-AR2

Copy to: Ms Jo-Anne Robertson  
NHSG R&D Department

## Appendix 4. Research and Development approval letter for empirical study.

**Research and Development** Foresterhill House Annexe  
Foresterhill  
ABERDEEN  
AB25 2ZB



Miss Ashley McColl  
NHS Grampian  
Dept of Clinical Psychology, Old Age  
Psychiatry Directorate  
Block D Clerkseat Building  
Royal Cornhill Hospital  
Aberdeen  
AB25 2ZH

Date 27/03/2015  
Project No 2015PC001  
Enquiries to Susan Ridge  
Extension 53846  
Direct Line 01224 553846  
Email grampian.randdpermissions@nhs.net

Dear Miss McColl

### **Management Permission for Non-Commercial Research**

**STUDY TITLE:** Exploring the relationship between executive function, attitudes to ageing, glycaemic control and self management of Type 2 diabetes in older adults.

**PROTOCOL NO:** 3, 17.3.15  
**REC REF:** 15/NS/0012

Thank you very much for sending all relevant documentation. I am pleased to confirm that the project is now registered with the NHS Grampian Research & Development Office. The project now has R & D Management Permission to proceed locally. This is based on the documents received from yourself and the relevant Approvals being in place.

All research with an NHS element is subject to the Research Governance Framework for Health and Community Care (2006, 2<sup>nd</sup> edition), and as Chief or Principal Investigator you should be fully committed to your responsibilities associated with this.

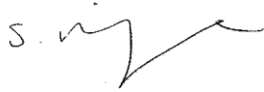
**It is particularly important that you inform us when the study terminates.**

The R&D Office must be notified immediately and any relevant documents forwarded to us if any of the following occur:

- A change of Principal Investigator, Chief Investigator or any additional research personnel
- Premature project termination
- Any amendments – substantial or non-substantial (particularly a study extension)
- Any change to funding or any additional funding

We hope the project goes well, and if you need any help or advice relating to your R&D Management Permission, please do not hesitate to contact the office.

Yours sincerely

A handwritten signature in black ink, appearing to read 'S. Ridge', with a stylized flourish at the end.

**Susan Ridge**  
**Non-Commercial Manager**

**Appendix 5.** Participant invitation letter (sent out on GP Practice headed paper).

**GP – Dr X**

General Practice address

Tel: 01224 XXXXXX

Date

Dear Mr/Ms X

This is a short note to let you know that we, as a service, have been asked to assist in an individual research project and wish to make you aware of a research study called ***Exploring the relationship between executive function, attitudes to ageing and self management of Type 2 diabetes in older adults.***

Please find enclosed a Participant Information Sheet for your information. The aim of this project is to explore whether processing and planning abilities (executive function) and attitudes towards ageing impact on how well older adults with Type 2 diabetes feel they are able to self-manage their diabetes. The findings of this study could help clinicians to improve the support that they provide to older adults with Type 2 diabetes, by considering factors like attitudes to ageing and executive function.

The research team is recruiting people aged 65 years and over, with Type 2 diabetes and our records show that you fall into that category.

The project involves attending a single session, lasting up to 1 hour, where you will be asked to complete some tasks and tests that look at your thinking abilities. You will also be asked to complete some brief questionnaires at that session.

If you would like to take part in this study or find out more, then please contact Ms Ashley McColl on **01224 557497** or at [ashleymccoll@nhs.net](mailto:ashleymccoll@nhs.net). Alternatively you can complete and return the tear-off slip provided at the end of the Participant Information Sheet, to the following address:

Ashley McColl, Trainee Clinical Psychologist

Department of Clinical Psychology (Old Age Psychiatry Directorate)

Block D, Clerkseat Building, Royal Cornhill Hospital, Aberdeen, AB25 2ZH.

Your routine care will be in no way affected by whether or not you decide to find out further information about this study.

Yours sincerely

Dr X

General Practitioner

## Appendix 6. Participant information sheet.



### Participant Information Sheet

Study title: **Exploring the relationship between executive function, attitudes to ageing and self management of Type 2 diabetes in older adults**

#### Invitation

We would like to invite you to take part in a research project we are conducting here in NHS Grampian.

It is entirely up to you if you choose to take part or not. Before you decide, a member of the research team can discuss the study with you and answer any questions you might have. It is very important that you understand why we are doing this research and what it would involve before you decide whether or not to take part.

Please feel free to talk to others about this study if you wish. You are under no obligation to participate in the study and can withdraw at any time, without giving a reason, and your current or future treatment will not be affected.

- The first part of the Participant Information Sheet tells you the purpose of the study and what will happen if you take part.
- Then we give you more detailed information about how we will run the study.

Please ask as many questions as you like if anything is unclear, or you would like more information.

## **Brief summary**

The aim of this research is to try to improve our understanding of factors that may make it more difficult for people over 65 to self-manage their Type 2 diabetes.

We have decided to focus on exploring whether attitudes to ageing and cognitive function act as a barrier to older people's ability to self-manage and maintain diabetes control. This could help clinicians working with older people with Type 2 diabetes to develop more effective ways of supporting their patients.

## **What is involved?**

- ***Purpose and Background***

A high number of people in Scotland over the age of 65 have Type 2 Diabetes; a condition that requires a high level of self-management to maintain healthy diabetes control and avoid complications. Self-management can be difficult for older adults; and some researchers have linked this to differences in cognitive function.

We know that as people grow older, they can become more forgetful and find it harder to process information quickly. Some people might see this as a natural part of ageing and this can be reflected in their attitudes towards ageing. Some researchers have linked those attitudes to engagement in health behaviours essential to self-management e.g. following exercise and dietary recommendations.

This study aims to explore the impact of cognitive function, and attitudes towards ageing on diabetes self-management in older adults. This could lead clinicians to identify ways of improving the support that they provide to older adults with Type 2 diabetes.

- ***Why have I been invited to take part?***

We hope to recruit around 77 people to our study. We are looking for people aged 65 years and older with Type 2 diabetes, and that's why we're inviting you to participate.

If you choose to participate, you will continue to receive your usual NHS care, and this won't be affected by your participation.

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

**No.** It is entirely up to you whether or not you take part. You can decline to take part or withdraw from the study at any time and this will not affect your current or future treatment.



- ***What will happen if I take part?***

You will be invited to meet with the researcher, Ashley McColl at an appointment where she will ask you to complete 2 tests looking at your thinking and processing abilities. This will involve you being asked to give responses such as drawing, and remembering instructions. You will also be asked to complete some questionnaires about your emotional wellbeing, attitudes towards ageing, and about your diabetes and how well you feel you manage this.

You will also be asked some questions about your level of education, and other relevant health conditions you may have. With your permission, we will also collect information from your medical files about your average blood glucose levels (HbA1c).

This session is likely to take up to 1 hour. You will be offered a break during testing and are welcome to take this if you feel it would be beneficial.

**You will be required to use visual materials and respond to a number of questions, and therefore, it is very important that you bring any visual or hearing aids that you need to your appointment with Ashley.**

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

The results of this study could help other researchers and clinicians to develop more effective ways of supporting older adults to self-manage their diabetes in the future; rather than you experiencing any immediate benefits directly.

- ***What are the possible risks of taking part?***

We don't know of any risks of taking part in this kind of research. However, we will be asking you about important aspects of your life that you might find upsetting. If there is anything raised in the questionnaires which you find upsetting, the researcher will be available to discuss this with you; if you wish to do so. You can also speak to your GP or other health professional.

Your score on the questionnaire about emotional wellbeing might indicate that you may be experiencing clinical levels of emotional distress. We will provide you with information about how you can seek help with this, if you wish to do so.

The NHS Grampian Diabetes Centre has a Psychology Team and the researcher will be able to put you in touch with the team should you wish to seek further support.

## **Supporting Information**

- ***What if something goes wrong?***

If you are concerned about any aspect of this study, you can speak to the lead researcher, Ashley McColl, who will do her best to answer your questions ([ashleymccoll@nhs.net](mailto:ashleymccoll@nhs.net) or 01224 557497).

If you wish to complain formally, you can do this by contacting the NHS Grampian Feedback Service:

Summerfield House

2 Eday Road

Aberdeen

AB15 6RE

Tel: 0845 337 6338

E-mail [nhsgrampian.feedback@nhs.net](mailto:nhsgrampian.feedback@nhs.net)

If something goes wrong and you are harmed during the research, and this is due to someone's negligence you may have grounds for legal action against NHS Grampian. The normal NHS complaints procedure will still be available to you (if appropriate).

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

You can withdraw from the study at any time and your routine NHS care won't be affected in any way. If you do withdraw from the study, we will keep the information that we have already collected from you so that we can provide collect unidentifiable information about people who dropped out.

We will not request further data from you. However, if you would like to tell us why you decided to withdraw, we would be delighted to hear from you.

- ***What will happen if I can't carry on with the study?***

In the unlikely event that you are not able to take part in the study after you have provided consent, any information we have already collected from you will be kept for the purposes of the study. However, you will be withdrawn from the study and no further information will be collected from or about you.

- ***Will my information be kept confidential?***

**Yes.** Only the research team will have access to the personal information we collect about you. Your information will be anonymised and stored securely in a locked filing cabinet on NHS Grampian premises, or on the NHS Grampian internal computer network.

The information collected may be used to support other research in the future, and may be shared anonymously with other researchers. The lead researcher, Ashley McColl, will be responsible for all aspects of data management during the course of the study.

- ***What will happen to the results of this study?***

The study will be written up in as part of the researcher's Doctorate in Clinical Psychology qualification. The results may be published in a scientific journal or presented at conferences and meetings, but no material will be published that contains information that could identify you personally.

If you wish to receive a summary of the overall findings of the study please let the researcher know when you attend your appointment with her.

- ***Who is organising and funding this study?***

Ashley McColl, Trainee Clinical Psychologist, is the primary researcher and is currently studying at the University of Edinburgh and working for NHS Grampian. She is completing the study as part of her formal qualification (Doctorate in Clinical Psychology) and will be supervised by qualified Clinical Psychologists from NHS Grampian and University of Edinburgh during the study.

The research team are not benefiting financially from any aspect of this project, and the study is not being funded by any organisation.

- ***Who has reviewed this study?***

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favourable opinion by the North of Scotland Research Ethics Committee. It has also been approved by academics from the University of Edinburgh.

- ***Further Information***

If you would like further information about the study that the researcher cannot provide, please contact:

Dr Kirsty MacLennan, Clinical Psychologist, on 01224 558121 or at [kmaclennan@nhs.net](mailto:kmaclennan@nhs.net)

If you would like independent advice about whether or not to participate in this research, then please contact a diabetes professional, such as a Medical

Consultant or Diabetes Specialist Nurse. Alternatively, contact your General Practitioner or Practice Nurse.

- ***Involvement of your GP and other health professionals***

Although this study does not involve clinical diagnosis, the measures used may indicate that further assessment of your emotional health might be beneficial. If this happens, the researcher will discuss this with you, and with your consent, will write a letter to your GP about this.

- ***Research Staff Details***

Ms Ashley McColl, Trainee Clinical Psychologist Tel: 01224 557497

Dr Kirsty MacLennan, Clinical Psychologist Tel: 01224 558121

### **What happens next?**

If you wish to participate in the study, please contact the researcher using the contact details provided below. You can contact her by telephone or email, or you can complete and return the tear-off slip provided below to the following address:

Ashley McColl, Trainee Clinical Psychologist

Department of Clinical Psychology (Old Age Psychiatry Directorate)

Block D, Clerkseat Building, Royal Cornhill Hospital,

Aberdeen, AB25 2ZH

Tel: 01224 557497

Email: [ashleymccoll@nhs.net](mailto:ashleymccoll@nhs.net)

----- Tear off slip

I confirm that I \_\_\_\_\_ (print name)

would like to be contacted about participating in the study described above,  
and understand that the researcher will contact me about this in due course.

Address: \_\_\_\_\_

\_\_\_\_\_

Town: \_\_\_\_\_ Postcode : \_\_\_\_\_

Telephone: \_\_\_\_\_

Email: \_\_\_\_\_

Many thanks for your cooperation and consideration.

## Appendix 7. Participant consent form.

Diabetes self-management in older adults with Type 2 Diabetes Version 2. (17.03.15)

Authors: Ashley McColl, Dr Paul G. Morris and Dr Kirsty MacLennan



Study Number: 15/NS/0012

### CONSENT FORM

Title of Project: *Exploring the relationship between executive function, attitudes to ageing and self management of Type 2 diabetes in older adults*

Name of Researcher: **Ashley McColl**

Participant ID number: \_\_\_\_\_

Please initial box

1. I confirm that I have read the participant information sheet dated **02/03/2015 (version 2)** 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, without my medical care or legal rights being affected.
3. I understand that relevant sections of my medical notes and data collected during the study may be looked at by individuals from the regulatory authorities and from the Sponsor University of Edinburgh and NHS Grampian where it is relevant to my taking part in this research. I give permission for those individuals to have access to my records.
4. I understand that research data obtained during the study will be fully anonymised so that others cannot identify me. This unidentifiable data will be stored securely and may be shared anonymously with other researchers for purposes in the public interest.
5. In the unlikely event that an underlying clinical issue is identified during the course of this research, the researcher will inform me of this. I give consent to the researcher providing me with this feedback.
6. In the unlikely event that an underlying clinical issue is identified during the course of this research, I give my consent to the researcher to inform my GP of this.

7. In the event that I lose capacity after consenting to participate in this study, I understand that I will be withdrawn from the study and I give my consent for any data that has already been collected to be retained within the study.

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

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

Original (x1) to be retained in site file.. Copy (x1) to be retained by the participant.