The Ageing Experience:

Perceived age discrimination and self-perceptions of ageing

in the English Longitudinal Study of Ageing (ELSA)

Isla Rippon

Declaration of authorship

I, Isla Rippon confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signed …………………………..

Isla Rippon

Date ……………………………….

Abstract

An ageing population has important implications for wider aspects of society including our own perceptions of and attitudes to ageing. This thesis investigated how perceived age discrimination and self-perceptions of ageing may affect wellbeing at older ages.

Using data from the English Longitudinal Study of Ageing (ELSA), Study 1 investigated the association between perceived age discrimination and socio-demographic characteristics in England. The results indicated that around a third of over 52 year olds in England reported perceptions of age discrimination. Perceived age discrimination was associated with older age, and it was associated with higher levels of education, lower levels of household wealth and lack of paid employment. The second study then went on to compare perceived age discrimination in everyday situations in England and the USA, using data from ELSA and the Health and Retirement Study (HRS). The results indicated that perceived age discrimination was higher in England in comparison with the USA (34.8% vs 29.1%).

Study 3 revealed that self-perceived age predicted all-cause and cardiovascular mortality but not cancer mortality over a follow-up period of 99 months. The strength of the association was reduced once existing health problems, functional limitations and health behaviours were accounted for. There was some evidence to indicate that there was a bi-directional association between self-perceived age and functional capacity and emotional health (Study 4). In the fully-adjusted models, self-perceived age was associated with elevated depressive symptoms and limited ADLs four years later, but not with impaired mobility. Conversely, only impaired mobility was associated with self-perceived age four years later, once all covariates were accounted for.

Key implications for future research and policy include addressing our own and societal attitudes towards ageing. The findings of this thesis indicate that there is scope to change this and that interventions may be possible.

Publications

Peer reviewed papers resulting from this thesis

Rippon, I., Zaninotto, P., & Steptoe, A. (2015). Greater perceived age discrimination in England than the United States: results from HRS and ELSA. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 70(6), 925-933.

Rippon, I., & Steptoe, A. (2015). Feeling old vs being old: associations between self-perceived age and mortality. *JAMA Internal Medicine*, 175(2), 307 - 309.

Rippon, I., Kneale, D., De Oliveira, C., Demakakos, P., & Steptoe, A, (2014). Perceived age discrimination in older adults. *Age and Ageing*, 43(3), 379 – 386.

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Table of Contents

List of Tables

List of Figures

Abbreviations

ADL: Activities of Daily Living

ALSA: Australian Longitudinal Study of Ageing

ATOA: Attitude Toward Own Aging scale

BASE: Berlin Ageing Study

CAPI: Computer-Assisted Personal Interview

CHD: Coronary Heart Disease

CI: Confidence Interval

CES-D: Center for Epidemiological Studies Depression scale

DEAS: German Ageing Survey (Deutscher Alterssurvey)

ELSA: English Longitudinal Study of Ageing

ESS: European Social Survey

ICD-10: International Classification of Diseases 10th revision

HR: Hazard Ratio

HRS: Health and Retirement Study

IADL: Instrumental Activities of Daily Living

MIDUS: Midlife in the United States study

NHS: National Health Service

OLSAR: Ohio Longitudinal Study of Aging and Retirement

ONS: Office for National Statistics

OR: Odds Ratio

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

RRR: Relative Rate Ratio

SD: Standard Deviation

SES: Socio-Economic Status

1   Introduction

In this thesis I will consider what impact an ageing society may have on attitudes to ageing, and in turn on our own perceptions of discrimination and self-perceptions of ageing. I intend to identify predictors of perceived age discrimination and investigate what impact self-perceptions of age may have on health and longevity. Consideration will also be given to how these perceptions may reflect ageist constructions of old age and social norms that dominate.

1.1   Ageing population

The population in England and many countries globally continues to age due to the dual processes of a decrease in fertility together with increased life expectancy. The proportion of older adults in developed countries such as England has been increasing rapidly over recent decades. According to the Office for National Statistics (ONS) the proportion of the population aged 65 years and over is projected to rise from 17% to 23% by 2035, as shown in Figure 1.1 (Office for National Statistics, 2013a). Life expectancy in the England is currently 83.2 years for females and 79.5 years for males and the number of 100 year olds is predicted to continue to rise (Office for National Statistics, 2015). In most developed countries life expectancy is predicted to keep rising and premature mortality to keep reducing. In England and Wales, the largest decrease between 2002 and 2012 has been seen in deaths from circulatory diseases, which includes heart disease and strokes (Office for National Statistics, 2013b).

Figure 1.1 Percentage of persons aged 65 and over in England, 1985, 2010 and 2035
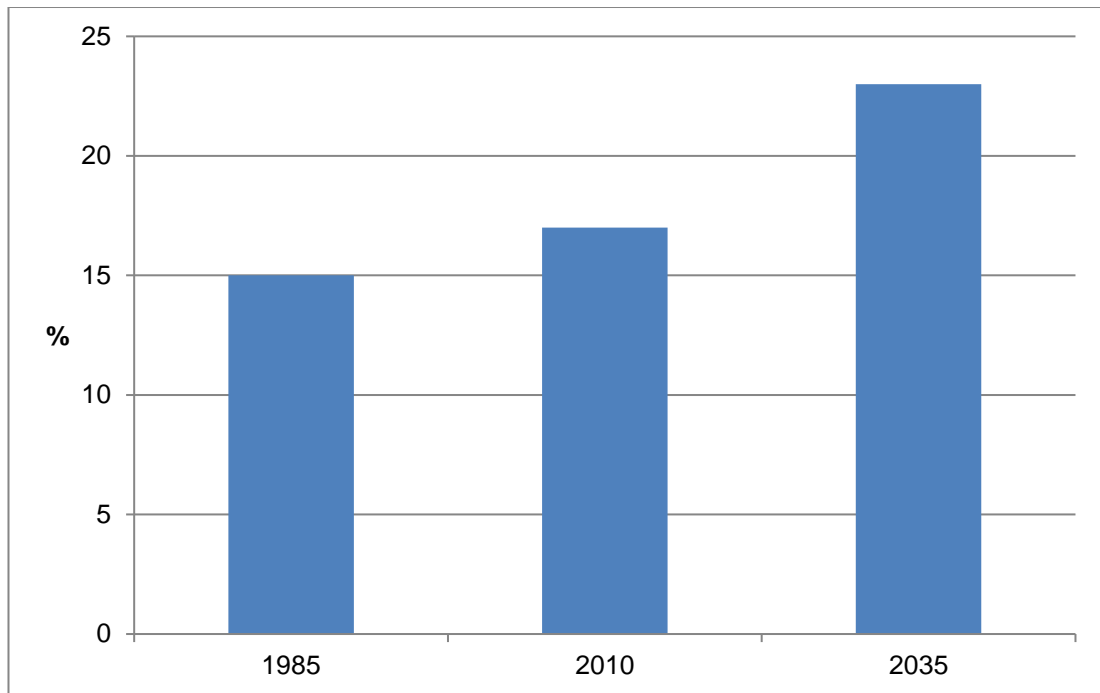
Source: 1985 to 2010 Mid-year population estimates, ONS; 2011 to 2035 National Population Projections, 2010-based, ONS.

Increased life expectancy has been attributed to change in health behaviours (O'Flaherty et al., 2013) along with medical and technological advancement, together with better nutrition and housing, improvements in personal and domestic hygiene and public health reforms. Whilst people are living longer many are living with long term conditions or disabilities. Healthy life expectancy or disability free years are not a reality for many. The ONS estimates that at birth a male born in 2012-2014 could expect to live 63.4 years (79.7% of life expectancy) in good health in comparison with 64.0 years (76.9%) for a female born at the same time (Office for National Statistics, 2016). This has important implications both for public policy and for the provision of future health care and social services amongst others. The House of Lords Select Committee on Public Service and Demographic Change has already warned the UK government that it is 'woefully unprepared' to deal with an ageing population (The House of Lords Select Committee on Public Service and Demographic Change, 2013).

The proportion of individuals living with multiple chronic conditions also increases steeply with age (Prince et al., 2015; Wolff JL et al., 2002). For example, Figure 1.2 illustrates the number of NHS patients in Scotland living with multiple health conditions by age. Based on this fact Barnett et al (2012) argue that health systems, medical education and research needs to adapt away from their current focus on single conditions to better deal with multi-morbidity in patients. This has a range of implications for the UK health system, with older adults being one of main users of health services.

Figure 1.2 Number of chronic conditions by age group (Barnett et al., 2012)
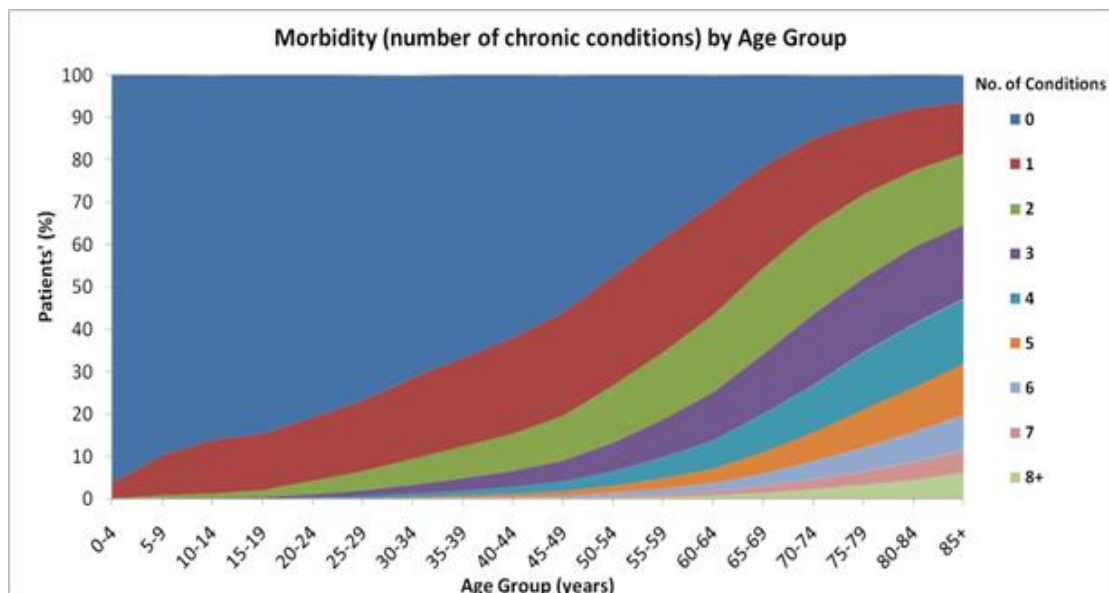
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Health care expenditure more than doubled over the past twenty years and it is estimated that two-fifths of the National Health Service (NHS) budget is currently spent on individuals aged 65 years and over (Robineau, 2016). A further challenge for the health system funding highlighted in earlier analyses conducted by the UK health think-tank the Nuffield Trust (2012), is the dual pressure the NHS will face from rising demand and additional pressure on Government finances caused by the effect of demographic change. The Nuffield Trust has calculated a corresponding NHS funding gap of £54 billion by 2021/22 (in today's terms) if the same proportion of GDP is

allocated to it and no productivity gains are made (Crawford and Emmerson, 2012).
This dual pressure on public services from the rise in the ratio of older aged
dependents, who use public services the most, to working age people who contribute
to taxes that evolving age structure will cause intergenerational tensions (Chipman and
Kielstra, 2012). This is highlighted by Figure 1.3, which illustrates the projected
changes to the population structure in the United Kingdom over the next 30 years.

Figure 1.3 Estimated and projected age structure of the United Kingdom population,
mid-2010 to mid-2035
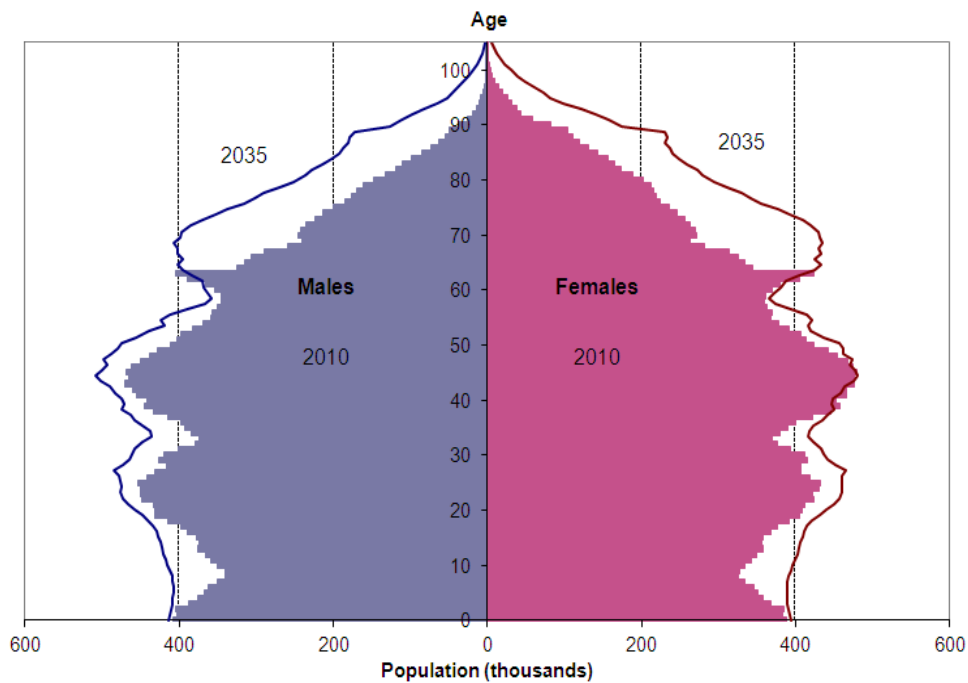
Source: Office for National Statistics (2013a)

The International Longevity Centre-UK (ILC-UK) estimates that by 2034 the UK's
'working age' (individuals aged 15-64) population will rise by 3.5% compared to 30.9%
for those aged 50 and over and a 57.3% increase in individuals aged 65 and over
(Franklin et al., 2015). All of which will have a number of implications if not addressed,
with increasing working options for older adults as one proposed solution. However,
age discrimination amongst others is one area that needs to be addressed to enable
this. Using data from Wave 6 of the English Longitudinal Study of Ageing (ELSA) the

ILC-UK report found that 26% of adults aged 50 to 64 years old who are currently not in employment would like to be able to continue working (Franklin et al., 2015). At the same time over a quarter of respondents retired early due to health reasons. Therefore, demographic change will have implications for the organisation of healthcare and society and issues such as these will need to be addressed over the coming decades.

Public awareness of population ageing and its implications varies globally; in part this is a reflection of the projected ageing in the particular country (Pew Research Center, 2014). For example, the results of a recent survey of respondents from 21 countries worldwide revealed that 23% of respondents in Egypt thought the growing number of older adults in their country was a problem in contrast to 87% respondents in Japan and 79% in South Korea (Pew Research Center, 2014). The USA was also lower down on the scale at 26% while in just under half of respondents in Great Britain (43%) regarded it a problem.

1.2   Age discrimination policy

The ageing population has many policy implications in relation to pension and savings policy, social care and the provision of health care among older adults. My thesis focuses more on the societal implications of an ageing society, and in particular our perceptions and attitudes to ageing. A related but equally important area is that of age discrimination legislation or equality legislation. Great Britain has only relatively recently passed legislation on age discrimination. First, through 2006 employment legislation, and subsequently through the broader Equality Act 2010, which extended existing age discrimination legislation to cover the provision of services. The act covers nine protected social characteristics, of which 'age' is one, and which cannot be used as reason to treat someone unfairly. In most European Countries, as in Great Britain, the introduction of age discrimination legislation followed a European Union Council directive establishing a general framework for equal treatment in employment and

occupation in 2000 (Council Directive 2000/78/EC). The directive only specifies age equality in employment and it was left to member countries to implement in an appropriate manner, with some countries, such as Great Britain, later extending the legislation to cover age discrimination in the provision of services and public functions.

By contrast countries such as the USA introduced legislation some forty years earlier. In the USA legislation to end age discrimination in the workplace was first introduced in the 1967 Age Discrimination and Employment Act (ADEA). Later amendments to the ADEA have brought the mandatory retirement age effectively to an end. Previous research has shown that US age discrimination legislation has had a positive impact on employment through the retention of older workers, but that it has not been as effective for those seeking work (Lahey, 2010; Lain, 2011).

1.3   Outline of remaining chapters

Chapter 2 presents an overview of the literature on older adults' perceptions of age discrimination. The identified gaps in the literature help to inform the Studies 1 (Chapter 3) and 2 (Chapter 4). The first study will investigate the socio-demographic correlates of perceived age discrimination in older adults in England using data from ELSA. The second study will then compare levels of perceived age discrimination in everyday situations in England in comparison with the USA.

Chapter 5 presents an overview of the literature on self-perceived age and its relationship with health and longevity. The literature review will help to inform studies 3 (chapter 6) and 4 (chapter 7). The first of these studies will investigate the association between self-perceived age and mortality, while the second will seek to understand whether self-perceived age effects health or whether health status effects self-perceived age.

Finally, Chapter 8 seeks to bring together the main findings from the four studies and to evaluate the strengths and limitations of this thesis, before considering the possible implications for future research and policy formation.

2 Perceived age discrimination: a review of the literature

The aim of this literature review is to discuss existing studies of perceived age discrimination, and highlight issues and limitations that will be addressed in studies 1 and 2. Firstly, how perceived age '[discrimination is defined will be discussed before identifying and discussing articles investigating perceived age discrimination and its association to socio-demographic characteristics and health outcomes. Finally, the role of ageing stereotypes and attitudes to ageing will then be considered in order to help explain these relationships.

2.1 Introduction

Discrimination whether it is based on age, sex, race or other characteristics can be regarded as unfair treatment. Perceived discrimination can be defined as an individual's perception of being treated unfairly by others due to a personal attribute, such as, age, gender or race (Ayalon and Gum, 2011; Kessler et al., 1999). Where age discrimination can be argued to differ from other forms of discrimination is that we are all at risk of experiencing it at some point in our lives (Gee, Pavalko, & Long, 2007).

2.1.1 Age discrimination and ageism

It is perhaps useful at this point to make a distinction between the terms age discrimination and ageism, which to some extent can be regarded as interrelated or complementary terms. As is often argued, ageism is not always the most straightforward concept to define with numerous definitions offered. The latest version of the Oxford English dictionary defines ageism as "prejudice or discrimination on the grounds of a person's age; age discrimination, especially against the elderly" (Oxford English Dictionary, 2013). The term ageism was first introduced by Robert Butler in 1969; he regarded it as the 'disease' which leads to discrimination and prejudice

against one age group by another (Butler, 1969). He identified three interrelated aspects of ageism: prejudicial attitudes towards older people; discriminatory practices against older individuals, for example, in employment and other social settings; and institutional practices and policies which can perpetuate certain stereotypes about older age (Butler, 1980; Wilkinson and Ferraro, 2002). All of these may impact on an older person's quality of life. Equally important is the individual's perception that he or she experiences discrimination on the basis of their age. The extent to which this perception reflects real occurrences of discriminatory attitudes or behaviours of other people or institutions is often difficult to trace, but it can be argued that perceptions are what matter in this context as they do in many other socially prescribed situations (Schmitt et al., 2014). In this thesis, the term age discrimination is used to describe any experiences where an individual feels they have been treated in an unfair or in a different way due to their age. It could perhaps also be argued that age discrimination is sometimes used to describe prejudice against younger age groups (such as adolescents), whereas ageism is typically linked with older ages.

2.1.2   Discrimination in day-to-day life

The focus of much research on perceived discrimination in the US in particular has been on racism or incidence of discrimination more broadly (Ayalon and Gum, 2011; Kessler et al., 1999; Krieger, 2000; Williams et al., 2008b, 1997). While a growing number of studies have begun to focus on age discrimination there are still relatively few which have used large representative samples of older adults. Previous studies have shown that the prevalence of perceived discrimination decreases with actual age but that among older age groups age discrimination was the most common form of discrimination (Abrams et al., 2009; Ayalon and Gum, 2011; Kessler et al., 1999).

This review aims to discuss some of these studies on perceived age discrimination and those that have measured the prevalence of age discrimination and to consider the impact age discrimination may have on older adults.

2.2   Methods

2.2.1   Search Strategy

Firstly, I conducted online literature searches of the bibliographic databases PsycINFO, MEDLINE, Scopus and Web of Science. The search strategy included the terms ("ageism" OR "age discrimination" OR ("perceived discrimination" AND ("age", "ageing" OR "aging" OR "older adults"))) AND "older adults". Articles were limited to those published in the English language and published before May 2015. In Scopus, articles were also limited to social science, psychology and medicine. Secondly, a search of the Health Management Information Consortium (HMIC) database was conducted for additional articles and grey literature using the indexed term "age discrimination". Lastly, the reference sections of selected articles and reports were scrutinised for any further relevant literature.

2.2.2   Selection criteria

Studies selected needed to be observational studies which included respondents aged 50 years and over in the sample. Studies measuring perceived age discrimination in adults under 50 years old were included if they also included older adults in the sample. Further, the studies had to include a measure of perceived discrimination, and to contain a measure for type of discrimination, specifically, age. Articles were limited to those published in the English language.

Figure 2.1 Phases of the literature search, based on PRISMA flow diagram (Moher et al., 2009)


```
┌─────────────────────────┐      ┌─────────────────────────┐
│ Records identified      │      │ Additional records      │
│ through database        │      │ identified through      │
│ searching               │      │ other sources           │
│ (n =215)                │      │ (n = 9 relevant)        │
└─────────────────────────┘      └─────────────────────────┘
              │                              │
              ▼                              ▼
      ┌───────────────────────────────────────────┐
      │ Records after duplicates removed          │
      │ (n = 120)                                 │
      └───────────────────────────────────────────┘
                        │
                        ▼
              ┌─────────────────────┐        ┌──────────────────────────┐
              │ Records screened    │───────▶│ Records excluded         │
              │ (n = 120)           │        │ (n = 43)                 │
              └─────────────────────┘        │ 1. 35 not observational  │
                        │                     │ studies                  │
                        │                     │ 2. 8 did not measure     │
                        │                     │ perceived discrimination │
                        │                     └──────────────────────────┘
                        ▼
              ┌─────────────────────┐        ┌──────────────────────────┐
              │ Full-text articles  │        │ Full-text articles       │
              │ assessed for        │───────▶│ excluded, with reasons   │
              │ eligibility         │        │ (n = 48)                 │
              │ (n = 77)            │        │ 1. 10 not observational  │
              └─────────────────────┘        │ studies                  │
                        │                     │ 2. 2 did not include     │
                        │                     │ older adults             │
                        ▼                     │ 3. 35 did not measure    │
              ┌─────────────────────┐        │ perceived age            │
              │ Studies on          │        │ discrimination           │
              │ perceived age       │        │ 4. 1 main focus not      │
              │ discrimination in   │        │ perceived discrimination │
              │ older adults        │        └──────────────────────────┘
              │ (n =29)             │
              └─────────────────────┘
```

2.3   Results

The initial search retrieved a total of 2,322 records of which 2,080 were discarded on the basis of title and abstract. An additional 9 records were retrieved, identified from inspection of references. As depicted in Figure 2.1, a total of 215 were selected for closer inspection. Following the removal of duplicates, a total of 120 papers were retrieved. After inspection of titles and abstracts 43 were discarded leaving 77 articles for closer inspection. Of these articles a further 10 studies were discarded on the basis of not being observational studies, an additional 35 studies did not include a specific measure of perceived age discrimination and 2 did not include older adults in the study. This left a total of 29 studies, 21 of which specifically focussed on perceived age discrimination (Table 2.1). The remaining eight studies investigated perceived everyday discrimination more broadly but did also include details of respondents who attributed their discriminatory experience to their age.

2.3.1   Description of studies

Table 2.1 sets out the 29 articles on perceived age discrimination, which were retrieved at the end. The majority of these studies have been published in the last ten years suggesting a growing interest in perceived age discrimination. Only five of the articles retrieved were longitudinal (Gee et al., 2007; Han and Richardson, 2015; Luo et al., 2012; Pavalko et al., 2003; Sutin et al., 2015) and around a third of the studies identified used data from the European Social Study (ESS) (Abrams et al., 2011a, 2011b; Alvarez-Galvez and Salvador-Carulla, 2013; Ayalon, 2014; Demos and WRVS, 2012; Hnilica, 2011; van den Heuvel and van Santvoort, 2011; Vauclair et al., 2015). Of these articles, nine analysed the relationship between perceived discrimination and mental health (Ayalon, 2014; Ayalon and Gum, 2011; Garstka et al., 2005; Han and Richardson, 2015; Hnilica, 2011; Kessler et al., Luo et al., Sutin et al., 2015; Vogt Yuan, 2007). Three studies specifically focused on Great Britain (Abrams et al., 2009; Ray et al., 2006; Sweiry and Willitts, 2012), although figures for the UK were also

available in the comparative studies using European data. The number of adults aged 50 and over included in these three studies ranged between 1,041 and 3,128.

The response rates for many of these studies have varied, as has the representativeness. Some have been convenience samples while others have been representative of the population they are studying. For example, the average response rate for the 2008 ESS survey was 63%, with a response rate of 55.8% in the UK (Abrams et al., 2011a). The 1995-1996 Midlife in the United States (MIDUS) survey also had a similar overall response rate of 60.8% (Kessler et al., 1999). While studies such as the Health and Retirement Study (HRS) had a response rate of around 89% in the 2008 to 2012 waves although the sample size has declined overtime (Sonnega et al., 2014). At the same time the ESS and HRS are both representative samples of the populations they study, while other studies have focused on particular settings, such as the workplace.

2.3.2 Measurement of perceived age discrimination

In eight of the twenty-nine studies, perceived discrimination is measured using a version of the Everyday Discrimination Scale originally developed by Williams et al (1997) in the USA. The scale has been included in the HRS and MIDUS surveys in the USA and a version of this scale is included in wave 5 of the English Longitudinal Study of Ageing (ELSA), as detailed in the next chapter on page 57. In the remainder of the studies identified, the measures used specifically asked respondents about experiences of ageism or age discrimination. For example, in the ESS study one of the questions asked respondents "how often, in the past year, has anyone shown prejudice against you or treated you unfairly because of your age?"

Table 2.1 displays the key characteristics from these studies and are organised by type of study, listed alphabetically by year. From each study the following characteristics

were abstracted: study authors and year of publication, study population, age range, sample source and area, the year of study or data collection, details of the perceived discrimination measure used and any covariates included in the study, the prevalence of age discrimination (where provided) and finally a brief description of the relevant findings.

Table 2.1 Studies on perceived age discrimination by study design

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Cross-sectional studies						
Abrams et al (2011a)	54,988 aged 15 and over from 28 European countries (average 1,966 respondents per country)	ESS, 2008, Europe	How often in the past year have you been treated badly because of your age?	Average of 35% respondents attributed unfair treatment to their age with 29.7% in the UK.	Age, sex, ethnicity	Most respondents' felt they were treated with less respect due to their age as opposed to treated badly (for example, denied access to services). 64% of individuals in UK perceive age discrimination to be a serious problem (European average 44.4%). Prevalence of age discrimination lower in the UK for over 50 year olds in comparison with the European average: 23.7% (50-64); 18.3% (65-74); 16.2% (75 and over) European average: 31.7% (50-64); 35.0% (65-74); 33.1% (75 and over)
Abrams et al (2011b)	54,988 aged 15 and over from 28 countries (1,215-2,751 per country)	ESS, 2008, Europe	How often in the past year have you been treated badly because of your age?	Approximately a third	Age, sex, education, work status, subjective poverty, residential area, ethnicity and country level variables (e.g. GDP, unemployment rate)	2,352 respondents from UK. Age discrimination experienced by around a third of individuals (never vs. experienced at least once to frequently in the past year). Despite better educated respondents reporting less ageism, they reported being more aware of it.
Abrams et al (2009)	5 surveys of 487-2113 respondents aged 16 and over	ACE & NSP, 2004, 2005, 2006, 2008, GB	In the past year, how often, if at all, has anyone shown prejudice against you or treated you unfairly because of your … age?	Mean prevalence of 26% (or 23.5% for over 50s)	Age, sex, social class, ethnicity, working status, housing tenure and marital status	26% of respondents reported age discrimination; those who were retired (or not working) and not married were more likely to report age discrimination. 31% under 50 and 23.5% over 50. Regional differences were also reported: lowest in Yorkshire and Humberside (18%) and highest in South East (30%).

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Alvarez-Galvez and Salvador-Carulla (2013)	52,458 individuals from 26 countries	ESS, 2010, Europe	"On what grounds is your group discriminated against?" Age was one of ten possible answers.	Mean of 9%	Age, sex, marital status, household income and geographic location (rural village to big city) Outcome: self-rated health	Perceived age discrimination associated with poorer self-rated health. Highest levels of perceived discrimination in UK (11.6%) and lowest in Cyprus (2.6%). Variations between European countries as observed in previous studies. Lower levels of income and higher levels of education associated with perceived discrimination. In UK, also being female and married.
Ayalon (2014)	54,988 aged 15 and over from 28 countries (1,215-2,751 per country)	ESS, 2008, Europe	How often they have experienced prejudice or have been treated unfairly because of their age, gender, or race or ethnic background	Mean prevalence across all countries 34.5% and 29.7% in UK	Age, sex, ethnicity, education, life satisfaction and subjective income	Mean prevalence of age discrimination 34.5%. Highest in Czech Republic (53.9%) and lowest in Cyprus and Portugal (17.1%), with 29.7% in UK (sample of 2,342). Perceived age discrimination associated with younger age, lower life satisfaction, and higher levels of both education and subjective income.
Ayalon and Gum (2011)	7,493 over 50 year olds	HRS, 2006, USA	Versions of the Everyday Discrimination and Major Experiences of Discrimination Scales (Williams et al., 1997): How often respondents experienced each of five everyday discriminatory events and whether respondents had ever experienced one of six major discriminatory events.	30.2%	Age, sex, ethnicity, education, income and marital status. Outcomes: elevated depressive symptoms and life satisfaction	Attributing discrimination to age was associated with elevated depressive symptoms and lower life satisfaction. Age was the most common reason given for a discriminatory situation overall, and for both white (31.2%) and Latinos (25.7%). For blacks, age was the second most common reason (23.1%) after race.
Demos and WRVS (2012)	Participants aged 65 years and over from Germany (612), Netherlands (387), Sweden (412) and UK (540)	ESS, 2008, Europe	How often in the past year have you been treated with prejudice because of age?		Age, sex, self-rated health	Older adults in the UK were more concerned about age discrimination than older adults in the Netherlands, Germany and Sweden. In the UK sample, older women perceived more age discrimination than men did; and a significant association was found between perceived age discrimination and health.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Eurobarometer (2012)	26,622 aged 15 and over from 27 EU countries (500-1,505 per country)	EB, 2012, Europe	In the past 12 months have you personally been discriminated against or harassed on the basis of one or more of the following grounds? Options included: being over 55; being under 30; gender; or ethnic origin.	17% report discrimination, with 4% attributing it to being over 55 years old		An average of 17% of respondents (and in UK) reported personal experience of discrimination, with 4% attributing it to being over 55 years old. On average 32% of respondents (ranging from 49% in Hungary to 16% in Ireland) think discrimination of over 55 year olds is widespread in everyday life (and 39% in UK). Compared to 45% who think any age discrimination is widespread.
Eurobarometer (2009)	26,576 aged 15 and over in 27 EU countries	EB, 2009, Europe	In the past 12 months have you personally been discriminated against or harassed on the basis of one or more of the following grounds? Options included: age; gender; religious belief; or ethnic origin.	16% report discrimination, with 6% attributing it to their age		On average 6% state they have experienced age discrimination (range 11% in Czech Republic to 1% in Cyprus with 8% in UK) and 58% think (any) age discrimination is widespread in their country (61% in UK). Older adults and women perceived age discrimination more widespread.
Garstka et al (2004)	59 young adults (aged 17-20) and 60 older adults (aged 64-91)	2004, USA	Four-item scale: "I feel like I am personally a victim of society because of my age,"; "I consider myself a person who has been deprived of the opportunities that are available to others because of my age,"; [Young adults/Older adults] as a group have been victimized by society," and "Historically, members of my age group have been discriminated against more than members of other age groups."		Age, age group identification and age group status Outcomes: self-esteem and life satisfaction	In the older adult group, a negative association was observed between perceived age discrimination and wellbeing. This relationship was partly explained by age group identification. The same association was not found in the younger adult age group.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Hnilica (2011)	Combined 3 waves of ESS from 24 EU countries (123,817 respondents in total)	ESS, 2002, 2006, 2008, Europe	Are you a member of a group discriminated against in this country?	Over 65 year olds reported age discrimination in 1.08% of cases	Age, sex, education, marital status and subjective wellbeing (index of happiness and life satisfaction)	A U-shaped relationship between age discrimination and subjective well-being observed (higher in younger age groups increasing again in older age groups). Perceived age discrimination had more harmful effects on the subjective well-being of middle-aged adults (40-64 year olds) than older aged group (over 65).
Jang et al (2008)	1,554 respondents aged 45-74	MIDUS, 1995/6, USA	Everyday Discrimination Scale developed by (Williams et al., 1997): a nine-item instrument assessing the frequency everyday discrimination	11.2% of respondents attributed incidence of discrimination to their age	Age, sex and ethnicity Outcomes: sense of control and subjective wellbeing (positive and negative affect)	Sense of control was a mediator in the association between perceived discrimination and both positive and negative affect. It only acted as a moderator for negative affect. Correlation between perceived discrimination and negative affect stronger in middle-aged group (45-54) in comparison with older age group (55-74). Greater sense of control associated being younger, male, and lower levels of discrimination.
Kessler et al (1999)	3,032 men & women aged 25-74	MIDUS, 1995/6, USA	Everyday Discrimination Scale and Major Experiences of Discrimination (an eleven-item instrument measuring lifetime discrimination)	Mean prevalence 23.9% and 30% for older adults (both 45 to 64 and over 65 year olds)	Age, sex, ethnicity, income, education and marital status Outcomes: mental health (major depression, generalized anxiety disorder and psychological distress)	Besides older age, men and white participants also reported perceived age discrimination more. While perceived everyday discrimination overall was associated with younger age, lower levels of income and marital status. No association with education level although increased levels of education associated with reporting major incidence of discrimination.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Kim and Williams (2012)	11,544 respondents aged 16 and over	KLIPS, 2004, South Korea	Eight-item instrument measuring life-time discrimination in: getting hired; income; training; promotion; higher education; at home; and social activities	Ranged from 8.3% at home to 58% as reason for being fired for men; and 2.3% at home and 45.9% being hired for women.	Age, sex, marital status, education, income, and employment status Outcome: self-rated health	Women, participants with lower education, lower wealth, previously married and in precarious employment reported higher rates of discrimination, along with participants aged 55 to 64 (24.8%). For women the main reason attributed to experience of discrimination was their gender, followed by education level and age. For men the main reasons attributed to an experience of discrimination were education level and age. In the group who experienced discrimination when being fired, 88% of those aged 65 and over attributed it to their age, compared with 36% of those aged under 65 years old.
Palmore (2001)	84 respondents aged 60 to 93	Senior Centers, 2000, USA	20 item instrument measuring different types of ageism from 'told a joke that pokes fun' to patronized and talked down to' and 'denied medical treatment or employment	Over 75% reported experiencing one or more incidence of ageism	Age, sex, education	Most frequently reported item was being told a joke that made fun of older people (58%), followed by being patronized (39%), being ignored (31%), and treated with less dignity and respect (30%). Told too old for something and 'a doctor or nurse assumed my ailments were due to my age' (43%) Respondents with less education reported more experiences of ageism. Few differences between the sexes and those aged above and below 75 years old.
Ray et al (2006)	1,864 respondents aged 16 and over	ACE, 2006, GB	In the past year, how often, if at all has anyone shown prejudice against you or treated you unfairly because of your age?	28% in the past year	Age	Age discrimination highest in younger adults but increases again between ages 55 and 64. Suggestion that work status may be an important factor here also.
Sweiry and Willitts (2012)	2,139 participants aged 16 and over (1,121 age 50 and over)	ONS OS, 2010, 2011, GB	How often in the past year has anyone shown prejudice or treated you unfairly because of your age?	23% of over 50 year olds (33% overall)	Age, sex, social class, ethnicity, working status, housing tenure, marital status and long-standing illness	Discrimination due to age was associated with age (young adults), gender (women), working status, social class, and housing tenure (those who owned their own homes experienced least and private renters the most).

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
van den Heuvel and van Santvoort (2011)	14,364 older adults from 28 European countries, aged 62 and older	ESS, 2008, Europe	Scores based on three items: how often were you treated with prejudice because of your age during last year?; how often did you feel a lack of respect because of your age last year?; how often were you treated badly because of your age last year?	26% sometimes experience age discrimination and 11% frequently	Age, sex, ethnicity & whether born in Country, education level, household income, social contact/support, subjective health and life satisfaction. Socio-cultural factors: seriousness of age discrimination in respondents' country and index of trust respondents have in other people	Overall, female sex, low levels of education and household income were significant predictors. Personal communication confirmed that for the UK high levels of education were associated with age discrimination. Participants who had greater trust in other people reported less age discrimination, while those who felt age discrimination was serious in their country reported more age discrimination.
Vauclair et al (2015)	7,819 older adults aged 70 and over from 28 European countries	ESS, 2008, Europe	How often in the past year has someone treated you badly because of your age, for example by insulting you, abusing you or refusing you services?	Mean 28.95%	Age, sex, education, subjective poverty, self-rated health and social capital	Prevalence ranged from 8.66% in Sweden to 59.79% in Czech Republic, with 14.85% in UK. Perceived age discrimination mediated the association between income inequality and self-rated health. Greater perceived age discrimination associated with poorer self-rated health
Vogt Yuan (2007)	2,766 aged 25-74	MIDUS, 1995/6, USA	What was the main reason for the discrimination you experienced? Responses divided into perceived age discrimination, discrimination due to another reason than age, and no discrimination	Mean of 11%	Age, sex, ethnicity, education, household income, marital status and social support. Outcomes: emotional distress and positive well-being	Higher educated, less affluent and employed individuals more likely to perceive age discrimination. Individuals reporting they were treated with less courtesy were more likely to perceive age discrimination in comparison with no discrimination. Perceived age discrimination associated with elevated depressive symptoms and lower levels of positive wellbeing.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Wamala et al (2007a)	15,406 men and 17,922 women aged 18 to 84 years old	SNSPH, 2004, Sweden	Modified version Williams et al measure of frequency of perceived discrimination and reasons attributed to it.		Age, sex, long-term illness, disability or infirmness, and socio-economic disadvantage. Outcome: psychological distress measured by GHQ-12	Response rate 63%. Socio-economic disadvantage associated with perceived discrimination Perceived discrimination overall and due to ethnicity, sexual orientation and disability associated with psychological distress. Perceived discrimination due to gender associated with psychological distress only for men. Perceived age discrimination not significantly associated with psychological distress for either men or women,
Wamala et al (2007b)	14,736 men and 17,115 women aged 18 to 84 years old	SNSPH, 2004, Sweden	Modified version Williams et al measure of frequency of perceived discrimination and reasons attributed to it.	8% of men and 10% of women	Age, sex, education, socio-economic disadvantage, long-term illness and living alone. Outcome: refraining from seeking medical treatment	21% of men and 30% of women reported some or frequent discrimination. Of these perceived discrimination in healthcare was reported by 14% of men and 18% of women.
Longitudinal studies						
Han and Richardson (2015)	3,921 aged 50 years and over	HRS, 2008-2012, USA	Modified version of the Everyday Discrimination Scale (how often respondents experienced each of five everyday discriminatory events and reasons they attributed to this). Responses grouped into: (1) age discrimination only, (2) co-occurrence of age discrimination and other discriminations, (3) other discrimination and (4) no discrimination.	31.1%	Age, sex, ethnicity, education, employment status, marital status and physical functioning (ADLs) Outcomes: depressive symptoms and self-perception of ageing	31.1% reported everyday discrimination due to age (10.4% only age and 20.7% both age and other reasons). Perceived age discrimination was associated with depressive symptoms over four years and self-perceived age mediated the relationship.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Luo et al (2012)	6,377 aged 65 and over	HRS, 2006-2008, USA	Modified versions of the Everyday Discrimination and Major Experiences of Discrimination scales	Around 30% attributed discriminatory experience to age	Age, sex, ethnicity, education, marital status and household income and assets. Outcomes: elevated depressive symptoms, self-rated health, functional limitations and number of chronic conditions	Race, marital status (separated/widowed), and lower household assets associated with higher levels of perceived discrimination. Women reported less discrimination than men. Perceived discrimination negatively associated with changes in health over 2 years. Perceived discrimination measured at baseline (2006) only.
Sutin et al (2015)	7,622 aged 50 and over. Longitudinal data available for between 4,234 (mental status) and 6,445 (subjective health) participants.	HRS, 2006-2010, USA	Modified version of the Everyday Discrimination Scale: how often respondents experienced each of five everyday discriminatory events in their everyday life and reasons they attributed to this.	30.1% attributed discriminatory experience to their age at baseline and 28.4% at follow-up	Age, sex, ethnicity, education, BMI and smoking Outcomes: life satisfaction, loneliness, self-rated health, disease burden, cognitive health (recall & mental status).	Perceived age discrimination was associated with poorer subjective health, greater disease burden, lower life satisfaction and greater loneliness but not with cognitive health four years later

Work Place Studies

Cross-sectional studies

Bayl-Smith and Griffin (2014)	280 employees aged 45 years old and over	WPS, 2011, Australia	An adaptation of Perceived Age Discrimination Climate scale and Workplace Prejudice/Discrimination Inventory.		Age, sex, work status, tenure and workload. Cognitive identification and affective identification with later career workers Outcomes: Work engagement and intended retirement age	An association was found between perceived age discrimination and work engagement but not with intended age of retirement. Significant positive correlations between perceived age discrimination and workload, cognitive identification and affective identification with later career workers; and a negative correlation with work engagement.

Author & year	Study population & age range	Sample, region & study year	Discrimination measure	Prevalence age discrimination	Covariates and outcomes	Findings
Rabl and Kühlmann (2009)	624 employees aged 30 to 40 years old and 631 aged 50 to 64 years old	WPS, 2009, Germany	Six-item scale adapted from Garstka et al. (2004)		Age, sex, marital status, number of children, work characteristics (hours, shift-work, type, part-time/full-time, and hierarchy) Outcomes: work-life and life work interference	Perceived age discrimination increased with age and was higher in the older age group of employees in comparison with the younger age group. It was also associated with higher rates of both work-life and life-work conflict.

Longitudinal Studies

Gee et al (2007)	7,225 working women followed between 1972 and 1989	NLSMW and NLSYW, 1972-1989, USA	Whether a woman reported experiencing age discrimination at work in the past five years (exact wording of the questions varies across surveys & years)	Range from 0.7% to 8% reported age discrimination in the workplace in the past 5 years	Age, education, region of residence, current employment status, current or most recent occupation and depressive symptoms	Curvilinear association between perceived age discrimination in workplace and age over the life course: higher levels in 20s, dropping in 30s before rising again and peaking in 50s. Women who were better educated, white and depressed were more likely to perceive age discrimination.
Pavalko et al (2003)	1,778 employed women age 47-62 years old at baseline	NLSMW, 1984-1989, USA	Whether a woman reported experiencing age discrimination at work in the past five years	6% attribute work discrimination to their age (~11.9% report work discrimination)	Age, marital status, education, ethnicity, functional limitations, emotional distress, attitudes (gender roles and job dissatisfaction) and work characteristics (occupation, sector, hours worked and wages per week)	Younger employees, those with more education, and those who are unmarried were more likely to report discrimination. Overall white women reported significantly more age discrimination but for black women, levels of perceived age discrimination were more comparable to race discrimination in their late 50s and early 60s.

Abbreviations: ACE=Age Concern England (now Age UK) survey; EB=Eurobarometer; ESS= European Social Survey; HRS= Health and Retirement Study; KLIPS=Korean Labor and Income Panel Study; MIDUS=Midlife in the United States; NSP= National Survey on Prejudice; NLSMW= National Longitudinal Survey of Mature Women; NLSYW= National Longitudinal Survey of Young Women; ONS OS=Office for National Statistics Opinions Survey; SNSPH= Swedish National Survey of Public Health; WPS=Workplace sample

2.4   Discussion

2.4.1   Discrimination attributed to age

While ageism may not have received the same level attention as sexism or racism in the past, it is of growing importance. As the proportion of older adults increases, these changes to population structures will have important economic as well as social implications. As a result, the effects of age discrimination will need to be identified and better understood. The extent of the problem in the UK is difficult to establish, since high quality evidence from large scale representative population surveys of older people is limited. Questions about age discrimination have been included in Eurobarometer surveys (Eurobarometer, 2012, 2009), but the samples in each country have included relatively few older people. Items about age discrimination were included in the 2008 round of the ESS, and showed wide variations in the prevalence of discrimination across countries (Abrams et al., 2011a, 2011b; Ayalon, 2014; van den Heuvel and van Santvoort, 2011). However, on average 26% of respondents aged 62 and older said they sometimes and 11% that they frequently experienced discrimination on account of their age (van den Heuvel and van Santvoort, 2011). Another study involving 1,121 British people aged 50 and over found that 23% of respondents had experienced age discrimination in the past year (Sweiry and Willitts, 2012). Previous studies using data from the HRS and MIDUS surveys in the US have found that approximately 30% of over 50 year olds gave age as the reason for their discriminatory experience (Ayalon and Gum, 2011; Han and Richardson, 2015; Kessler et al., 1999; Luo et al., 2012; Sutin et al., 2015).

Despite the considerable evidence concerning age discrimination in these studies, a new investigation using Wave 5 of ELSA would still be valuable and would add to this existing literature. Using data from ELSA would enable the perceptions of age discrimination in a larger sample of older adults to be analysed as previous studies of

older adults from England are limited to samples of no more than 2,400 participants. The range of measures available in ELSA will allow a detailed investigation of a number of factors that are potentially relevant, such as, age, wealth, employment status and education, which will be discussed further in the next section. In addition, the data for many of these earlier studies were collected over ten years ago and during this time there have been secular and legislative changes in some countries, while the impact of the economic recession in 2008 might also have had an impact on perceptions of age discrimination due to cuts to public services and employment. Budgets in England, for example, have bought into focus benefits viewed to help certain age groups and sectors of society over others. However, as argued by the Ready for Ageing coalition many of these perceived advantages of generations such as those referred to in the media as 'baby boomers' are myths (Ready for Ageing Alliance, 2015).

Although the focus of this thesis is perceived age discrimination in older adults it is worth acknowledging that age discrimination can equally apply to younger adults. In one study a curvilinear association was observed between perceived age discrimination and age, with higher levels observed for respondents in their 20s and over 50s and lowest for individuals in their 30s (Gee et al., 2007). However, it is argued that older and younger adults may experience ageism differently (Garstka et al., 2004). In a small scale study of 59 younger adults (aged 17 to 20) and 60 older adults (aged 64 to 91), Garstka and colleagues (2004) found that perceived age discrimination was negatively associated with wellbeing in the older age group but not in the younger age group.

2.4.2 Predictors of age discrimination

Existing studies that have considered perceived age discrimination indicate that besides age, experiences of age discrimination have variously been found to be associated with sex, employment status, marital status, ethnicity and socioeconomic status (SES) as defined by household income or occupational social class and education (Abrams et al., 2011b; Ayalon, 2014; Gee et al., 2007; Luo et al., 2012; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011). The strength and direction of these associations has also differed across studies. For example, studies using data from the European Union have indicated that women are more likely to experience age discrimination than men (Demos and WRVS, 2012; Sweiry and Willitts, 2012), while research using data from the US has shown that men report higher levels of day-to-day discrimination than women (Kessler et al., 1999; Luo et al., 2012). It has been argued previously that women are more likely to deny or discount experiences of discrimination which may lead to underestimation (Crosby, 1984; Kessler et al., 1999). Equally, it is likely that women are more likely to experience 'double discrimination' whereby they may perceive discrimination both due to their age and gender (Arber and Ginn, 1995).

Mixed results have been found for the association between perceived discrimination and SES. The majority of studies have indicated that lower levels of household income or occupational social class are associated with experiences of age discrimination and everyday discrimination (Alvarez-Galvez and Salvador-Carulla, 2013; Kessler et al., 1999; Luo et al., 2012; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011; Vogt Yuan, 2007). In contrast, both fewer years of education (Abrams et al., 2011b; Kim and Williams, 2012; Palmore, 2001; van den Heuvel and van Santvoort, 2011) and higher levels of education (Alvarez-Galvez and Salvador-Carulla, 2013; Ayalon, 2014; Gee et al., 2007; Pavalko et al., 2003; Van Den Heuvel and van Santvoort, 2013; Vogt Yuan, 2007) have been identified as predictors of age

discrimination. Although Abrams and colleague (2011b) found that while better educated respondents reported less ageism, they also reported being more aware of it. While Kessler et al (1999) found no association between education level and everyday discrimination, although increased levels of education were associated with reporting major incidence of discrimination.

Overall significantly more older Blacks in the USA report perceived everyday discrimination in comparison with older Whites (Ayalon and Gum, 2011; Barnes et al., 2008, 2004; Luo et al., 2012), however the absolute differences are relatively small in comparison with studies using younger age groups (Barnes et al., 2004). One explanation offered is that where Blacks may have experienced discrimination due to racism throughout their life, whites experience greater discrimination due to ageism in later life, with the transition to retirement playing a more important role for the perceived status of older Whites (Barnes et al., 2004). For example, Pavalko et al (2003) found that although significantly more white women reported age discrimination in the workplace in comparison with black women, that for black women age discrimination rivalled that of race discrimination at older ages. Furthermore, using data from HRS, Ayalon and Gum (2011) demonstrated that while Blacks reported higher levels of perceived everyday discrimination in comparison with White and Hispanic respondents, that they reported less age discrimination (23.1%) relative to the two other ethnic groups (31.2% and 25.7%).

Due to the varied results shown for the relevance of different socio-demographic characteristics in how individuals may attribute discrimination to their age, one of the aims of this thesis is to clarify some of these associations. The studies reviewed here have all varied in the size, age group and measures used. Therefore, I plan to add to the current literature by using a representative sample of older adults in England.

2.4.3 Cross-national studies

Comparisons between countries may throw light on the drivers of discrimination and may offer insights into perceptions of discrimination. To my knowledge there is only a handful, although growing number, of cross-national studies that have been carried out on perceived age discrimination. The majority of which have been comparative studies of European countries using data from the 2008 ESS survey (Abrams et al., 2011a, 2011b; Ayalon, 2014; Demos and WRVS, 2012; van den Heuvel and van Santvoort, 2011; Vauclair et al., 2015). One of the studies showed vast differences in levels of age discrimination experienced by over 62 year olds in the 28 countries (van den Heuvel and van Santvoort, 2011). Age discrimination was found to be experienced most in countries, such as the Czech Republic, Russia and Ukraine and least in countries with stronger social support systems, such as, Sweden, Denmark and Norway.

In 2008 the ESS survey included a module on ageism and attitudes to ageing, which covered a range of measures from whether respondents had experienced discrimination due to their age in the past year to how serious is discrimination against people because of their age to questions on perceived age stereotypes. Studies using this data have shown that wide variations in the level of age discrimination reported across the 28 participating European countries (with the inclusion Israel) included in the study (Abrams et al., 2011a, 2011b; Ayalon, 2014; van den Heuvel and van Santvoort, 2011; Vauclair et al., 2015). Respondents per country ranged from 1,215 to 2,715. On average 35% of respondents attributed discrimination to their age, with figures ranging from 17% in Cyprus and Portugal to 54% in the Czech Republic and 47% in both Finland and the Netherlands (Abrams et al., 2011a; Ayalon, 2014). The European average dropped to 31.7% in 50 to 64 year olds before rising again to 35% in 65 to 75 year olds and 33.1% in over 75 year olds. In the UK an average of 29.7% reported experiencing age discrimination, with the proportion declining at older ages, falling from 23.7% for 50 to 64 year olds to 18.3% and 16.2% in 65 to 74 year olds and over 75

year olds respectively (Abrams et al., 2011a). However, it is notable that the proportion of older adults aged 65 and over who responded in each country ranged from between 9.7% in Turkey and 34.2% in Portugal with 23% in the UK (Abrams et al., 2011b). Questions on whether you are a member of a group that is discriminated against in your country, with age being one of the options, have been included in subsequent years of the ESS but no specific time frame is given or whether respondents are asked if they have personally experienced discrimination (Alvarez-Galvez and Salvador-Carulla, 2013; Hnilica, 2011).

The 2012 and 2010 Eurobarometer studies had similar coverage and age range to the ESS but with smaller samples per country. These studies reported lower levels of discrimination in comparison with the ESS and other studies. In 2012 an average of 17% reported experiencing discrimination in the past year, with 4% attributing it to being over 55 years old and 2% to being under 30 years old. However, the Eurobarometer is very specific on what is defined by age discrimination and therefore it might not capture everyone who feels that they have been discriminated against due to their age.

A further consideration is whether the differences between countries are genuine. For example, willingness to complain or report discrimination may be an issue. As highlighted by Williams and Mohammed (2009) in relation to race discrimination, willingness to report discrimination may account for some observed discrepancies between countries. For example, in an earlier study Williams and colleagues (2008a) point out that rates of perceived racial discrimination were found to be much lower in South Africa in comparison with the USA despite it having a history of racial segregation and tensions. Some of this may reflect the level of interaction between different racial groups where high levels of residential segregation still exist in South Africa. Furthermore, observed differences may also be cultural or may also reflect the attention given to the issue. It could be argued that having better social policy and

legislation regarding ageism may just as likely sensitise individuals to age discrimination, as discussion around it may actually highlight the issue and therefore may make individuals more aware of it or to acknowledge when an incidence may be due to ageism. For example, Ayalon (2014) demonstrated that sexism was just as common, if not higher, in those European countries that had better provisions for gender equality, in comparison with those countries that did not have strong gender equality policies. In line with this it could be argued that the introduction of certain policies in the workplace or other arenas could be seen to reinforce the notion of preferential treatment towards older adults (Ray et al., 2006).

Furthermore, awareness of being treated as old or of ageism may also play a role in whether an individual perceives that they have been discriminated against due to their age (Minichiello et al., 2000). Around the time the data were collected for the 2008 ESS ageism module there was quite a lot of discourse around age equality in social policy and in the British media. Great Britain first passed legislation on age discrimination in employment in the 2006 Employment Equality (Age) Regulations, and subsequently through the broader Equality Act 2010, age discrimination legislation was extended to cover the provision of services and public functions. This followed a European Union directive on age discrimination. However, the directive only specifies age equality in employment and it was left to member countries to implement in appropriate manner (Lahey, 2010). Most European countries had not implemented legislation at the point of data collection but some such as Spain and Hungary had done so. Most of the data were also collected prior to the banking crisis or before the full extent of it was known. Structural differences at the country level may influence perceptions of older adults at the individual level.

There has also been conflicting evidence on the seriousness of age discrimination. Cross-national studies using data from the ESS also revealed wide variation in the perceived seriousness of ageism across European countries. On average 44% of

respondents viewed age discrimination to be quite or very serious, with slightly higher rates for respondents aged 50 to 64 years old (46.5%). The proportion differed greatly between countries, ranging from 17% and 22% in Cyprus and Denmark (22%) up to 64% and 68% in the UK and France (Abrams et al., 2011a). While an earlier British study of over 15 year olds demonstrated that age discrimination was viewed less seriously than racism and discrimination due to religion or disability (Ray et al., 2006). Furthermore, the study showed that respondents aged 65 years and over were less likely than other age groups to view it as serious. This may reflect cultural differences in how age discrimination is viewed.

2.4.4   Discriminatory situations

Age discrimination has also been reported to occur more frequently in certain discriminatory situations. For example, ageism in medical settings has been identified by previous research as a particular problem (Bowling, 1999; Greene et al., 1989; Wait, 2005). This may be evident in how clinical staff communicate with older patients and in the quality of care older patients receive in comparison to younger patients (Nussbaum et al., 2005; Wait, 2005). In one Swedish study investigating reasons for not seeking medical treatment, 21% (3,354) of men and 30% (5,263) of women aged 18 to 84, reported experiencing some or frequent discrimination. Of these 14% (476) of men and 18% (652) of women attributed it to perceived discrimination in healthcare settings and 8% (279) of men and 10% (538) of women attributed it to their age (Wamala et al., 2007b). However, nearly half of respondents did not attribute a specific reason for this. In the fully adjusted model, respondents who perceived discrimination in healthcare were 1.7 times (female) and 2.4 times (male) more likely to refrain from seeking medical care in comparison with those who perceived no discrimination. The authors' multivariate analyses did not include other attributions in the model, such as, perceived age discrimination, therefore, it is unclear whether age discrimination reduced an

individual's likelihood of seeking health treatment in the same manner as perceived discrimination in medical setting or to what extent the two overlapped.

Equally age discrimination has often been reported to be prevalent in the workplace, in particular for individuals approaching retirement age, in comparison with other social settings (Gee et al., 2007; ILC-USA Anti-Ageism Task Force, 2006; Pavalko et al., 2003; Vogt Yuan, 2007). This may be witnessed in the hiring of older adults in the workplace or where individuals feel they have been looked over for promotion or unfairly dismissed (ILC-USA Anti-Ageism Task Force, 2006). Studies carried out in the workplace indicate that individuals in their later forties and early fifties perceive greater discrimination in comparison with those in their thirties and early forties suggesting that individuals approaching retirement age maybe at greater risk of age discrimination (Gee et al., 2007; Rabl and Kühlmann, 2009; Roscigno et al., 2007). One longitudinal study following women in different age cohorts found that women who were older, better educated, white and who reported depressive symptoms were more likely to report age discrimination in the workplace (Gee et al., 2007). Studies comparing discriminatory situations have shown that respondents who have been fired often attribute it their age. For example, an American study of reported cases of age discrimination in the workplace found that 66.2% of cases were brought about due to being fired (Roscigno et al., 2007). Similarly a South Korean study comparing discrimination in different situations showed that for both men and women their age was cited as the main reason for being fired (58% and 44.8% respectively) (Kim and Williams, 2012). For women, age discrimination was also the main reason for not being hired for a job, while for men it was the second reason after perceived discrimination due to their level of education. In social activities, women cited perceived sex discrimination as the most common type of discrimination, while for men it was their education level. However, a shortcoming with many of these studies, especially those carried out in the workplace or medical setting, is that they only focus on the one

situation. Therefore, it is difficult to say with certainty whether age discrimination occurs more in one setting over another.

When it comes to everyday discriminatory situations, it has often been reported that people have been treated with less courtesy or respect because of their age (Abrams et al., 2011a; Kessler et al., 1999; Vogt Yuan, 2007). For example, this may be evident in the use of patronizing communication both verbal and non-verbal in interactions with strangers in everyday situations (Nussbaum et al., 2005). A study using data from the MIDUS study showed that perceived age discrimination was more likely to occur where individuals were treated with less courtesy or respect and least where individuals were harassed or insulted (Vogt Yuan, 2007). In a small-scale study of 84 individuals aged 60 years old over, respondents were asked whether or not they had experienced ageism in 20 different situations ranging from 'told a joke that pokes fun at older adults' to 'patronized and talked down to' and denied medical treatment or employment (Palmore, 2001). The most frequently reported situations included being told a joke that made fun of older people (58%), followed by being patronized (39%), being ignored (31%), and treated with less dignity and respect (30%). While 43% reported being told too old for something and that a doctor or nurse assumed their ailments were due to their age. Although the findings accord with other studies and suggest that respondents are more likely to be aware of discrimination due to their age in certain situations it would be important carry out further research on larger representative population in order to verify these findings.

2.4.5 The impact of perceived discrimination on health

The cross-sectional association between perceived discrimination in everyday situations and health status and wellbeing has been documented by a number of studies (Ayalon and Gum, 2011; Kessler et al., 1999; Pascoe and Smart Richman, 2009; Vogt Yuan, 2007). This might suggest that experiences of discrimination can

have a negative impact on an individual's wellbeing. It is argued that perceived discrimination acts like a stressor and can build up over time, eventually taking a toll on an individual's mental and physical health and wellbeing (Kessler et al., 1999). Cross-sectional evidence has also indicated that everyday discrimination is more strongly associated with psychological wellbeing than major lifetime discriminatory events (Kessler et al., 1999; Williams et al., 1997). Most of the evidence for an association between perceived discrimination and mental health is drawn from cross-sectional studies, which do not provide evidence of cause and effect. Therefore, it is not possible to tell from these studies whether discrimination contributes to poor mental health. It is possible that more mental health might lead people to perceive discrimination in situations that others would not because of sensitivity to negative social cues.

A meta-analysis conducted by Pascoe and Smart Richman (2009) indicated that along with mental health, perceived discrimination has an impact on physical health and mortality. The evidence for this predominantly comes from studies of perceived racism. Of all the studies included in the meta-analyses the majority focused on perceived race discrimination and health (65%), while around 15% did not specify a type of discrimination. No specific reference was made to perceived age discrimination. Of the 134 studies included in the meta-analysis 36 included data on physical health, compared with 110 studies that included data on mental health. Furthermore, few longitudinal studies were identified. Using path analyses and structural equation modelling, perceived discrimination was found to be related to poorer mental health status in 90% (448 effects) of the analyses (500 effects) included with 69% (345 effects) reaching significance. While 83% (184 analyses) showed higher levels of perceived discrimination were related to poorer physical health, with 49% (93) reaching significance. However, the direct causal pathway between perceived discrimination and health could not be determined. Overall results of meta-analysis supported their model (see figure 2.2) and suggested that increased levels of perceived discrimination were associated with more negative mental and physical health.

Figure 2.2 Pathways by which perceived discrimination influences health outcomes.

Solid lines indicate analysed pathways; dashed lines represent pathways hypothesized by past research (Pascoe & Richman, 2009)
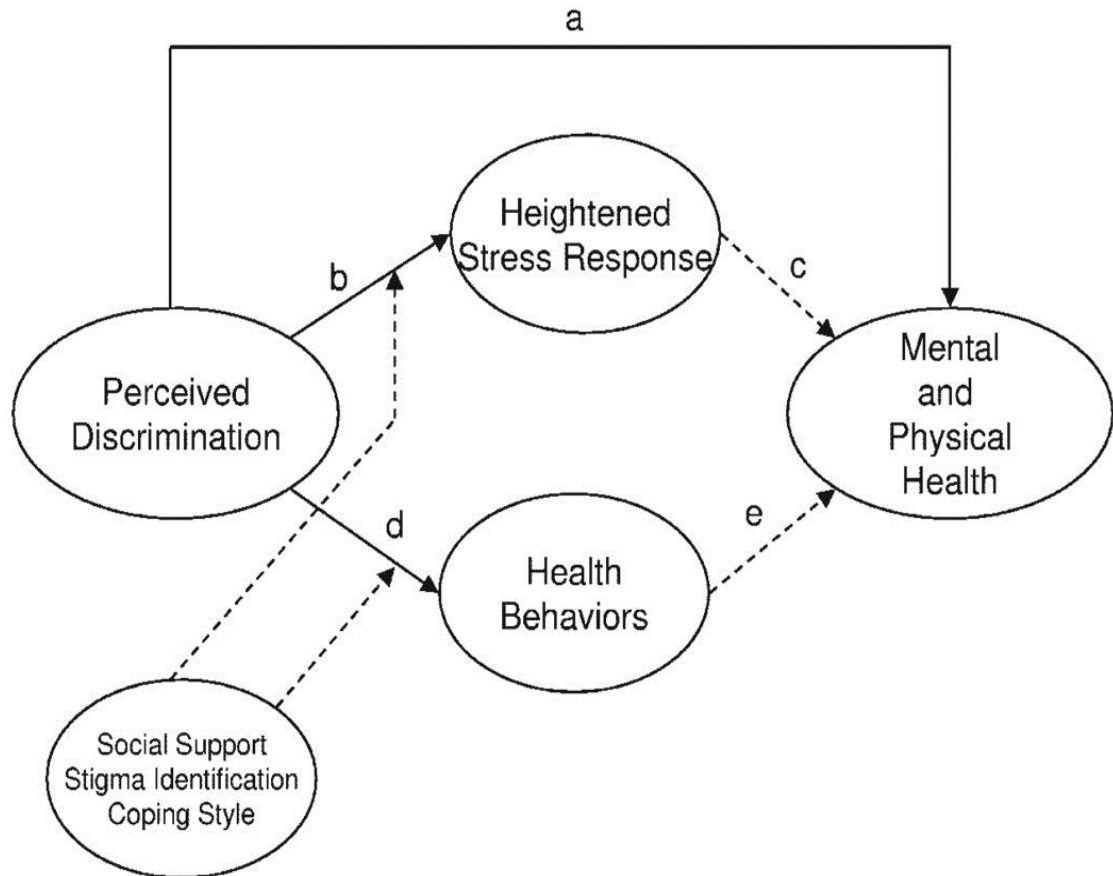
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A wide variety of physical health outcomes were assessed including: hypertension, cardiovascular disease, diabetes, and respiratory infections; and a number of potential moderators were identified in the literature, including social support, coping style and group identification. Health behaviours and stress responses were proposed in the literature as mediators of health outcomes (pathways b and d). It is hypothesised that exposure to perceived discrimination can activate both physiological and psychological stress responses and which in turn will eventually impact upon mental and physical health. Overall the results of the meta-analysis indicated that perceived discrimination was associated with both heightened physiological and psychological stress responses

and the adoption of poorer health behaviours or a reduced participation of healthier behaviours. However, Pascoe & Smart Richman did not specifically examine whether chronic stress and health behaviours mediated the relationship between perceived discrimination and health.

Although this study provides strong evidence for the effect of perceived discrimination on health, it does not specifically address the type of discrimination experienced. Therefore, it is not known with certainty whether the same effects apply to age discrimination. The majority of the studies included in the meta-analysis focused on perceived discrimination in general or on racism or sexism and the search criteria used by the authors did not include ageism or age discrimination: discrimination, prejudice, racism, sexism, and unfair treatment. A more recent meta-analysis investigating the relationship between perceived discrimination and psychological wellbeing confirmed the negative association between perceived discrimination in general and mental health (Schmitt et al., 2014). The strength of the observed association was dependent on study characteristics, with weaker effects observed for racism and sexism in comparison with studies focusing on perceived discrimination due to weight, HIV status and sexuality. However again, these analyses did not specifically address age discrimination.

Only a handful of longitudinal studies have investigated the relationship between perceived age discrimination and health (Han and Richardson, 2015; Pavalko et al., 2003; Sutin et al., 2015) and have added further support to the association between perceived discrimination and poorer health outcomes. Two of these studies used data from the HRS study in the USA and found that perceived age discrimination was associated with poorer subjective health, greater disease burden, lower life satisfaction, greater loneliness (Sutin et al., 2015) and change in depressive symptoms (Han and Richardson, 2015) over a four year period. Sutin and colleagues (2015) followed HRS respondents aged 50 and over between 2006 and 2010. Of the 7,622 respondents who

completed the perceived discrimination measure at baseline, longitudinal data were available for between 4,234 (mental status) and 6,445 (subjective health) participants, dependent on the outcome measure. The study showed that participants who reported discrimination due to age, weight and physical disability had poorer subjective health, higher burden of disease, lower life satisfaction and loneliness at baseline and four years later. The study showed no association between perceived age discrimination and cognitive health, both recall and mental status, over time. This was also the case for most other types of perceived discrimination, with the exception of sex discrimination and discrimination due to physical disability. Contrary to much of the evidence from cross-sectional studies, the authors also found that perceived discrimination due to race and sex were not strongly associated with physical or emotional health over time in older adults. Another US study involving 3,921 participants aged 50 and over demonstrated that perceived age discrimination was significantly related to a change in depressive symptoms over four years, after adjustment for covariates including age, sex, education, race, employment status, marital status, and baseline emotional health (Han and Richardson, 2015).

2.4.6 Stereotypes of ageing

The majority of the theoretical models of ageism have tended to focus on how it originates and why someone will treat someone else differently due to their age, for example, why a younger person holds negative beliefs about an older adult (Bugental and Hehman, 2007; Nelson, 2005). One of the models used to explain why one societal group may be either a focus of more positive or negative prejudices is the Stereotype Content Model. The Stereotype Content Model suggests that most stereotypes are mixed based on two main dimensions: competence and warmth (Cuddy et al., 2005). With lower status groups, or those viewed as non-competitive, such as, older adults (who are viewed as lower status relative to younger and middle aged groups) consistently viewed as high on warmth but lower on the competence

dimension, and who are more likely to evoke a sense of pity in comparison to higher status groups who are more likely to be viewed with envy (Fiske et al., 2002). The perception of lack of competence can be viewed to translate into the capability to carry out certain tasks and work, while warmth may reflect friendliness or approachability (Cuddy et al., 2005), equally it may also reflect a perceived absence of competitiveness and a lower status. Stereotypes of ageing may also help to explain why certain discriminatory situations are more prevalent than others are. For example, in the workplace or in situations where individuals feel they have been treated with less courtesy or as less clever.

While it is easy to focus on the negative aspects associated with ageism, it is equally important to acknowledge some of the positive elements that may exist; for example, some behaviours maybe be regarded as more compassionate or beneficial towards older people in comparison to younger adults (Pasupathi and Lockenhoff, 2002). This could include some legislative protections and positive age stereotypes, highlighted by the Stereotype Content Model which contains both positive and negative characteristics (Cuddy et al., 2005; Kite et al., 2005). However it is also important to bear in mind that some of age differentiated behaviours may not necessarily be ageist (Pasupathi and Lockenhoff, 2002).

2.4.7 Stereotype embodiment theory

Negative stereotypes of ageing, often portrayed in the media and elsewhere, may have a strong influence on societal and individuals' attitudes and behaviour towards older adults and in turn may also ultimately influence how older adults view ageing themselves. Levy (2009) argues that stereotypes of ageing are embodied when their assimilation from the surrounding culture leads to self-definitions that in turn influence functioning and health. She has proposed that stereotypes become: internalised across the lifespan; can operate unconsciously; gain salience from self-relevance; and, utilise

multiple pathways. It is argued that these ageing stereotypes become ageing self-stereotypes in older age, in turn influencing an individual's conceptions of ageing and old age. Equally these age stereotypes can be regarded as a subset of age related attitudes and beliefs that give rise to prejudice and discrimination, such as, ageism. As these age-related stereotypes are assimilated over the life course, they may gain relevance at older ages and affect actual ageing experiences almost unknowingly.

Becca Levy's theory is an accumulation of her work on ageing stereotypes (Levy and Banaji, 2002). It offers a clear way to understand how perceptions of ageing are formed and may gain greater relevance at older ages. A number of studies can be identified which support age-stereotype embodiment (Hess et al., 2004; Kotter-Gruhn and Hess, 2012; Levy et al., 2009) and demonstrate how it has a greater relevance for older adults in comparison to middle-aged and younger adults. Levy's theory has particular relevance to the last two studies in this thesis, when I investigate individuals' self-perceptions of ageing and it will be discussed in more detail in Chapter 5.

An additional factor is that individuals perceive age discrimination because they are exposed to experiences of discrimination or differential treatment due to their age. As argued by Minichiello et al (2000) awareness of age discrimination makes it more reportable. Therefore, by extension exposure to age discrimination will also make it more reportable. Further it may also reflect how an individual interprets an interaction or event or whether they perceive themselves to be a member of a discriminated group.

2.5   Summary of literature review

There are several gaps in the literature. I hope that this PhD will go some way to filling the gaps identified in the existing literature where older adults' perceptions of age discrimination have not been studied widely. Age discrimination is an important topic,

but empirical research in this area is limited and few have focused on the predictors of age discrimination and how these may shape and influence perceptions of age discrimination. Very few studies have used large nationally representative samples from the UK in their investigations, so findings are limited by sample selection. Existing studies using data from Great Britain and the UK have used measures of discrimination which specifically asked about individuals' experiences of age discrimination. I believe using data from ELSA will be beneficial to aid our understanding of perceptions of discrimination in older adults as it will enable a large sample of older adults in England to be analysed. Equally only a handful of cross-national studies have been identified, the majority of which have used European data. Therefore, conducting a comparative study of perceived age discrimination in the USA and England will add to existing knowledge. Both the HRS and ELSA have been developed in coordination to facilitate the collection of comparable data which enable such a cross-national study (Steptoe et al., 2013a).

In the following two chapters, I aim to investigate the cross-sectional associations between key socio-demographic characteristics and perceived age discrimination, firstly in England and then conducting a cross-national study looking at the associations in the USA in comparison with England.

3 Perceived age discrimination in older adults in England (Study 1)

The first study aims to evaluate the relationship between perceived age discrimination and key socio-demographics in a sample of older adults. A version of this study was published in the journal *Age & Ageing*.

3.1 Introduction

The literature review in the previous chapter showed there have been a limited number of studies of perceived age discrimination using large-scale representative data. Further, very few studies have looked specifically at the correlates of perceived age discrimination in older age groups in the UK. Therefore, in order to enhance current knowledge, the first objective of this cross-sectional study is to examine the extent of perceived age discrimination in a large nationally representative sample of >7,500 men and women aged 52 and older, assessed as part of the English Longitudinal Study of Ageing (ELSA) (Steptoe et al., 2013a). The second objective of this study is to explore the socio-demographic factors that are related to experiences of perceived age discrimination in everyday situations.

3.1.1 Aims

The aims of this study are:

1) to investigate the overall levels of perceived age discrimination reported by older adults in England

2) to examine the socio-demographic correlates of perceived age discrimination in older adults

3) to investigate whether these results differ across individual discriminatory situations

Based on the previous literature, the hypotheses tested in this study are:

1) It is expected that levels of perceived age discrimination in England will be comparable to those reported in other studies and that they will increase with age

2) Perceived age discrimination will be associated with female sex, older age, lower levels of wealth and education, being in employment and unmarried.

3) Prevalence of perceived age discrimination will differ in the individual discriminatory situations. It is expected to be highest where people perceive they have been treated with less courtesy and least where they have experienced actual harassment.

3.2   Methods

Data were drawn from Wave 5 (2010-11) of the ELSA. ELSA is a longitudinal panel survey of ageing and quality of life among men and women aged 50 and older living in private households in England, which commenced in 2002-03 (Steptoe et al., 2013a). The initial sample was selected from three survey years of the Health Survey for England (HSE; 1998, 1999 and 2001) - an annual government health survey based on a stratified random sample of all households in England (Mindell et al., 2012). Households were included if they contained at least one individual who was aged 50 or over and who had agreed to be contacted again in the future. The ELSA sample is reassessed every two years and every four years for a health examination, and is periodically refreshed to ensure a representation of younger participants. Refreshment samples were added in Waves 3 and 4 and respondents were selected from HSE survey years 2001 to 2004 (Wave 3) and 2006 (Wave 4). Data are collected each wave

using computer-assisted personal interviews (CAPI), and self-completion questionnaires, and from a nurse visit every four years (Waves 2, 4 and 6). ELSA was designed as a sister study to the Health and Retirement Study (HRS) in the United States, covering a broad range of topics, including health, psychosocial, economic and genetic measures enabling multidisciplinary analysis and cross-national comparisons.

Of the 10,274 respondents who were interviewed at wave 5 of ELSA, 6,242 (60.8%) were core members from the original cohort first interviewed in 2002. A further 936 (9.1%) and 1,912 (18.6%) were added as part of refreshment samples in waves three (2006) and four (2008) respectively, giving a total of 9,090 core members. The 1,184 (11.5%) remaining respondents were either young (aged under 50 years old), old or new partners of the core members and are not included in this analysis. Among the core participants, 8,107 (93% of those eligible) answered the self-completion questionnaire that contained the measures of age discrimination. A further 302 (3.7%) participants had missing data on the perceived discrimination measure and an additional 152 (1.9%) participants had missing data on covariates, primarily wealth (149). The remaining variables had less than 1% missing data. The complete analytical sample comprised 7,653 respondents. The sample included 172 (2.2%) participants from a non-white ethnic background.

I applied a cross-sectional weight to all analyses to correct for non-response and ensure the results could be generalised to the population in England aged 52 years old and over. The cross-sectional weight used was produced by the National Centre for Social Research (NatCen) and was derived for the three cohorts constituting the core ELSA members. It accounts for differential non-response between waves four and five and is calculated to be representative of individuals living in England in 2010 (Cheshire et al., 2012b). The derived weights also took into account socio-demographic characteristics that were previously shown to be significantly different between

responders and non-responders, for example, marital status, housing tenure, highest educational qualifications and quintiles of indices of multiple deprivation (IMD).

3.2.1 Measures

Wave 5 of ELSA was the first to include questions on experiences of discrimination. These were based on the items developed Williams and colleagues (1997) and which have been used widely in other longitudinal studies in the USA, notably the HRS and the Midlife in the United States (MIDUS) survey (Ayalon and Gum, 2011; Han and Richardson, 2015; Jang et al., 2008; Kessler et al., 1999; Luo et al., 2012; Sutin et al., 2015; Vogt Yuan, 2007; Williams et al., 1997). It has been shown to be a robust measure of perceived everyday discrimination (Krieger et al., 2005).

Perceived age discrimination

As part of the self-completion questionnaire, respondents were asked about the frequency of five discriminatory situations as follows: "In your day-to-day life, how often have any of the following things happened to you?"

1. You are treated with less respect or courtesy
2. You receive poorer service than other people in restaurants and stores
3. People act as if they think you are not clever
4. You are threatened or harassed
5. You receive poorer service or treatment than other people from doctors or hospitals

The measure directly followed questions in the self-completion questionnaire on the frequency and type of social interaction with friends, family and children. Possible response options ranged from 1 (Almost every day) to 6 (Never). I chose to dichotomize these responses because the data were skewed, with most participants

reporting discrimination less than once a year or never in any of the discriminatory situations. The responses were dichotomised to indicate whether or not participants had experienced discrimination in the past year (a few times or more a year vs. less than once a year or never), with the exception of the fifth item which was dichotomised to indicate whether or not respondents had ever experienced discrimination from doctors or hospitals (never vs. all other options). The fifth item was categorised differently because it was thought that individuals might visit the doctor or hospital less frequently over a year in comparison with other situations.

A follow-up question asked respondents to indicate what reason/s they attributed their experience to in any of the five discriminatory situations. Possible options included: age, gender, race, weight and physical disability, and participants were able to select more than one reason. From the responses to this question I created a perceived age discrimination variable, where participants who attributed any experiences of discrimination to their age were treated as cases of perceived age discrimination in this study.

In addition to the measure of perceived age discrimination, I derived five dummy variables in order to investigate experiences of age discrimination in the individual discriminatory situations. Participants who reported being either (treated with less courtesy/ treated as less clever/threatened or harassed/ receiving poorer service in shop or restaurant/receiving poorer treatment in a medical setting) and also attributed any experiences of discrimination to their age were treated as cases of perceived age discrimination in that particular situation and coded '1'. Remaining respondents were coded '0'

Covariates

Age, sex, wealth, education, marital status and current work status were all included as covariates. These socio-demographic covariates were identified from the literature as being associated with perceived age discrimination. Incidence of perceived age discrimination has variously been found to be associated with age, gender, lack of paid employment, not being married, lower levels of household income or occupational social class and both fewer years and higher levels of education (Abrams et al., 2011b; Alvarez-Galvez and Salvador-Carulla, 2013; Gee et al., 2007; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011; Vogt Yuan, 2007). Although levels of overall perceived discrimination have been found to decrease at older ages, those respondents who do report experiences of discrimination are more likely to attribute it to their age in comparison with other factors, such as, gender (Kessler et al., 1999). Lower levels of household income and occupational social class have been shown to be associated with both age discrimination and everyday discrimination (Alvarez-Galvez and Salvador-Carulla, 2013; Kessler et al., 1999; Luo et al., 2012; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011; Vogt Yuan, 2007) , whereas both fewer years of education (Abrams et al., 2011b; Kim and Williams, 2012; Palmore, 2001; van den Heuvel and van Santvoort, 2011) and higher levels of education (Alvarez-Galvez and Salvador-Carulla, 2013; Ayalon, 2014; Gee et al., 2007; Pavalko et al., 2003; Van Den Heuvel and van Santvoort, 2013; Vogt Yuan, 2007) have been found to predict experiences of age discrimination.

Age

Age was categorised for the purposes of analysis in order to observe changes in the prevalence of perceived age discrimination between age groups. In order to keep anonymity, participants aged 90 and over are recoded to 99 in ELSA. Age was then subsequently split into four categories: 52-59 years; 60-69 years; 70-79 years; and a final group combining all those aged 80 and over. It was grouped into decades in order to explore the impact of age discrimination between the different decades of life. There

was no refreshment sample at Wave 5 (2010) so the youngest respondents who joined the study at Wave 4 (2008) were now aged 52 (Cheshire et al, 2012b).

Sex

Sex was coded 1 for female and 0 for male

Wealth

Wealth was measured by total non-pension net wealth categorised into quintiles. Total non-pension wealth is defined as the sum of financial worth, physical worth (such as business wealth, land or jewellery), and housing wealth after deducting debts; and it is regarded as the best indicator of socioeconomic resources at older ages (Banks et al., 2003).

Education

As part on of the main CAPI interview, respondents were whether they had attained any further qualifications since they were last interviewed. In cases where the answer was yes, or if there was no previous information available, respondents were given a predetermined list of response options from which to choose. If their answer was no, then their previous answer was fed forward from earlier waves or from the original Health Survey for England (HSE) they participated in. Education was measured by the highest educational qualification attained and divided into three groups: low (no educational qualifications), intermediate (O Levels, Certificate of Secondary Education or equivalent), and high (A Levels or equivalent through to higher degrees). The 591 respondents who had a foreign or other qualification were included in the intermediate category as no details about the level of the qualification were provided.

Marital status

Marital status was grouped into four categories: single (never married), married (married, remarried or in a civil partnership), separated or divorced, and widowed.

Current employment status

In the main ELSA questionnaire, respondents are asked: "which one of these best describes your current situation?" Possible response options include: retired, employed, self-employed, unemployed, permanently sick or disabled, looking after home or family, or other, which could include semi-retired. From responses to this question I derived a variable to indicate whether a respondent was currently employed (including self-employed), retired or in another situation, for example, unemployed, permanently sick or disabled, or looking after the home or family.

3.2.2   Statistical Analyses

I analysed the data in three main steps. Firstly, chi-square tests were used to assess the bivariate relationship between perceived age discrimination and individual covariates. Secondly, I conducted multivariable logistic regression analysis to estimate the odds ratios of experiencing perceived age discrimination adjusting for all covariates. Interactions between age and wealth and between age and education were also tested. Finally, in order to examine perceived age discrimination in the individual discriminatory situations, I ran five separate logistic regression models in order to identify the significance of different socio-demographic characteristics in these situations. In these five models, the outcome was the perception of age discrimination in each of the discriminatory situations. A cross-sectional survey weight was applied to all analyses.

3.3   Results

3.3.1   Sample characteristics

Table 3.1 sets out the sample characteristics by sex of respondent. Of the 7,653 respondents who completed the self-perceived discrimination measure at wave 5 of

ELSA, 53.1% were women and 46.9% were men. The mean age of respondents was 66.7 (SD 9.2) with 66.2 (SD 8.9) for men and 67.1 (SD 9.5) for women. Over a third of both sexes were aged between 60 and 69 years old. Three-quarters of men were married in comparison with around 60 per cent of women. However, the considerably higher proportion of women who state they are currently widowed (21.2%) in comparison with men (7.4%) offsets this. This could in part be explained by women living longer, as demonstrated by a slightly higher proportion of female respondents aged 80 and over (13.1%) in comparison with male respondents (9.7%).

Men were more highly educated than women were, with just over half of male respondents reporting that their highest attained level of education was A level or above in comparison with around a third of women. Female respondents were less wealthy in comparison with male respondents, with a lower proportion in the highest two wealth quintiles and a higher proportion in the lowest wealth quintile. At the time of interview, 53.1% of men and 58.2% of women were retired. Close to two times as many women (15.0%) reported being either unemployed, looking after the home or family, or in another situation in comparison with men (9.0%).

Table 3.1 Sample characteristics by sex (n=7,653)

	Male N	Weighted %	Female N	Weighted %
All	3,410	46.9	4,243	53.1
Age in years				
52-59	750	28.1	920	25.8
60-69	1,386	38.5	1,703	36.7
70-79	953	23.7	1,126	24.4
Over 80	319	9.7	494	13.1
Wealth				
Lowest 1	488	16.4	755	19.5
2	629	18.9	885	20.9
3	678	19.8	872	20.2
4	763	21.4	877	20.2
Highest 5	852	23.5	854	19.1
Education				
Low	644	21.3	1,223	31.7
Intermediate	907	27.6	1,472	35.1
High	1,859	51.1	1,548	33.2
Marital Status				
Single	226	6.8	229	5.2
Married	2,586	75.7	2,495	60.1
Divorced or Separated	327	10.2	586	13.6
Widowed	271	7.4	933	21.2
Employment Status				
Retired	1,986	53.1	2,597	58.2
Employed	1,154	37.8	1,049	26.8
Other	270	9.0	597	15.0
Ethnicity				
White	3,324	96.6	4,154	97.5
Non-white	84	3.3	88	2.5
Missing	2	0.03	1	0.01

Note: Percentages are weighted.

3.3.2 Descriptive analyses

Approximately a third (33.4%) of all respondents experienced age discrimination, rising to 36.8% in the aged 65 and over. As depicted in Figure 3.1, discrimination attributed to age was the most common type of discrimination reported in the ELSA sample, followed by discrimination attributed to gender (9.4%) and financial status (6.2%). Perceived age discrimination increased in older age while the remaining discriminatory reasons, with the exception of physical disability, declined with age.

Figure 3.1 Reasons attributed to discrimination by age group
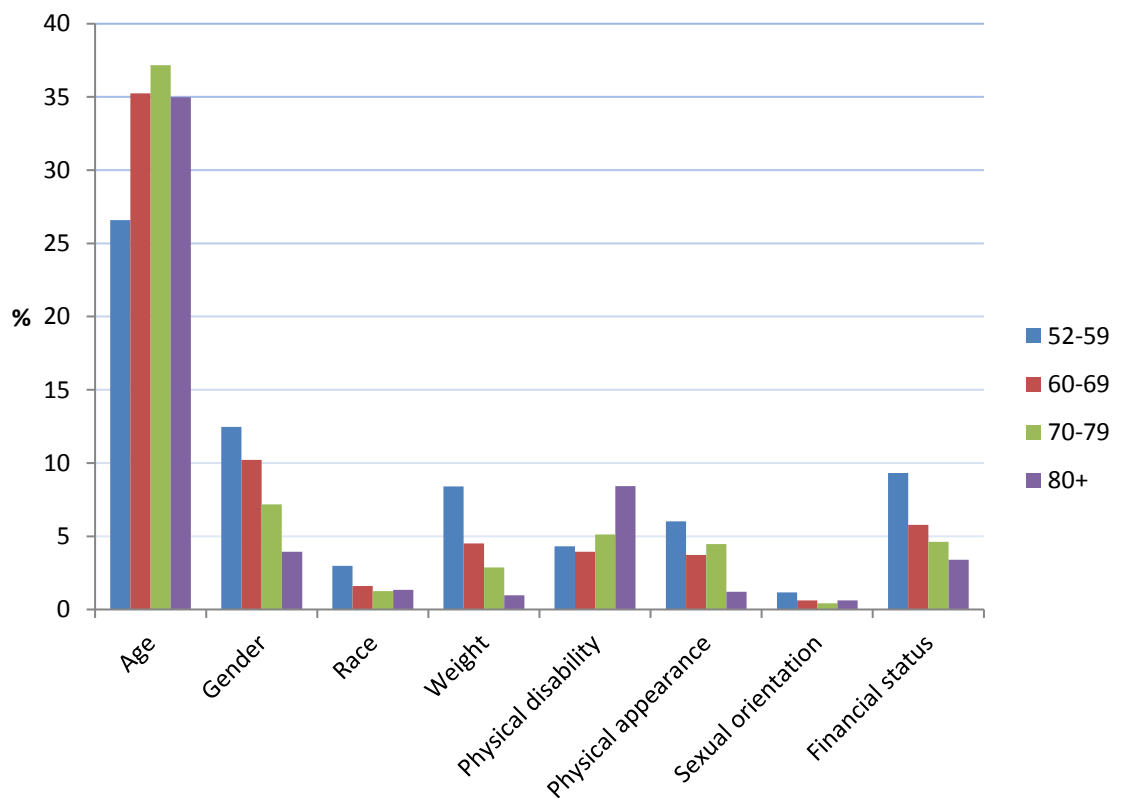
The descriptive analyses indicated that all the socio-demographic factors with the exception of marital status were related to perceived age discrimination (Table 3.2). Overall, perceived age discrimination was more common in male (p=0.04), older (p<0.001), less wealthy (p=0.018), more educated (p=0.005) and retired respondents (p<0.001). 34.7% of men and 32.3% of women attributed an experience of age discrimination to their age. The prevalence of perceived age discrimination increased with age, peaking in the 70 to 79 age group. 26.8% of respondents aged 52 to 59 attributed an experience of discrimination to their age, rising to 37.3% in those aged 70 to 79 years old.

Around 34.7% of respondents in the highest education category reported experiencing age discrimination, compared with 31.1% in the least educated group. The opposite gradient was observed for wealth with perceived age discrimination decreasing as wealth quintile increased. 35.8% of participants in the lowest wealth quintile attributed discrimination to their age decreasing to 30.0% for those in the highest wealth quintile. 36.9% of respondents who are currently retired reported age discrimination in comparison with 28.3% of respondents currently in employment. Perceived age discrimination was reported by 35.5% of participants who were widowed in comparison with 31.9% of respondents who had never married.

3.3.3   Multivariate analyses

The multivariable analyses showed that perceived age discrimination increased with age, peaking in the 70-79 age group (OR 1.42; 95% CI 1.18-1.71; p<0.001), but that the sex difference was no longer significant (Table 3.2). The elimination of the sex difference might be explained by women living longer as indicated by the higher proportion of older women. Those with intermediate and high education were more likely to report age discrimination than those with a low level of education, OR 1.26 (95% CI 1.10-1.45; p=0.001) and OR 1.50 (95% CI 1.30-1.73; p<0.001) respectively. In

contrast, respondents in the highest wealth quintile were 35% less likely to experience perceived age discrimination in comparison with those in the lowest wealth quintile (OR 0.65; 95% CI 0.54-0.78; p<0.001). A dose-response relationship was observed for the association between wealth and perceived age discrimination overall, with the likelihood of reporting age discrimination increasing as level of wealth decreased. The results also indicated that current work status was an important correlate of age discrimination. Employed respondents were shown to be 25% (OR 0.75; 95% CI 0.65-0.86; p<0.001) less likely to report age discrimination in comparison to those who were retired, even after taking age, gender and other factors into account.

The results indicated that those at greatest risk of perceived age discrimination were older men, who were retired, widowed and both highly educated and least wealthy. For example, for a retired men aged 70 to 79 in the lowest wealth quintile, higher educated and widowed, is around 20% more likely to perceive age discrimination (OR 2.29, 95% CI, 1.62-3.23, p<0.001) in comparison with a widowed woman aged 70-79, in the poorest wealth quintile, who is retired and in highest education category (OR 2.07, 95% CI 1.44-2.97, p<0.001). While someone in the lowest risk category is around 250% less likely to attribute an experience of discrimination to their age. For example, being a woman, aged 52 to 59 years old in the wealthiest quintile, who is single, employed, and has no educational qualifications has an odds ratio of 0.43 (95% CI 0.34-0.57, p<0.001). Similarly, being a man in the lowest age group, in the wealthiest quintile, who is married, employed, and has no educational is also protective of perceived age discrimination OR 0.47 (95% CI 0.34-0.64, p<0.001)

Interactions were tested between age and wealth and between age and education but no significant interactions were observed. The Likelihood Ratio Test statistic confirmed that the model including interactions where age modifies the level of wealth (p=0.69) or the level of education (p=0.21) did not improve the model, therefore confirming the null hypotheses of no age and wealth or age and education interaction.

Table 3.2 Associations between age discrimination and sociodemographic factors

	N (Unweighted)	Age Discrimination (%)	Unadjusted Odds Ratio (95% CI)	P value[a]	Adjusted Odds Ratio (95% CI)	P value[b]
All	7,653	33.4				
Over 65s	4,298	36.8				
Age in years						
52-59	1,670	26.8	1.00	<0.001	1.00	
60-69	3,089	35.1	1.51 (1.32-1.73)		1.36 (1.17-1.59)	<0.001
70-79	2,081	37.3	1.67 (1.45-1.92)		1.42 (1.18-1.71)	<0.001
Over 80	813	35.1	1.50 (1.25-1.79)		1.28 (1.02-1.62)	0.036
Sex						
Male	3,410	34.7	1.00	0.037	1.00	
Female	4,243	32.3	0.90 (0.82-0.99)		0.90 (0.78-1.10)	0.064
Wealth						
Lowest 1	1,243	35.8	1.00	0.018	1.00	
2	1,514	34.7	0.99 (0.85-1.15)		0.92 (0.78-1.10)	0.365
3	1,550	33.7	0.93 (0.79-1.08)		0.83 (0.70-0.98)	0.032
4	1,640	33.3	0.89 (0.76-1.04)		0.78 (0.66-0.93)	0.007
Highest 5	1,706	30.0	0.80 (0.68-0.93)		0.65 (0.54-0.78)	<0.001
Education						
Low	1,867	31.1	1.00	0.005	1.00	
Intermediate	2,379	33.7	1.14 (1.00-1.30)		1.26 (1.10-1.45)	0.001
High	3,407	34.7	1.22 (1.08-1.38)		1.50 (1.30-1.73)	<0.001
Marital Status						
Single	455	31.9	1.00	0.736	1.00	
Married	5,081	33.1	1.04 (0.85-1.27)		1.07 (0.87-1.34)	0.535
Divorced or Separated	913	33.6	1.10 (0.86-1.39)		1.06 (0.82-1.37)	0.674
Widowed	1,204	35.5	1.09 (0.87-1.37)		1.08 (0.83-1.39)	0.576
Employment Status						
Retired	4,583	36.9	1.00	<0.001	1.00	
Employed	2,203	28.3	0.68 (0.60-0.75)		0.75 (0.65-0.86)	<0.001
Other	867	30.9	0.76 (0.65-0.88)		0.85 (0.71-1.01)	0.059

Notes: CI=confidence interval. All analyses are weighted.
[a]Chi-square test of association; [b]Multivariable odds ratios and p-value are adjusted for all covariates in the table

Individual discriminatory situations

Descriptive analyses of the individual discriminatory situations indicated that the proportion of respondents who experienced age discrimination in each situation ranged from 17.8% for those who were treated with less courtesy or respect, to 4.6% for those who experienced harassment (Table 3.3). Approximately 11% of respondents reported being treated as less clever due to their age in the past year and around 10% reported receiving poorer service or treatment than other people from doctors or hospitals due to their age. Men reported more age discrimination than women in all five situations, with around a fifth of men (20.8%) reporting being treated with less courtesy or respect in comparison with just over one-sixth of women (15.2%). The association with age differed across situations. In both the less courtesy and service setting items, perceived age discrimination was highest in the 60 to 69 age group. In the case of being treated as less clever, this increased with age while harassment declined steadily with age. The level of perceived age discrimination in medical settings remained at a similar level across all age groups.

As observed overall, age discrimination was more common among better educated respondents while wealth was inversely associated with discrimination, with the exception of the less clever item where education was also inversely associated with perceived age discrimination. Wealth in most of the individual discriminatory situations was also consistent with to the overall pattern, with wealthier respondents reporting less age discrimination. The wealth gradients for the courtesy and clever situations are particularly steep – falling from 21% to 13% where people reported being treated with less courtesy, and 16.3% to 7% for the less clever item. While the gradient for discrimination in medical settings, although significant, is quite shallow, ranging from 11.8% to 9.1% across quintiles.

Table 3.3 Percentage of sample reporting age discrimination in different discriminatory situations (N=7,653)

	Less Courtesy		Medical Setting		Harassed		Service Setting		Less Clever	
	N	%	N	%	N	%	N	%	N	%
Age Discrimination Age in years	1,376	17.8	787	9.9	341	4.6	671	8.7	849	11.2
52-59	293	17.5	156	9.1	91	5.5	152	9.1	174	10.5
60-69	612	19.9	335	10.6	139	4.8	275	9.1	327	11.2
70-79	360	17.0	217	9.8	87	4.1	189	8.7	249	11.9
Over 80	111	13.5	79	10.0	24	2.7	55	6.4	99	11.9
Sex										
Male	711	20.8	371	10.7	204	6.2	346	10.1	394	12.0
Female	665	15.2	416	9.3	137	3.1	325	7.5	455	10.5
Wealth										
Lowest 1	264	21.0	151	11.8	71	6.0	123	10.3	197	16.3
2	293	19.1	148	9.1	86	5.7	147	9.3	203	13.0
3	296	18.7	160	10.2	52	3.4	150	9.3	166	10.5
4	295	18.0	165	9.7	78	4.9	143	8.7	161	10.0
Highest 5	228	13.0	163	9.1	54	3.2	108	6.1	122	7.0
Education										
Low	302	16.2	167	8.8	74	4.0	159	8.3	230	12.5
Intermediate	452	18.8	227	9.3	101	4.4	214	9.0	271	11.2
High	622	18.2	393	11.2	166	5.1	298	8.7	348	10.4
Marital Status										
Single	81	17.8	48	10.4	31	6.9	40	8.7	50	11.1
Married	907	17.8	503	9.5	223	4.6	450	8.9	507	10.3
Divorced or Separated	195	20.5	114	11.8	45	5.0	91	9.5	138	14.5
Widowed	193	15.6	122	10.4	42	3.2	90	7.1	154	12.7
Employment Status										
Retired	827	18.0	498	10.5	187	4.0	399	8.4	540	11.9
Employed	409	18.6	195	8.6	111	5.2	192	8.8	219	10.1
Other	140	16.2	94	10.9	44	5.6	80	9.6	90	10.9

Note: All percentages are weighted.

The results of multivariable analysis (Table 3.4) indicate that sex, wealth and level of education were the most consistent correlates in all five situations. As observed overall, age discrimination was more common among better educated respondents while wealth was inversely associated with discrimination. The likelihood of attributing a discriminatory situation to age discrimination generally declined with age, with the exception of being treated with less courtesy and in medical settings. Here the likelihood of reporting of age discrimination increased in the 60-69 age group before remaining at a constant level. Retired respondents reported more discrimination than those in employment although this was not statistically significant for individual situations. Men reported significantly more age discrimination than women in all five situations. The sex difference was largest in the harassment situation, here women were 50% less (OR 0.50, 95%CI 0.39-0.64, p <0.001) likely to report being harassed due their age in comparison with male respondents. While the difference was least where participants reported experiencing discrimination in medical settings (women OR 0.84, 95% 0.72-0.99, p=0.043).

The association with education is similar in most of the situations to the overall pattern, with more perceived age discrimination in better educated respondents. However, for the less clever item the pattern is less marked. There was no difference between participants in the lowest education group and those in the intermediate group, while respondents in the highest education category were only 8% more likely to perceive age discrimination in comparison with respondents who had no educational qualifications. In each discriminatory situation there is a steep decline in the likelihood of reporting perceived age discrimination by wealth quintile, and this is especially marked where participants report being treated as less clever, declining to OR 0.38 (95% CI 0.29-0.38, <0.001) in the highest wealth quintile.

Table 3.4 Adjusted odds ratios (95% CIs) from logistic regression of reporting discrimination in different discriminatory situations and attributing it to age, with sociodemographic factors

	Less Courtesy		Medical Setting		Harassed		Service Setting		Less Clever	
	Odds Ratio (95 % CI)	P value	Odds Ratio (95 % CI)	P value	Odds Ratio (95 % CI)	P value	Odds Ratio (95 % CI)	P value	Odds Ratio (95 % CI)	P value
Age in years										
52-59	1.00		1.00		1.00		1.00		1.00	
60-69	1.16 (0.97-1.40)	0.109	1.11 (1.24-1.72)	0.371	0.93 (0.67-1.30)	0.664	0.97 (0.77-1.25)	0.868	1.01 (0.79-1.28)	0.954
70-79	0.91 (0.73-1.15)	0.438	0.98 (1.31-1.94)	0.912	0.81 (0.53-1.23)	0.319	0.91 (0.68-1.23)	0.543	0.98 (0.74-1.30)	0.893
Over 80	0.69 (0.51-0.93)	0.016	0.98 (1.12-1.81)	0.923	0.54 (0.29-0.98)	0.042	0.66 (0.44-1.00)	0.050	0.93 (0.65-1.33)	0.688
Sex										
Male	1.00		1.00		1.00		1.00		1.00	
Female	0.68 (0.60-0.78)	<0.001	0.84 (0.72-0.99)	0.043	0.50 (0.39-0.64)	<0.001	0.72 (0.60-0.86)	<0.001	0. 81 (0.69-0.95)	0.011
Wealth										
Lowest 1	1.00		1.00		1.00		1.00		1.00	
2	0.84 (0.69-1.03)	0.078	0.75 (0.58-0.98)	0.032	0.91 (0.64-1.28)	0.579	0.85 (0.66-1.12)	0.267	0.79 0.63-0.99)	0.042
3	0.80 (0.65-0.98)	0.028	0.83 (0.64-1.08)	0.164	0.52 (0.35-0.77)	0.001	0.84 (0.63-1.10)	0.204	0.61 (0.48-0.78)	<0.001
4	0.73 (0.59-0.90)	0.003	0.75 (0.57-0.98)	0.034	0.71 (0.48-1.03)	0.076	0.76 (0.57-1.01)	0.058	0.57 (0.44-0.74)	<0.001
Highest 5	0.47 (0.38-0.60)	<0.001	0.67 (0.51-0.88)	0.004	0.42 (0.28-0.65)	<0.001	0.50 (0.36-0.68)	<0.001	0.38 (0.29-0.51)	<0.001
Education										
Low	1.00		1.00		1.00		1.00		1.00	
Intermediate	1.23 (1.04-1.47)	0.017	1.17 (0.93-1.46)	0.178	1.16 (0.83-1.61)	0.380	1.13 (0.89-1.42)	0.313	1.01 (0.82-1.23)	0.944
High	1.24 (1.04-1.48)	0.018	1.55 (1.23-1.95)	<0.001	1.33 (0.95-1.86)	0.094	1.14 (0.90-1.45)	0.278	1.08 (0.88-1.34)	0.456

	Less Courtesy		Medical Setting		Harassed		Service Setting		Less Clever	
	Odds Ratio (95 % CI)	*P* value	Odds Ratio (95 % CI)	*P* value	Odds Ratio (95 % CI)	*P* value	Odds Ratio (95 % CI)	*P* value	Odds Ratio (95 % CI)	*P* value
Marital Status										
Single	1.00		1.00		1.00		1.00		1.00	
Married	1.09 (0.83-1.43)	0.544	0.96 (0.69-1.34)	0.812	0.78 (0.51-1.19)	0.253	1.13 (0.79-1.64)	0.490	1.06 (0.76-1.49)	0.720
Divorced or Separated	1.16 (0.85-1.59)	0.338	1.17 (0.80-1.70)	0.423	0.73 (0.44-1.21)	0227	1.08 (0.72-1.64)	0.707	1.29 (0.89-1.86)	0.182
Widowed	1.09 (0.79-1.49)	0.597	1.10 (0.74-1.61)	0.634	0.73 (0.43-1.27)	0.274	1.01 (0.65-1.57)	0.955	1.19 (0.81-1.75)	0.380
Employment Status										
Retired	1.00		1.00		1.00		1.00		1.00	
Employed	0.90 (0.76-1.07)	0.107	0.75 (0.60-0.94)	0.013	0.96 (0.68-1.35)	0.817	0.89 (0.71-1.13)	0.353	0.82 (0.65-1.03)	0.099
Other	0.83 (0.67-1.03)	0.097	1.03 (0.79-1.34)	0.838	1.18 (0.80-1.75)	0.410	1.04 (0.78-1.37)	0.796	0.82 (0.62-1.06)	0.124

Notes: CI=confidence interval

All analyses based on weighted data. Odds ratios are adjusted for the individual discriminatory scenario, age, gender, wealth, education, marital status and employment status

3.4   Discussion

The results of this study indicated that around a third of over 52 year olds in England reported perceptions of age discrimination. Perceived age discrimination was associated with older age, and it was associated with higher levels of education, lower levels of household wealth and lack of paid employment. Of the five individual discriminatory situations measured, perceived age discrimination was more prevalent where people were treated with less courtesy (17.8%) and least where they experienced harassment (4.6%). The analysis of the individual discriminatory situations revealed many similar associations, with level of education, and wealth being the most significant correlates regardless of the discriminatory situation itself.

The level of perceived age discrimination reported here is comparable with a number of the studies reviewed in the previous chapter. Studies using data from the HRS and MIDUS surveys in the US reported that approximately 30% of respondents age 50 and over cited age as the most common reason for perceived everyday discrimination (Ayalon and Gum, 2011; Han and Richardson, 2015; Kessler et al., 1999; Luo et al., 2012; Sutin et al., 2015). While analyses of European Union countries found that on average across 28 countries 35% of people reported experiencing age discrimination, with 29.7% in the UK (Abrams et al., 2011a; Ayalon, 2014). However, this figure was lower for those aged 50 and over in the UK in comparison with the average figure, falling to 23.7% for those aged 50 to 64 and again to 18.3% for those aged 65 to 74 years old. Another European study demonstrated that 26% of people aged 62 and over had frequently or sometimes experienced age discrimination (van den Heuvel and van Santvoort, 2011). In accordance with previous studies, I found that overall perceived age discrimination increased with age (Ayalon and Gum, 2011; Kessler et al., 1999; Luo et al., 2012).

My hypothesis was that perceived age discrimination would be associated with lower levels of both wealth and education. However, the results revealed somewhat counterintuitive results for the relationship between perceived age discrimination and these two indicators of socio-economic status (SES). In common with previous studies, a negative gradient was observed between perceived age discrimination and wealth, with individuals in the lowest wealth quintile more likely to experience age discrimination in comparison with wealthier respondents (Kessler et al., 1999; Luo et al., 2012; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011; Vogt Yuan, 2007). In contrast, perceived age discrimination was more likely to be reported by respondents with a high level of education than those with an intermediate or low level of education. The findings for both wealth and education are supported by some but not all previous studies on perceived discrimination (Kessler et al., 1999; Luo et al., 2012; Vogt Yuan, 2007). They are consistent to overall findings from the European Union, which indicated that older adults with a higher level of education and low-household income reported more age discrimination (van den Heuvel and van Santvoort, 2011; Van Den Heuvel and van Santvoort, 2013). A US study of 25–74 year olds also found that respondents who were better educated and less affluent were more likely to report age discrimination than those who experienced no discrimination or discrimination due to another reason (Vogt Yuan, 2007). This may be due to the fact that better educated older adults more readily perceive inequities and are, therefore, more likely to report discrimination (Kessler et al., 1999), whereas it could be argued that wealth potentially protects individuals from exposure to situations that give rise to discrimination or provides a greater sense of control or security. Further analysis of the relationship between indicators of SES and perceived age discrimination may help to shed further light on these observed disparities. In my next study, it will be interesting to investigate whether these relationships are also found in a sample of older adults in the USA, in particular, whether higher levels of education are associated with perceived age discrimination.

The current study also indicated that respondents who were retired reported perceived age discrimination more than those who were employed. This is consistent with analysis of data from the UK, which found that working status was a strong correlate of age discrimination, with a larger proportion of respondents who were not working or were retired reporting age discrimination in comparison with those employed (Abrams et al., 2009). One possible explanation could be that individuals in employment perceive old age to begin later in comparison to individuals who are retired or not working for other reasons (Abrams et al., 2009). Contrary to some previous studies, I found no association between marital status and age discrimination, whereas others have reported that unmarried and separated/divorced or widowed respondents experienced more age discrimination than married people (Abrams et al., 2009; Pavalko et al., 2003; Van Den Heuvel, 2012). This finding could suggest that an individual's identification with other socio-demographic characteristics explains their perception of age discrimination to a greater extent than marital status, in this sample of English older adults. For example, one study of middle aged Americans revealed mixed results for the association between marital status and perceived age discrimination. It found that on the one hand married respondents were less likely to report perceived age discrimination in comparison to no discrimination, while on the other hand married respondents were more likely to report age discrimination in comparison with discrimination due to another reason. However, neither association was significant (Vogt Yuan, 2007).

The analyses of the individual discriminatory situations revealed rather low rates of actual harassment, which could suggest that older people are regarded as less of a target by younger generations in comparison with other societal groups. An American study on perceived discrimination in general showed that older black respondents were more likely to report being threatened or harassed than white respondents (Barnes et al., 2004). Although for both groups the proportion of individuals experiencing harassment or being threatened was lower in comparison to items, such as, being

treated with less courtesy or as less clever. In accordance with previous studies, respondents perceived greater discrimination where they were treated with less courtesy (Abrams et al., 2011a; Kessler et al., 1999; Vogt Yuan, 2007). While 11% of respondents reported being thought of as less clever because of their age. This might reflect the negative old age stereotype in which older people are regarded as incompetent. The findings from these discriminatory situations could be seen as reinforcing the persistence of the old age stereotype where older people are regarded as both warm and incompetent (Cuddy et al., 2005).

Approximately 10% of the whole sample reported perceived age discrimination in a hospital or from a doctor, providing further evidence of the existence of ageism in medical settings, an area that previous research has identified as a particular problem (Bowling, 1999; Greene et al., 1989; Wait, 2005). Similar levels of age discrimination were reported in a recent study commissioned by Macmillan Cancer Support of 1,504 respondents aged 55 years old and over (1,004 respondents living with cancer and 500 respondents who did not have a cancer diagnosis). The study revealed that 11% of all respondents had experienced different care due to their age or felt healthcare staff treated them differently due to their age (Ipsos Mori and Macmillan Cancer Support, 2015). Age discrimination may be evident in how clinical staff communicate with older patients and in the quality of care older patients receive in comparison with younger patients (Greene et al., 1986; Wait, 2005).

In contrast with the overall results, where perceived age discrimination peaked in the 70 to 79 age group, the likelihood of perceiving age discrimination generally declined with age in the individual discriminatory situations, with the exception of being treated with less courtesy and in medical settings. In these two situations, the likelihood of perceiving age discrimination peaked in the 60 to 69 year old age group before declining. In all five situations, the association between age and perceived age discrimination was not statistically significant. Possible explanations for the differences

between the results from the individual discriminatory situations and the overall result may in part reflect the smaller numbers of respondents reporting discrimination in each age group and in each situation. Studies have previously indicated that the overall prevalence of discrimination declines with age but that of those who report discrimination a higher proportion are more likely to attribute it to their age in comparison to other social characteristics, such as, gender and race (Kessler et al., 1999).

Caution is needed when interpreting these findings. First, it is not possible to establish causal relationships in this cross-sectional study. I do not know whether older people are more likely to experience discrimination because of their age or whether they are more likely to attribute discrimination to age as they get older. Second, the measures of discrimination used were self-reported and therefore subject to recall bias. This may have led to either an underestimation or overestimation of the prevalence of perceived age discrimination, especially given the timeframe of in the past year, specified in the question. A possible alternative would be to ask respondents about their experiences of discrimination over a shorter period, such as over the past month. Third, the questions were designed to measure age discrimination in the context of other sources of discrimination, and therefore may not be optimal. However, a more targeted measure may prime respondents to answer in a particular way, whereas in the present study, age was not the apparent focus of the items. Finally, respondents were able to attribute more than one reason to their experiences of discrimination; therefore, it is not possible to establish for certain whether an individual situation was due to age discrimination or another type of discrimination.

Nevertheless, what this study has been able to show though is that age discrimination is encountered in the day-to-day lives of many older adults in England and that it is an area that needs to be studied further in order to improve our understanding of the mechanisms through which it impacts upon the individual and society. The fact that age

discrimination has been shown to affect a high proportion of individuals in later life is relevant to public policy. Understanding age discrimination is important if we are to develop appropriate policies and to target interventions effectively.

4 Greater perceived age discrimination in England than the United States: results from HRS and ELSA (Study 2)

4.1 Introduction

The aim of this second study is to extend the findings of Study 1, by investigating potential cross-national differences in perceived age discrimination between the USA and England. Few studies have used large scale nationally representative data to analyse perceptions of age discrimination in older adults or to evaluate potential cross national differences between these two countries. Both the United States and England have unique social, political and cultural characteristics which may offer an insight into why levels of perceived age discrimination may vary by age or country. A version of this study was published in the *Journals of Gerontology B: Social Sciences.*

Various studies have been carried out in the two countries on attitudes towards older adults and on discriminatory experiences, but less on individual perceptions of discrimination. However, one difficulty in making international comparisons is that different measures have often been used. ELSA and the US Health and Retirement Study (HRS) offer a way to address this, as the two studies have been developed in a complementary fashion so as to facilitate cross-national comparisons through use of identical measures (Steptoe et al., 2013a). No previous comparative studies of perceived age discrimination in England and the USA have been identified.

The USA and England have differing legislative environments and attitudes to age, so the comparison is interesting. In both the USA and England debates around age discrimination in the workplace have existed since the 1930s (Macnicol, 2006). In the USA, legislation to end age discrimination in the workplace has been in place for over forty-five years, with successive amendments bringing mandatory retirement age to a

virtual end (ILC-USA Anti-Ageism Task Force, 2006). By contrast, England has only relatively recently passed legislation on age discrimination. First, through 2006 employment legislation, and subsequently through the broader Equality Act 2010, age discrimination legislation was extended to cover the provision of services and public functions. Previous research has shown that US age discrimination legislation has had a positive impact on employment through the retention of older workers, but that it has not been as effective for those seeking work (Lahey, 2010; Lain, 2011). However, it is notable that there has been less discussion in the USA around extending age discrimination legislation to cover services as has been seen in England (Macnicol, 2012).

Although the implementation of legislation has been of importance, it does not directly cover the experiences of discrimination that may occur on a frequent or daily basis – the personal attacks on an individual's character. In addition to the legislative environment, age discrimination may arise through prejudicial attitudes towards older persons, and the prevalence of stereotypes about older people. Because of the subjective nature of perceived age discrimination, the culture of the two countries may influence these perceptions and the age-related attitudes that may result. At the individual level, Levy argues that stereotypes of ageing are embodied when their assimilation from the surrounding culture leads to self-definitions that in turn influence functioning and health (Levy, 2009). As these age-related stereotypes are assimilated over the life course, they may gain relevance at older ages and affect actual ageing experiences almost unknowingly, including many health outcomes.

4.1.1   Aims and Objectives

To my knowledge few studies have used large scale nationally representative data to analyse perceived age discrimination in older adults or to evaluate potential cross national differences in discrimination between these two countries. In this study I focus

on cross-national differences in perceptions of age discrimination in the USA and England, and the extent to which older adults in both countries attribute experiences of discrimination in their day-to-day lives to their age.

The aims of this study are:

1) to investigate whether or not there are differences in the overall levels of perceived age discrimination reported by older adults in the United States and England

2) To examine the socio-demographic correlates of perceived age discrimination in the two countries.

3) To investigate whether these results differ across individual discriminatory situations.

I aim to test the following hypotheses:

1) Perceived age discrimination would be lower in the USA in comparison with England.

This is hypothesised for two reasons. Firstly, as age discrimination legislation has been in place for a longer period in the USA, and secondly, as there would be a greater awareness of it in England due the recent discourse around age discrimination before and after the legislation's implementation. Therefore, assimilation of cultural and institutional attitudes to age may influence respondents' perceptions of the level of age discrimination in the two countries.

2) In both countries the socio-demographic correlates would be associated with perceived age discrimination in a similar fashion.

Based on previous research I included a number of the key socio-demographic characteristics identified in previous studies from the USA and Europe that have been shown to be associated with perceived discrimination in order to test this assumption. Although I expected overall levels to differ across countries, I expected that among those individuals who attributed a perceived incidence of discrimination to their age, social characteristics such as wealth, education, older age and work status would be predictors of perceived discrimination in both countries.

3) Perceived age discrimination would be lower in the USA in each of the individual discriminatory situations with the exception of medical settings

Due to the greater inequality in access to healthcare in the USA in comparison with England (Davis et al., 2014), it was predicted that perceived age discrimination would be higher in this situation in the USA.

4.2   Methods

4.2.1   Study samples

The samples were drawn from two longitudinal studies of ageing, the US HRS and ELSA; the two surveys were developed collaboratively with significant overlap in the questions in order to facilitate cross-national comparisons. To maximise comparability between the two study populations I included people aged 52 and over only and restricted the sample to non-Hispanic white respondents only due to the very low numbers of non-white respondents in ELSA (282 respondents or approximately 3% of the core sample).

I used data from Wave10 (2010) of HRS to assess age discrimination in the USA. HRS is longitudinal study of over 50 year olds which commenced in 1992 (National Institute on Aging, 2007; Sonnega et al., 2014). The sample was selected using a multi-stage area probability sample design, with oversamples of African-Americans, Hispanics, and residents of Florida and is refreshed periodically. The response rate for the main interview in 2010 was 88.6%. Since 2006 the study has included a self-completion questionnaire collecting data on psychosocial measures. The perceived discrimination measures were included within this leave-behind questionnaire which is sent randomly to approximately half of the HRS participants at each wave (Smith et al., 2013). After exclusion of 44 respondents aged 51 years or under and 899 black and Hispanic respondents, a total of 4,822 participants responded to the discrimination questions in 2010. Data were missing on one or more covariates for eight individuals, giving a final HRS sample of 4,818 respondents.

For England, data were drawn from Wave 5 (2010-11) of ELSA which was the first wave to include the measures of perceived discrimination, as detailed in the previous chapter. The mean cross-sectional response rate for Wave 5 was 80.1% (Banks et al., 2012). Among the 9,090 core participants at wave 5 of ELSA, 8,803 (96.4%) white respondents were interviewed. Of these 7,910 respondents answered the self-completion questionnaire that contained the measures of age discrimination. A further 283 had missing responses to the discrimination questions. Data were missing on one or more covariates for 149 individuals, primarily wealth (146). The analytic sample therefore comprised 7,478 participants.

4.2.2 Measures

Perceived age discrimination

Both HRS and ELSA have included questions on perceived everyday discrimination in their self-completion questionnaires. Respondents were asked about the frequency of five discriminatory situations as follows: "In your day-to-day life, how often have any of the following things happened to you?"

1.   You are treated with less respect or courtesy than other people

2.   You receive poorer service than other people in restaurants and stores

3.   People act as if they think you are not clever (ELSA)/smart (HRS)

4.   You are threatened or harassed

5.   You receive poorer service or treatment than other people from doctors or hospitals

Possible response options ranged from 1 (Almost every day) to 6 (Never). As the data were skewed, with most participants reporting discrimination less than once a year or never in any of the discriminatory situations, I dichotomised the responses to indicate whether or not participants had experienced discrimination in the past year (a few times or more a year vs. less than once a year or never), with the exception of the fifth item which was dichotomised to indicate whether or not respondents had ever experienced discrimination from doctors or hospitals (never vs. all other options). A follow-up question asked respondents to indicate what reason/s they attributed their experience in any of the five discriminatory situations. Possible options included: age, gender, race, weight and physical disability, and participants were able to select more than one reason. As before, participants who attributed any experiences of discrimination to their age were treated as cases of perceived age discrimination.

For each country I also derived five dummy variables in order to investigate experiences of age discrimination in the individual discriminatory situations.

Participants who reported being either - treated with less courtesy/ treated as less clever/threatened or harassed/ receiving poorer service in shop or restaurant/receiving poorer treatment in a medical setting - and also attributed any experiences of discrimination to their age were treated as cases of perceived age discrimination in that particular situation and coded '1'. Remaining respondents were coded '0'

Covariates

My analyses took into account the same six socio-demographic measures used in study one in order to establish whether they were associated with perceived age discrimination in the same way in the USA as they were in England. The six measures used were: age, sex, wealth, education, marital status and current work status. Age was split into four categories for the purpose of analysis: 52-59 years; 60-69 years; 70-79 years; and a final group combining all those aged 80 and over. Sex was coded 1 for female and 0 for male. Two measures of socio-economic status (SES) were included: wealth and education. Total household wealth (excluding pensions or individual retirement accounts) was divided into country-specific equally sized wealth quintiles. In the case of education, American education was divided into low (less than high school), intermediate (high school graduate) and high (some college through to college graduate or more). English education was measured by the highest educational qualification attained and divided into three groups: low (qualifications below O-Level or no educational qualification), intermediate (A-Levels, O-Levels or equivalent), and high (those with higher education below a degree through to higher degrees). Marital status was coded into four categories: married or remarried, single, separated or divorced, and widowed. Finally, current employment status indicated whether or not a respondent was currently employed, retired or in another situation, for example, unemployed or looking after the home or family.

4.2.3 Statistical Analyses

The primary outcome was the perception of age discrimination in any of the five discriminatory situations in the USA and England. The secondary outcomes were perceptions of age discrimination in each of the five individual discriminatory situations. I analysed the data in five main steps. Firstly, I used chi-square tests to assess the bivariate relationships between perceived age discrimination and individual covariates in both the USA and England. Secondly, I conducted multivariable logistic regression analysis for each country separately, with perceived age discrimination as the dependent variable, adjusting for all covariates. Next, the data from the HRS and ELSA samples were then pooled, and a dummy variable indicating country was included in the regression model in order to determine any cross-national differences in age discrimination. To further examine potential country differences, I ran a series of logistic regression models including interaction terms in order to examine whether the associations between socio-demographic characteristics and perceived age discrimination differed significantly between the countries. Lastly, to test the final hypothesis I analysed the individual discriminatory situations in five separate models in order to determine whether country effects were the same across the different situations. The outcome variable in each of these five models was the proportion of respondents who attributed an experience of discrimination to their age (for example, respondents who perceived they had been treated with less courtesy in a situation and attributed this to their age). The data were unweighted since the study combined two sub-samples of respondents in the HRS and ELSA which had different weights. The previous study in Chapter 3 used weighted ELSA data and produced similar results to the current study.

In addition, I conducted a sensitivity analysis using the data that included non-white respondents. These analyses showed similar patterns of the effects of perceived age discrimination as the sample which excluded non-white respondents.

4.3   Results

4.3.1   Descriptive analyses

Table 4.1 describes the socio-demographic characteristics of the two study populations. There were significant differences between the two countries for all socio-demographic characteristics with the exception of gender. The US cohort has a higher proportion of over 70 year olds, retired, well-educated and widowed respondents in comparison with the English sample (all p<0.001). The mean age of the HRS sample is 71 years old (SD 9.4) and the mean age of the ELSA sample is 67.4 years old (SD 8.8). Although a slightly higher proportion of the US cohort are female (57.2%) in comparison with the English sample (55.5%), the difference between the two countries is not significant (p=0.065).

The American sample has a higher proportion of both married (69%) and widowed (20%) respondents in comparison with the English cohort (66.4% and 15.9% respectively). Nearly three-quarters of the HRS sample is retired in comparison with around 60% of ELSA respondents. The higher proportion of retired Americans may in part be explained by the higher proportion of over 70 year olds and women in the HRS sample in comparison with ELSA. The American respondents are more highly educated with 49.2% of participants having some college or a higher educational qualification, in comparison with just over a third of English respondents who have an educational qualification above A Level. A higher proportion of the HRS sample is also wealthier relative to the ELSA sample, with 49.5% of Americans in the highest two quintiles in comparison with 43.7% of English respondents.

Table 4.1 Sample characteristics by country

Variable	USA (%)	England (%)	P value[a]
Total	4,818	7,478	<0.001
Age in years			
52-59	623 (12.9)	1,603 (21.4)	<0.001
60-69	1,524 (31.6)	3,019 (40.4)	
70-79	1,712 (35.5)	2,051 (27.4)	
Over 80	959 (19.9)	805 (10.8)	
Mean	71.0 (9.4)	67.4 (8.8)	<0.001
Sex			
Male	2,060 (42.8)	3,324 (44.5)	0.065
Female	2,758 (57.2)	4,154 (55.5)	
Wealth			
Lowest 1	628 (13.0)	1,205 (16.1)	<0.001
2	807 (16.8)	1,483 (19.8)	
3	996 (20.7)	1,520 (20.3)	
4	1,157 (24.0)	1,603 (21.4)	
Highest 5	1,230 (25.5)	1,667 (22.3)	
Education			
Low	842 (17.5)	1,836 (24.6)	<0.001
Intermediate	1,604 (33.3)	2,986 (39.9)	
High	2,372 (49.2)	2,656 (35.5)	
Marital Status			
Married	3,322 (69.0)	4,967 (66.4)	<0.001
Single	109 (2.3)	440 (5.9)	
Divorced or Separated	422 (8.8)	886 (11.9)	
Widowed	965 (20.0)	1,185 (15.9)	
Employment Status			
Retired	3,542 (73.5)	4,504 (60.2)	<0.001
Employed	981 (20.4)	2,130 (28.5)	
Other	295 (6.1)	844 (11.3)	

Notes: [a] Chi-square test for differences between the US and England.

Overall, I found that perceived age discrimination was higher in England than the USA, as shown in Table 4.2. 29.1% of over 52 year olds in the USA reported age discrimination in comparison with 34.8% in England (p<0.001), with this figure rising to 30.2% and 37.5% for over 70 year olds in the USA and England respectively. A significantly higher proportion of individuals who were married, higher educated, retired, older and across all wealth levels and of both sexes reported age discrimination in England than the USA.

Age discrimination was inversely associated with wealth in both countries. 32.5% of American respondents perceived age discrimination in the lowest wealth quintile, falling to 26.0% in the highest wealth quintile. In each wealth quintile English respondents reported significantly higher rates of age discrimination; declining from 37% in the lowest wealth quintile to 31.6% in the highest wealth quintile. In terms of education, the two countries showed different patterns. In the case of the English respondents, the proportion attributing discrimination to their age increased with educational group. In the US sample, respondents in the intermediate education category reported the least age discrimination (27%), while similar rates were reported in both the lowest (30.6%) and highest educational groups (30%). In both countries respondents who are currently employed reported the least age discrimination in comparison with retired respondents or those in another situation. In regard to marital status, married Americans perceived significantly less age discrimination (28%) than their English counterparts (34.5%) and the least age discrimination overall in comparison with unmarried respondents in both countries.

Table 4.2 Bivariate associations between perceived age discrimination and socio-demographic factors

Variable	Age Discrimination		P value[a]
	USA (%)	England (%)	
Total	29.1	34.8	<0.001
Age in years			
52-59	26.7	27.6	0.638
60-69	27.4	36.2	<0.001
70-79	30.3	38.3	<0.001
Over 80	31.3	35.2	0.085
Sex			
Male	28.8	36.2	<0.001
Female	29.3	33.8	<0.001
Wealth			
Lowest 1	32.5	37.0	0.054
2	32.3	36.9	0.030
3	30.3	35.1	0.012
4	27.3	34.4	<0.001
Highest 5	26.0	31.6	0.001
Education			
Low	30.6	31.7	0.584
Intermediate	27.0	35.5	<0.001
High	30.0	36.3	<0.001
Marital Status			
Married	28.0	34.5	<0.001
Single	31.2	34.3	0.537
Divorced or Separated	31.5	35.8	0.129
Widowed	31.7	35.7	0.052
Employment Status			
Retired	29.9	38.0	<0.001
Employed	25.8	29.5	0.034
Other	30.5	31.6	0.720

Notes: [a] Chi-square test for differences between the US and England.

4.3.2 Multivariate analyses

I ran logistic regression models for the two countries separately and the results of the two models are shown in Table 4.3. The fully adjusted analyses revealed that perceived age discrimination was significantly associated with older age groups, higher levels of education, being retired and lower levels of household wealth in the English sample. In the US sample, individuals who perceived age discrimination were more likely to be older and to have lower levels of household wealth, with no statistically significant differences related to education or work status.

In both the USA and England an inverse association was observed between age discrimination and wealth, with respondents in the highest wealth quintile least likely to perceive age discrimination. Wealthy American respondents were 29% less likely to perceive age discrimination (OR 0.71, 95% CI 0.57-0.89, p=0.003) in comparison with the least wealthy respondents. The gradient was steeper for English respondents with those in the highest wealth quintile 34% less likely to perceive age discrimination (OR 0.66, 95% CI 0.55-0.79, p<0.001) in comparison with the least wealthy respondents. The relationship between perceived age discrimination and education differed in the two countries. In England, a positive gradient was observed with respondents in the intermediate (OR 1.34, 95% CI 1.18-1.53, p<0.001) and highest (OR 1.52, 95% CI, 1.32-1.76, p<0.001) educational categories significantly more likely to perceived age discrimination in comparison to respondents with qualifications below O-Level or no educational qualifications. In the US sample no significant association was observed between education and perceived age discrimination, although higher educated respondents (OR 1.14, 96% CI 0.95-1.37, p=0.152) were also more likely to perceive age discrimination, this was not the case for respondents in the intermediate educational category (OR 0.90, 95% CI 0.75-1.08, p=0.263).

Retired respondents in both countries were less likely to perceive age discrimination in comparison with those currently in employment, although the association was not statistically significant in the US sample (OR 0.86, 0.71-1.04, p=0.111).

To test differences between the two countries the data were pooled. Using perceived age discrimination as the dependent variable, the fully adjusted logistic regression model showed that English respondents were significantly (OR 1.39; 1.28-1.51; p<0.001) more likely to report age discrimination than the Americans. Overall significant interactions of country with age, and education were found but not for wealth or gender (Table 4.3). Marked differences between the two countries were observed at the 60-69 age groups (p=0.040) and a significant difference was observed between the two countries at both the intermediate (p<0.001) and higher education categories (p=0.014). Thus, the likelihood of perceiving age discrimination was significantly higher for English respondents aged 60 to 69 and in intermediate or higher education in comparison with their American counterparts.

Table 4.3 Adjusted odds ratios of reporting age discrimination by in the USA and England

	Pooled country model[a]		USA		England		Interaction
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	*P* value
Country							
USA	1.00						
England	1.39 (1.28-1.51)	<0.001					
Age							
52-59	1.00		1.00		1.00		
60-69	1.27 (1.12-1.44)	<0.001	1.03 (0.82-1.29)	0.809	1.36 (1.17-1.58)	<0.001	0.040
70-79	1.34 (1.17-1.55)	<0.001	1.16 (0.91-1.48)	0.223	1.42 (1.19-1.70)	<0.001	0.184
Over 80	1.26 (1.07-1.50)	0.007	1.18 (0.90-1.54)	0.239	1.24 (0.99-1.55)	0.059	0.760
Country x age[b]							0.029
Male	1.00		1.00		1.00		
Female	0.94 (0.87-1.02)	0.164	1.00 (0.89-1.15)	0.949	0.92 (0.83-1.01)	0.093	0.288
Country x sex[b]							0.148
Wealth							
1 (Lowest)	1.00		1.00		1.00		
2	0.98 (0.86-1.12)	0.763	1.01 (0.81-1.27)	0.921	0.96 (0.81-1.13)	0.601	0.698
3	0.87 (0.76-0.99)	0.039	0.92 (0.74-1.15)	0.456	0.83 (0.70-0.98)	0.029	0.473
4	0.78 (0.68-0.89)	<0.001	0.78 (0.62-0.97)	0.026	0.77 (0.65-0.92)	0.003	0.960
5 (Highest)	0.68 (0.60-0.78)	<0.001	0.71 (0.57-0.89)	0.003	0.66 (0.55-0.79)	<0.001	0.609
Country x wealth[b]							0.798
Education							
Low	1.00		1.00		1.00		
Intermediate	1.19 (1.07-1.32)	0.002	0.90 (0.75-1.08)	0.263	1.34 (1.18-1.53)	<0.001	0.001
High	1.40 (1.25-1.57)	<0.001	1.14 (0.95-1.37)	0.152	1.52 (1.32-1.76)	<0.001	0.014
Country x education[b]							0.002
Marital status							
Married	1.00		1.00		1.00		
Single	1.00 (0.83-1.20)	0.986	1.08 (0.72-1.27)	0.703	0.98 (0.79-1.21)	0.840	0.666
Separated	1.05 (0.92-1.19)	0.503	1.10 (0.88-1.39)	0.396	1.02 (0.87-1.20)	0.792	0.584
Widowed	1.01 (0.90-1.13)	0.834	1.08 (0.91-1.29)	0.367	0.96 (0.83-1.12)	0.630	0.318
Country x marital status[b]							0.393

	Pooled country model[a]		USA		England		Interaction
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	*P* value
Employment Status							
Retired	1.00		1.00		1.00		
Employed	0.78 (0.70-0.88)	<0.001	0.86 (0.71-1.04)	0.111	0.74 (0.64-0.85)	<0.001	0.239
Other	0.88 (0.77-1.02)	0.086	1.04 (0.80-1.35)	0.785	0.82(0.70-0.97)	0.023	0.147
Country x employment status[b]							0.097

Notes: [a] model adjusted for country, age, sex, education, wealth, marital status and work status;

[b] p-value of likelihood ratio test for an interaction between country and a socio-demographic variable.

I repeated the analyses including black and Hispanic respondents in the sample. The pattern of results was very similar to that shown for the sample restricted to white respondents (Table 4.4). Older and wealthier respondents were more likely to perceive age discrimination in both countries, and better educated English respondents were significantly more likely to perceive age discrimination in comparison with individuals with no or lower levels of education. In contrast to the results from my main analyses, respondents currently in employment in both countries were less likely to perceive less age discrimination in comparison with individuals who were currently retired. As before I observed significant interactions of country with age and education but in addition interactions were found for marital status and race. In the case of ethnicity, this result could be explained by the very small proportion of non-white respondents in ELSA in comparison with HRS (2.3% versus 15.7%), as highlighted by table 4.5 which illustrates the socio-demographic characteristics of the black and Hispanic respondents. In relation to marital status, this may reflect the smaller proportion of black and Hispanic American participants who are married (50.3%) in comparison with white respondents in the US (69.0%) and English samples (66.4%). The overall levels of perceived age discrimination were lower for black respondents in comparison with white respondents in both the USA (27.9% vs 29.1%) and England (19.2% vs 34.8%). In the English sample this is particularly marked but again this may reflect the low numbers. This is especially apparent when looking at the proportion of perceived age discrimination across socio-demographic characteristics.

Table 4.4 Adjusted odds ratios of reporting age discrimination by Country

	USA		England		Interaction
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	*P* value
Age					
52-59	1.00		1.00		
60-69	1.03 (0.84-1.25)	0.803	1.38 (1.19-1.60)	0.000	0.020
70-79	1.14 (0.92-1.41)	0.236	1.44 (1.21-1.73)	0.000	0.097
Over 80	1.19 (0.93-1.52)	0.163	1.30 (1.04-1.62)	0.021	0.602
Country x age[a]					0.012
Sex					
Male	1.00		1.00		
Female	0.98 (0.87-1.11)	0.744	0.92 (0.83-1.02)	0.100	0.433
Country x sex[a]					0.118
Wealth					
1 (Lowest)	1.00		1.00		
2	0.93 (0.77-1.13)	0.490	0.95 (0.81-1.11)	0.514	0.910
3	0.90 (0.74-1.09)	0.280	0.83 (0.71-0.98)	0.028	0.552
4	0.78 (0.64-0.95)	0.014	0.77 (0.65-0.92)	0.003	0.962
5 (Highest)	0.73 (0.60-0.90)	0.003	0.67 (0.56-0.80)	0.000	0.511
Country x wealth[a]					0.579
Education					
Low	1.00		1.00		
Intermediate	0.90 (0.76-1.06)	0.212	1.33 (1.17-1.51)	0.000	0.000
High	1.11 (0.94-1.30)	0.212	1.51 (1.31-1.74)	0.000	0.005
Country x education[a]					0.001
Marital status					
Married	1.00		1.00		
Single	1.05 (0.74-1.49)	0.790	0.96 (0.78-1.18)	0.700	0.671
Separated	1.19 (0.98-1.45)	0.084	1.03 (0.88-1.21)	0.699	0.267
Widowed	1.18 (1.00-1.38)	0.048	0.95 (0.82-1.10)	0.514	0.058
Country x marital status[a]					0.050
Employment Status					
Retired	1.00		1.00		
Employed	0.83 (0.70-0.99)	0.041	0.75 (0.65-0.86)	0.000	0.339
Other	1.05 (0.83-1.32)	0.712	0.83 (0.70-0.98)	0.031	0.122
Country x work status[a]					0.078

	USA		England		Interaction
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	*P* value
Ethnicity					
White	1.00		1.00		0.003
Black/Hispanic	0.86 (0.73-1.02)	0.091	0.45 (0.31-0.67)	0.000	
Country x ethnicity[a]					0.001

Notes: CI=Confidence Interval;

[a] p-value of likelihood ratio test for an interaction between country and a socio-demographic variable.

Table 4.5 Characteristics of Black and Hispanic respondents

	USA (n=899)	Age Discrimination %	England (n=172)	Age Discrimination %
Total	899 (15.7)	251 (27.9)	172 (2.3)	33 (19.2)
Age in years				
52-59	168 (18.7)	23.8	67 (39.0)	10.4
60-69	328 (36.5)	25.9	67 (39.0)	20.9
70-79	298 (33.2)	28.5	30 (17.4)	20.0
Over 80	105 (11.7)	39.0	8 (4.7)	75.0
Sex				
Male	324 (36.0)	27.5	84 (48.8)	19.1
Female	575 (64.0)	28.2	88 (51.2)	19.3
Wealth				
Lowest 1	328 (36.5)	31.1	38 (22.1)	23.7
2	228 (25.4)	23.7	31 (18.0)	9.7
3	179 (19.9)	26.3	30 (17.4)	20.0
4	106 (11.8)	26.4	36 (20.9)	16.7
Highest 5	58 (6.5)	34.5	37 (21.5)	24.3
Education				
Low	334 (37.2)	29.6	31 (18.0)	25.8
Intermediate	239 (26.6)	27.6	49 (28.5)	16.3
High	326 (36.3)	26.4	92 (53.5)	18.6
Marital Status				
Married	452 (50.3)	22.6	112 (65.1)	19.6
Single	51 (5.7)	25.5	15 (8.7)	6.7
Divorced or Separated	185 (20.6)	31.9	26 (15.1)	26.9
Widowed	211 (23.5)	36.5	19 (11.1)	15.8
Employment Status				
Retired	612 (68.1)	29.9	78 (45.4)	23.1
Employed	203 (22.6)	21.8	71 (41.3)	14.1
Other	84 (9.3)	29.8	23 (13.4)	21.7

4.3.3   Individual discriminatory situations

Table 4.6 shows the results of the logistic regression models for each individual discriminatory situation, where perceived age discrimination in the particular situation is the dependent variable. The fully adjusted logistic regression models showed that English respondents were significantly more likely to report age discrimination than Americans were where they were treated with less courtesy (OR 1.22, 95% CI 1.10-1.36, p<0.001), in medical settings (OR 1.16, 95% CI 1.02-1.31, p=0.026) and where they were harassed (OR 1.55, 95% 1.25-1.91, p<0.001). In contrast, English respondents were less likely to report age discrimination where they had been treated as less clever or smart than Americans were (OR 0.82, 95% 0.73-0.92, p<0.001). No significant difference was observed between the two countries in service settings (OR 1.09, 95% CI 0.95-1.25, p=0.218). Adjustment for covariates reduced the difference between the two countries in each of the situations with the exception of service settings. In this discriminatory situation the difference increased by 3%.

Table 4.6 Unadjusted and adjusted odds ratios from logistic regression of reporting discrimination in different situations and attributing it to age

	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)[a]	P value
Treated with less courtesy than others				
USA	1.00		1.00	
England	1.28 (1.16-1.41)	<0.001	1.22 (1.10-1.36)	<0.001
Received poorer service or treatment than other people from doctors or hospitals				
USA	1.00		1.00	
England	1.13 (1.00-1.28)	0.050	1.16 (1.02-1.31)	0.026
People act as if they think you are not clever or smart				
USA	1.00		1.00	
England	0.85 (0.76-0.94)	0.003	0.82 (0.73-0.92)	0.001
Received poorer service than others in a restaurant or shop				
USA	1.00		1.00	
England	1.13 (0.99-1.29)	0.062	1.09 (0.95-1.25)	0.218
You are threatened or harassed				
USA	1.00		1.00	
England	1.72 (1.40-2.11)	<0.001	1.55 (1.25-1.91)	<0.001

Notes: [a] model adjusted for country, age, sex, education, wealth, marital status and work status

For each of the five individual discriminatory situations, the proportion of respondents who perceived discrimination in a particular situation and attributed it to their age was calculated (Table 4.7). The prevalence of respondents reporting perceived age discrimination ranged from 18.2% and 14.8% in England and the USA respectively for those who were treated with less courtesy to 2.7% and 4.5% for those who experienced harassment (both p<0.001). Americans reported higher rates of age discrimination in only one of the five discriminatory situations; 12.9% of American respondents thought that they were treated as less smart because of their age, compared with 11.1% of English respondents (p=0.003). 9.2% of Americans and 10.3% of English participants attributed the occurrence of discrimination in medical settings to their age (p=0.05). Similar results were found in the adjusted model, where I also found very little or no difference between the two countries regarding age discrimination experienced in service settings. In the situations where people perceived they were treated with less courtesy or were harassed, a higher proportion of individuals who were male, married, higher educated, retired, older and across all wealth levels perceived age discrimination in England in comparison with the USA. The reverse was the case where individuals perceived they were treated as less clever. While in service and medical settings very few differences were observed between the two countries.

Across each discriminatory situation, men perceived greater age discrimination with the exception of where American respondents perceived they were treated as less clever or smart. In this situation 13.4% of American women perceived age discrimination in comparison with 12.3% of American men. As observed previously, wealth was inversely associated with perceived age discrimination for both countries. In the medical setting the decline was less steep in both countries, falling from 10.9% to 7.8% in the USA and from 12.4% to 9.5% in England. As observed before, education was positively associated with age discrimination in the English sample across most of the individual discriminatory

situations, with the exception of the less clever item. In this situation, the reverse pattern was observed, with higher educated respondents less likely to perceive age discrimination in comparison with respondents with lower levels of education – 9.8% compared with 12.3%. In both countries married respondents perceived less age discrimination in comparison with unmarried respondents where they were treated with less courtesy or as less clever. While a higher proportion of employed respondents in both countries perceived age discrimination where they were treated with less courtesy or harassed. This could be confounded by or reflect the age of respondents reporting age discrimination in these situations, in particular where individuals perceived being harassed due to their age, which steadily decreases at older ages.

Table 4.7 Proportion of respondents attributing discrimination to their age in different discriminatory situations in the USA and England

	Less Courtesy		Medical Setting		Less Clever		Service Setting		Harassed	
	USA	England	USA	England	USA	England	USA	England	USA	England
Age Discrimination	14.8**	18.2	9.2*	10.3	12.9**	11.1	7.9	8.8	2.7**	4.5
Age in years										
52-59	17.0	18.1	11.6	9.4	13.8*	10.7	9.8	9.3	3.5*	5.6
60-69	15.4**	20.1	8.9*	10.9	11.8	10.6	8.2	8.9	2.8**	4.4
70-79	14.5*	17.4	9.1	10.4	13.1	12.0	7.7	9.1	2.5**	4.2
Over 80	12.7	13.1	8.3	9.6	13.9	11.7	6.4	6.7	2.2	3.0
Sex										
Male	15.3**	21.1	10.2	10.9	12.3	11.6	8.3*	10.2	3.2**	6.0
Female	14.4	15.9	8.6*	9.8	13.4**	10.7	7.5	7.7	2.3*	3.3
Wealth										
Lowest 1	17.7*	21.5	10.9	12.4	17.0	15.9	9.9	10.0	4.1	5.7
2	17.1	19.8	9.7	9.8	16.6	13.7	8.3	9.9	3.5*	5.8
3	15.4*	19.2	9.3	10.1	14.4**	10.7	8.8	9.7	3.1	3.4
4	13.0**	18.2	9.8	10.1	11.2	9.9	8.0	8.8	2.1**	4.9
Highest 5	12.9	13.4	7.8	9.5	8.8	7.0	5.6	6.2	1.5**	3.1
Education										
Low	16.0	16.3	10.0	8.9	15.8*	12.3	8.3	8.6	3.8	3.9
Intermediate	13.5**	19.6	7.9*	9.7	12.7	11.7	6.8**	9.0	2.2**	4.5
High	15.2**	18.0	9.9*	12.0	12.0*	9.8	8.4	8.8	2.6**	4.9
Marital Status										
Married	14.3**	18.1	9.3	9.9	12.1**	10.0	7.9	8.9	2.5**	4.4
Single	17.4	18.2	10.1	10.7	17.4	11.4	10.1	9.1	6.4	7.1
Divorced or Separated	17.1*	21.7	8.8*	12.5	15.4	15.4	7.4	10.1	3.6	5.0
Widowed	15.1	16.1	9.0	10.1	14.2	12.7	7.9	7.5	2.5	3.5

	Less Courtesy		Medical Setting		Less Clever		Service Setting		Harassed	
	USA	England	USA	England	USA	England	USA	England	USA	England
Employment Status										
Retired	14.5**	18.1	9.2*	10.9	12.8	11.8	7.7	8.7	2.3**	4.1
Employed	16.0*	19.0	9.5	8.8	12.8*	10.1	8.8	8.9	3.7	5.2
Other	14.2	16.4	8.8	10.8	14.2	10.4	7.1	9.4	3.1	5.0

Notes: *statistically significant differences between USA and England at p<.05.
 ** statistically significant differences between USA and England at p<.01

4.4   Discussion

This study compared levels of perceived age discrimination in the USA and England using nationally representative samples of older adults. Using the same measure of perceived discrimination, the results indicate that perceptions of age discrimination are higher in England than the USA, with 34.8% of men and women aged 52 years and older in England reporting age discrimination compared with 29.1% in the USA. In the fully adjusted multivariate model, English participants were significantly more likely to report age discrimination (OR 1.39; 1.28-1.51; p<0.001). In the English sample perceived age discrimination was significantly associated with older age, lower levels of wealth and higher levels of education and lack of paid employment, while in the USA only lower levels of wealth and older age were predictive of perceived age discrimination. Americans reported higher rates of age discrimination in only one of the five discriminatory situations; 12.9% of American respondents thought that they were treated as less smart because of their age, compared with 11.1% of English respondents. In both the USA and England perceived age discrimination was more prevalent where people were treated with less courtesy (14.8% and 18.2%) and least where they experienced harassment (2.7% and 4.5%).

In agreement with my first hypothesis, I found that the level of perceived age discrimination was lower in the USA in comparison with England. It is possible that older men and women in the USA encounter less age discrimination than their English counterparts, so fewer perceive age discrimination, but an alternative explanation for the higher levels of age discrimination in England is that English respondents are more aware of age discrimination and therefore more readily report it, or are more likely to label an experience as due to age discrimination. Equally this may provide evidence of the role that surrounding culture may play in the development of self-stereotypes of ageing and in turn influence individuals' perception of age discrimination in the two

countries. The more recent introduction of legislation and the resulting discourse around it may have sensitised individuals to age discrimination more strongly in England in comparison with the USA where such legislation has been in place for over 45 years (Abrams and Swift, 2012). Further, it has been argued that despite evidence of age discrimination and how it affects quality of life, many Americans perceive it as less serious than other forms of discrimination, such as, racism and sexism (ILC-USA Anti-Ageism Task Force, 2006). Furthermore, while the USA could be seen to have acknowledged the importance of age discrimination, its legislation only concentrates on the workplace and has not extended to other social arenas.

The observed level of perceived age discrimination in the USA (29.1%) differed slightly in comparison with two recent studies using the perceived discrimination measure in HRS but there are some differences in the samples used in these studies that might account for this discrepancy (Han and Richardson, 2015; Sutin et al., 2015). For example, Han and Richardson (2015) reported a level of 31.1% at baseline in 2008 but restricted their sample to the 3,921 respondents who completed the discrimination measure at both the 2008 and 2012 waves of HRS. While Sutin and colleagues (2015) used data from 7,622 respondents in 2006, with the longitudinal sample size differing according to the outcome measure. The authors did report a decrease in perceived age discrimination from 30.1% in 2006 to 28.4% at follow-up in 2010. Both studies included non-white respondents and adults aged 50 to 52 years in their analyses whereas I did not, in order to make my analytical Country samples as comparable as possible.

The second objective of this study was to investigate socio-demographic characteristics associated with perceived age discrimination in the USA and England. I had expected there to be few differences between the two countries in their correlates of perceived age discrimination; this assertion was based on previous research in this area which has indicated that there are greater similarities between European

Countries and the United States than differences. Due to the subjective nature of perceived discrimination, I expected the level of perceived age discrimination to be a reflection of cultural cues in the two countries. However, the findings indicate that there were some important differences between the countries in the correlates of age discrimination, and suggest that the second hypothesis was too broad since the relationships between perceived age discrimination and age, education, marital status and work status all differed. In the US sample, perceived age discrimination was more common in older age groups and people with less wealth. In the English sample, perceived age discrimination was also more common in older and less affluent respondents, but in addition it was associated with higher levels of education and being retired. This could suggest that perceptions of age discrimination in older age groups are less socially patterned in the USA than England.

In agreement with previous studies, I observed an inverse gradient between perceived age discrimination and SES, in this instance indexed by wealth, with individuals in the lowest wealth quintile more likely to experience age discrimination than wealthier respondents in both countries (Kessler et al., 1999; Luo et al., 2012; Sweiry and Willitts, 2012; van den Heuvel and van Santvoort, 2011; Vogt Yuan, 2007). Thus the proportion of respondents reporting perceived age discrimination rose from 26.0% and 31.6% in the wealthiest US and English quintiles to 32.5% and 37% in the least wealthy quintiles. Wealth potentially protects individuals from exposure to situations that give rise to discrimination and provides a greater sense of control or security. I found contrasting results for the relationship between perceived age discrimination and level of education in the two countries. In the HRS sample, no association was observed between age discrimination and education, but a positive association was observed in ELSA, where respondents with higher levels of education were more likely to report age discrimination. While I would have expected that the two measures of SES would follow an inverse gradient, some studies using data from the USA and Europe have

reported no significant associations between education and everyday discrimination, (Ayalon and Gum, 2011; Kessler et al., 1999; Luo et al., 2012), while others have reported a positive association between education and discrimination (Alvarez-Galvez and Salvador-Carulla, 2013; Ayalon, 2014; Gee et al., 2007; Pavalko et al., 2003; Vogt Yuan, 2007). My previous study using data from ELSA also showed a positive association between education and age discrimination, despite using different groupings of education for England. The unexpected association between high education and greater perceived age discrimination in England but not in the USA could highlight cultural differences between the two countries, or reflect differences within the education systems in both countries. Previous studies comparing American and English older adults have also indicated that in this age group American respondents have higher educational qualifications than English (Chan et al., 2012; Zivin et al., 2010). Of particular relevance here is that the higher education category in HRS is much greater than in ELSA (49.5% versus 35.5%). This could mean that the education effect seen in England is diluted by the greater proportion of people with at least some college experience in the USA.

Retired respondents in England were more likely to report perceived age discrimination than those who were employed. This is consistent with analyses of other data from the UK (Abrams et al., 2009). In the US sample, no significant relationship between current employment status and age discrimination was observed, suggesting that there is less of a marked transition between work and retirement in the USA. This may reflect the effective abolition of mandatory retirement in the USA several decades ago, while this occurred in England only in 2006. However, in this study it is hard to establish whether legislation has an impact on age discrimination in day-to-day situations. The workplace is also an important context for older people to meet and interact with those of younger ages and could offer an explanation as to why those who are retired perceived greater age discrimination in comparison to those in work (Abrams and Swift, 2012). Previous

research on prejudice and discrimination has tended to argue that increasing the quality of contact between different social groups, in this instance, between younger and older generations, is the best intervention to reduce discrimination (Richeson and Shelton, 2006). Stereotypes of older age are argued to reflect the lack of contact between different generations.

Women perceived less age discrimination than men in both countries, a finding that has been previously reported in relation to both every day and major incidents of discrimination (Jang et al., 2008; Kessler et al., 1999; Lee and Turney, 2012; Luo et al., 2012). It has been argued previously that women are more likely to deny or discount experiences of discrimination which may lead to underestimation (Crosby, 1984; Kessler et al., 1999). While women may report less discrimination, it has also been found that everyday discrimination is more strongly associated with poorer mental health in women while major discriminatory events are more strongly associated with mental health in men (Lee and Turney, 2012). Equally, while I found that women perceived less age discrimination, it is likely that women are more likely to experience 'double discrimination' whereby they may perceive discrimination both due to their age and gender (Arber and Ginn, 1995).

Finally, I looked in detail at several individual discriminatory situations. The findings revealed that in both countries age discrimination was perceived most where people were treated with less courtesy and least where people experienced actual harassment. In both instances rates were higher in England in comparison with the USA. Overall, I observed virtually no difference between the countries regarding perceived age discrimination in service settings. It has been shown previously that older adults may encounter patronising communication when interacting with strangers in public places such as shops or restaurants and that negative ageist stereotypes may explain or reinforce such reactions (Kite et al., 2005; Nussbaum et al., 2005).

Contrary to my prediction, I found that approximately 10% of the sample in both countries reported perceived age discrimination in a hospital or from a doctor. I had expected that the disparities in health care access in the USA might lead to greater perceived discrimination (Davis et al., 2014), but this was not the case. Nevertheless, the findings provide further evidence of the existence of age discrimination in medical settings, an area that previous research has identified as a particular problem (Braithwaite, 2002; Greene et al., 1986). The only setting where Americans perceived greater age discrimination than the English was where they were treated as less clever or smart. In this situation, English respondents were significantly less likely to perceive age discrimination (OR 0.82, 95% CI 0.73-0.92, p<0.001). This could in part reflect the stronger emphasis on youthful identities in the USA in comparison to other western countries, such as, the Netherlands and Germany (Westerhof et al., 2003). This could mean that in a discriminatory situation an individual may feel talked down to despite having a younger age identity. Alternatively, it may reflect learnt behaviours from institutional settings or the greater proportion of Americans with college experience may be relevant. If a higher proportion of individuals in the USA perceived themselves as well educated, they may be more likely to resent being thought less smart in comparison with the English respondents.

One of the main strengths of this study is that I used data from two nationally representative cohorts of over 50 year olds in England and the USA. Further as ELSA and HRS have been designed in a complimentary fashion, this enabled me to use identical measures in the analyses of the two samples, with the cross-national design of the study as an additional strength. However, there are several limitations and caution is needed when interpreting these findings. As discussed in the previous chapter, it is not possible to establish causal relationships in this cross-sectional study. I do not know whether older people are more likely to experience discrimination

because of their age or whether they are more likely to attribute discrimination to age as they get older. Longitudinal data would enable me to see whether rates change over time. As discussed in the previous chapter, there are several limitations with the measures of discrimination used in this study. Firstly, they were self-reported and therefore subject to recall bias and secondly, the questions were designed to measure age discrimination in the context of other sources of discrimination and therefore may not be optimal. However, a more targeted measure may prime respondents to answer in a particular way, whereas in our study age discrimination was not the apparent focus of the items. Further, respondents were able to attribute more than one reason to their experiences of discrimination; therefore, it is not possible to establish for certain whether an individual situation was due to age discrimination or another type of discrimination. In addition, my decision to restrict the sample to white respondents only, to increase the comparability between the two study populations, makes it difficult to say how perceived age discrimination differs across racial groups. However, sensitivity analyses did indicate that the same overall associations were found in both the USA and England. Finally, there may be factors that have not been captured here which may influence perceptions of age discrimination, for example, the effect of social networks and intergenerational closeness in both countries.

In summary, this study found that levels of perceived age discrimination are significantly lower overall in the USA in comparison with England. While I cannot identify the specific reason for the observed US advantage, I can surmise that differing social and political circumstances in the two countries may have an important role to play. Since this study measured perceived age discrimination, I cannot draw conclusions about levels of actual age discrimination. Nonetheless, my findings may be indicative of how older age is perceived in each country. Age discrimination is an important issue in both England and the USA and has the potential to affect a sizeable proportion of society.

5 Self-perceptions of ageing: a review of the literature

The aim of this literature review is to discuss existing studies that investigate self-perceptions of age in older adults, and to highlight issues and limitations that will be addressed in studies 3 and 4. Firstly, I will present existing evidence for an association between self-perceptions of age and mortality, before discussing its relationship with health outcomes, in particular functional capacity and emotional health. Finally, conceptual models used to illustrate personal experiences of ageing, the role of ageing stereotypes, and self-perceptions of ageing will be considered. These may help to explain these relationships.

5.1 Introduction

Self-perceptions of ageing among middle-aged and older adults refer to the ways they comprehend their own ageing. It is worth noting that in the literature on self-perceptions of age, different authors may use a number of different terms to relate to the same or similar concepts (Barak and Stern, 1986; Kleinspehn-Ammerlahn et al., 2008; Levy et al., 2002b; Montepare, 2009; Uotinen et al., 2005). In part this is a reflection of the measures used in the literature, with the majority of studies using multi-item questionnaires to assess self-perceived age (Levy et al., 2002a, 2002b; Maier and Smith, 1999; Sargent-Cox et al., 2014). However it may also reflect the lack of an established conceptual framework (see section 5.7) (Diehl et al., 2014). Self-perceived age may variously be referred to as subjective age, felt age, mental age, or age identity usually distinct from actual age and ideal age (what age an individual would like to be). In some contexts subjective age is regarded as an element of self-perceptions of ageing. In this thesis I will use the term self-perceived age to refer to the age an individual feels or perceives they are.

5.2 Self-perceived age

Self-perceived age is an important feature of later life, since it is relevant to self-assessments of health and physical limitations, satisfaction with ageing, cognitive fitness and wellbeing (Larzelere et al., 2011; Levy, 2009). It is a multi-dimensional construct reflecting how old a person feels they are, adaptation to age-related changes across the adult life course, along with an individual's wellbeing and faith they have in the future (Kleinspehn-Ammerlahn et al., 2008; Levy, 2009; Wiest et al., 2011). Self-perceived age appears to be a better predictor of physical and cognitive functioning in older age than chronological age and its effect increases with chronological age (Levy et al., 2002a; Wurm et al., 2008). Self-perceptions of ageing do not necessarily become more negative with increasing chronological age, and if anything, they become less so. Kastenbaum et al (1972) demonstrated that there was a bias towards a more youthful evaluation of how old an individual feels they are as chronological age increases. Discrepancies between chronological age and self-perceived age are often found to be wider in older age in comparison with earlier in life (Kastenbaum et al., 1972; Kotter-Grühn et al., 2009) and several studies have shown that older adults tend to feel younger than their chronological age (Hughes et al., 2013; Rubin and Berntsen, 2006; Wurm et al., 2008). Carstensen (2006) amongst other argues that years lived (or chronological age) declines in importance as we age, while the subjective sense of time remaining until death increases in significance.

In the literature, there have been a number of ways to evaluate self-perceived age but they generally involve one of two types of measurement tool: single-item and multi-item. The single-item measures tend to ask individuals how old they feel at a given point in time whereas the multi-item instruments tend to ask individuals how much they agree with both negative and positive statements about ageing, such as, 'things keep getting worse as I get older' (Lawton, 1975) or 'ageing means to me that I retain the ability to learn new things' (Steverink et al., 2001). Despite the differing methods of

operationalising self-perceived age, all these approaches to measuring subjective ageing experiences have been able to demonstrate robust associations with a range of health outcomes and mortality (Spuling et al., 2013; Westerhof et al., 2014). It is argued by some authors that single-item measures do not capture the multi-dimensional aspects of how an individual perceives ageing and their own age identity, so that reducing self-perceived age to a single-item may be an over-simplification (Sargent-Cox et al., 2012; Steverink et al., 2001). However, a recent meta-analysis of longitudinal studies on self-perceived age revealed no significant difference in the effects of the two types of measurement in relation to both health outcomes and survival (Westerhof et al., 2014).

5.3   Associations between self-perceptions of ageing and mortality

5.3.1   Method

Firstly, I conducted online literature searches of the bibliographic databases PsycINFO, MEDLINE, Scopus and Web of Science. The search strategy contained both indexed keywords and free text and included the following terms: ((subjective age OR subjective ageing OR felt age OR self-perceived age OR age identity OR ageing satisfaction OR self-perceptions of ageing) AND (mortality OR longevity OR survival OR life expectancy (OR distance to death in PsycINFO)). Articles were limited to those published in the English language and published before May 2015. American spellings of ageing were also included in the search strategy. Lastly, the reference sections of selected articles were scrutinised for any further relevant literature.

Figure 5.1 Phases of the literature search, based on PRISMA flow diagram (Moher et al., 2009)

Records identified through database searching (n =119)	Additional records identified through references (n = 1)

Records screened (n = 46)

Records after duplicates removed (n = 28)

Full-text articles assessed for eligibility (n = 28)

Full-text articles excluded, with reasons (n = 20)
1. The study did not measure self-perceived age (n=3)
2. The study did not measure mortality (n=15)
3. The study was not observational (n=2)

Studies self-perceived age and mortality (n = 8)

5.3.2 Results

The initial search retrieved a total of 119 records of which 73 were discarded on the basis of title and abstract. An additional record was retrieved, identified from inspection of references. As depicted in Figure 5.1, a total of 46 were selected for closer inspection. Following the removal of duplicates, a total of 28 papers were retrieved. After assessing the full-text of these articles, 20 were discarded. 15 of these articles did not contain a measure of mortality as an outcome, an additional 3 studies did not include a specific measure of self-perceived age and 2 studies were reviews. This left a total of 8 studies.

Five of the eight studies used a multi-item instrument to measure self-perceptions of ageing (Kotter-Grühn et al., 2009; Levy et al., 2002b; Levy and Myers, 2005; Maier and Smith, 1999; Sargent-Cox et al., 2014). The Attitude Toward Own Aging (ATOA) sub-scale from the Philadelphia Geriatric Center Morale Scale (Lawton, 1975) consists of five items:

- Things keep getting worse as I get older
- I have as much pep as I had last year
- As I get older, I am less useful
- As I get older, things are better than I thought they would be
- I am as happy now as I was when I was younger

Each item is measured using a five point Likert scale, ranging from 'this does not apply to me' to 'this applies to me very well'.

Kotter-Grühn et al (2009) used both the multi-item ATOA measure and the single-item subjective age measure where they asked respondents 'how old do you feel?'. The remaining three studies used one or more single-item measures to tap into to how old an individual feels they are (Lim et al., 2013; Markides and Pappas, 1982; Uotinen et

al., 2005). For example, (Uotinen et al., 2005) asked respondents about their perceived physical age (do you feel physically younger, the same or older than your real age?) and perceived mental age (do you feel mentally younger, the same or older than your real age?).

The majority of the studies used all-cause mortality as the dependent variable. One study focused on cause-specific mortality, in this instance dying from respiratory causes (Levy and Myers, 2005). Although another of the studies focused on cancer patients the outcome was inspection of medical records and therefore it is assumed that the outcome was all-cause mortality. The number of control variables varied, although most of the studies included key demographic measures (for example, chronological age, sex, a measure of SES) and one or more psychosocial and physical health measures.

Table 5.1 displays the key characteristics from these studies and are listed in chronological order, most recent first. From each study the following characteristics were abstracted: study authors and year of publication, study population & age range, sample source and country, the length of follow up, details of the self-perceived age measure used, mortality measure and any covariates included in the study, and finally a brief description of the relevant results.

Table 5.1 Studies on self-perceived age and mortality

Author & year	Study population & age range	Study & Country	Follow-up period	Predictive measure	Mortality measure	Covariates	Results
Sargent-Cox et al (2014)	1507 respondents aged 65-103 years	ALSA, Australia	16 years (1992-2010)	ATOA	All-cause (official record)	Age, sex, education, partner status, ADL limitations, self-rated health, depressive symptoms and cognitive function.	Baseline self-perceived age predicted risk of mortality after adjustment for covariates (final model: HR 1.12, 1.02-1.23). Trajectories of self-perceived age also predicted mortality, although inclusion of demographic factors reduced the association to non-significance (final model: HR 1.11, 0.96-1.30).
Lim et al (2013)	292 cancer patients, aged 26-85 years	Mayo Clinic, Minnesota, USA	1.3 years (2010-2011)	SPA	All-cause (medical record)	Age, sex, cancer curability, number of symptoms and pain severity	Self-perceived age did not predict survival, only fewer symptoms and curability of cancer. 63% felt younger than their age, 19% felt about the same age and 15% felt older. Inverse association between self-perceived age and actual age. No association with remaining covariates.

Author & year	Study population & age range	Study & Country	Follow-up period	Predictive measure	Mortality measure	Covariates	Results
Kotter-Grühn et al (2009)	496 respondents aged 70-103 years	BASE, Germany	16 years (1990/3-2007)	ATOA and SPA	All-cause (official record)	Age, sex, SES (income, occupational prestige and education), comorbidity (number of doctor diagnosed conditions) and dementia	Feeling old, being dissatisfied with own age and ageing, and negative changes in self-perceptions of ageing were related to an increased risk of mortality. At baseline men, those with fewer doctor-diagnosed conditions & those diagnosed with dementia reported feeling younger and more satisfied with their age and ageing. Having a positive self-perception of age was associated with a lower mortality risk (RR 0.98, 0.96-1.00, p<0.05) and an older subjective age was associated with an increased mortality risk (RR 1.03, 1.01-1.05, p<0.05). Self-perceptions of ageing became more negative with increasing age and with closer proximity to death.

Author & year	Study population & age range	Study & Country	Follow-up period	Predictive measure	Mortality measure	Covariates	Results
Levy and Myers (2005)	620 respondents, aged 50-87 years	OLSAR, USA	23 years (1975-1998)	ATOA	Respiratory causes (official record)	Age, sex, marital status, SES (Two-Factor Index of Social Position), functional health, loneliness and self-rated health. Smoking behaviour	Respondents with a positive self-perception of ageing had a significantly lower risk of respiratory mortality (HR 0.695, 0.540-0.895, p<0.005). In the multivariate model, younger age and female sex were the only other significant predictors of survival from respiratory diseases. Additional analysis indicated that the association remained after adjustment for smoking behaviour over a 3-year period. Positive self-perceptions of ageing had a stronger effect on respiratory mortality in comparison with all-cause mortality (see Levy et al. 2002b)
Uotinen et al (2005)	1165 respondents aged 65-84 years old	EP, Finland	13 years (1988-2001)	Subjective physical age and mental age	All-cause (official record)	Age, sex, education, number of diagnosed long-term health conditions, self-rated health, depressive symptoms and cognitive status.	For self-perceived physical age, 37% felt younger, 52% about the same and 11% felt older. For self-perceived mental age, 57% felt younger, 38% about the same and 5% felt older. Higher risk of mortality observed in the older physical and mental age categories in comparison with the younger than actual age groups. Statistically significant in both the older (RR 1.42, 1.00-2.02) and same as physical age groups (1.28, 1.03-1.60) vs feels physically younger group. In the mental age groups only higher risk in older vs younger group (RR 1.19, 0.74-1.92).

Author & year	Study population & age range	Study & Country	Follow-up period	Predictive measure	Mortality measure	Covariates	Results
Levy et al (2002b)	660 respondents aged 50 and over	OLSAR, USA	23 years (1975-1998)	ATOA	All-cause (official record)	Age, sex, race, SES (occupational status and education), functional health, self-rated health and loneliness. Will-to-live tested as a potential mediator.	Individuals with a more positive self-perception of ageing lived on average 7.5 years longer than those with a less positive self-perception of ageing. The association remained after controlling for covariates (HR 0.87, 0.80-0.94, p<0.001). Will-to-live partly mediated the relationship between positive self-perceptions of ageing and survival. Self-perceptions of ageing did not mediate the relationship between will-to-live and survival.
Maier and Smith (1999)	513 respondents 70 to 103 years	BASE, Germany	Mean 4.5 years (1990/3-1996)	ATOA	All-cause (official record)	Age, sex, marital status, SES (education, income, occupational prestige), health (self-rated health and number of health conditions), and 16 other indicators of psychological functioning (e.g. loneliness, social support, memory, life satisfaction)	Of 17 psychological indicators only dissatisfaction with ageing (RR 1.22, 1.02-1.45) and low perceptual speed were significant predictors of mortality after controlling for age, health, SES and the 16 other psychological indicators.
Markides and Pappas (1982)	460 respondents, aged 60 and over	San Antonio, Texas, USA	4 years (1976-1980)	SPA	All-cause (follow-up survey)	Age, sex, self-rated health, objective health (a score based on the number of doctor diagnosed conditions; and days spent confined to bed or in hospital over the past year), actuarial life expectancy, education and marital status	Survivors had a lower self-perceived age and better self-rated and objective health. No significant differences in socio-demographic measures observed.

Abbreviations: ALSA= Australian Longitudinal Study of Ageing; BASE=Berlin Ageing Study; EP=Evergreen Project, Finland; OLSAR=Ohio Longitudinal Study of Aging and Retirement;
ATOA= Attitude Toward Own Aging subscale from the Philadelphia Geriatric Center Morale Scale (Lawton, 1975); SPA=self-perceived age

5.3.3 Discussion

In seven of the eight studies reviewed, respondents who felt younger or who had more positive self-perceptions of ageing had a lower risk of mortality. The earliest of these studies to demonstrate an association between self-perceived age and mortality was conducted by Markides and Pappas (1982). In this study 460 respondents aged 60 and over from San Antonio, Texas were asked whether they felt young, middle-aged, old or very old and were followed up over a period of four years. Survivors had a lower self-perceived age, and self-perceived age was more predictive of mortality than self-rated health after adjustment for covariates including self-rated health, objective health (a score based on the number of doctor diagnosed conditions; and days spent confined to bed or in hospital over the past year) and life expectancy at baseline.

Following on from this a German study using data from the Berlin Ageing Study (BASE) examined the relationship between seventeen indicators of psychological functioning - covering four broad domains which include subjective wellbeing, cognitive function, personality and social relationships - and mortality. 513 respondents aged between 70 and 103 years were monitored over a 3 to 6 year period (mean 4.5 years). Maier and Smith (1999) observed that out of the 17 psychological indicators only a negative self-perception of ageing and low perceptual speed predicted mortality in the fully-adjusted model controlling for age, sex, SES, self-rated health, doctor diagnosed health conditions and the other 16 psychological indicators. When the authors split the respondents into two age groups - 70 to 84 years and 85 to 103 years - a similar association was observed between ageing satisfaction and mortality in both age groups. However, the authors did not provide the size and demographic characteristics of respondents in each group. Therefore, it is difficult to comment on the possible reasons for the similarities between the two groups.

An American study following 660 older adults over a period of 23 years found that on average respondents with a more positive self-perception of ageing lived up to 7.5 years longer in comparison with respondents who had a more negative self-perception of ageing (Levy et al., 2002b). Using data from the Ohio Longitudinal Study of Aging and Retirement (OLSAR), Levy and colleagues showed that the association remained after statistical adjustment for chronological age, sex, SES (measured using a combination of years of education and occupational status), and functional capacity. In the second part of the study will-to-live partially mediated the relationship between self-perceived age and mortality. Will-to-live was assessed using a three-item measure in which respondents were asked to rate how they currently felt about life in retirement along the scales: empty-full, hopeless-hopeful and worthless-worthy.

A second study using data from OLSAR also produced similar results for respiratory mortality (Levy and Myers, 2005). In this instance 620 respondents age 50 to 87 years were monitored over a 23 year period. Those with a higher positive self-perception of ageing at baseline were less likely to die of respiratory diseases over the follow-up period, after statistical adjustment for chronological age, sex, SES (measured using a combination of years of education and occupational status), marital status, loneliness, functional health and self-rated health. The authors argued that the inclusion of both self-rated health and loneliness in the model helped to ensure that self-perceptions of ageing are a new explanatory variable of survival and not just another way to measure these more established variables, as both self-rated health and loneliness have previously been shown to predict mortality. In addition, Levy and Myers demonstrated that positive self-perceptions of age had a stronger protective effect of respiratory mortality (HR 0.695; $p < 0.005$) in comparison with all-cause mortality (HR 0.87; $p < 0.001$) found in the earlier OLSAR study.

Uotinen et al (2005) studied a sample of Finnish men and women aged 64-84 years for a 13 year period, and found that mortality was lower in those who felt younger than

their age after statistical adjustment for chronological age, sex, education, chronic illness, cognitive function and depressive symptoms. Respondents were asked about their self-perceived mental age and physical age and those who had an older physical or mental age tended to be older, less educated, and had more health conditions, poorer self-rated health, lower cognitive function and a higher depression score in comparison with respondents who had younger self-perceived ages. A higher risk of mortality was observed in the older physical and mental age categories in comparison with the younger than actual age groups. However, the association was only statistically significant for the self-perceived physical age groups - a relative risk of mortality of 1.42 (95% CI 1.00-2.02) for the older group and of 1.28 (95% CI 1.03-1.60) for same age group. In self-perceived mental age groups there was only a significantly higher risk of mortality in older vs younger group after adjustment for age, sex, education, chronic illness and self-rated health (RR 1.56, 95% CI 1.09-2.23), the addition of cognitive function and depressive symptoms attenuated the association (RR 1.19, 95% CI 0.74-1.92).

Kotter-Grühn et al (2009) used both a single item and a multi item measure to account for self-perceptions of ageing in their study using data from the German study BASE. In a sample of 496 respondents aged 70-103 years both feeling older than actual age and being dissatisfied with own age and ageing were related to increased risk of mortality over a period of 12 to 16 years. The study further demonstrated that negative changes in self-perceptions of ageing were related to an increased risk of mortality. Thus extending the earlier findings of Maier and Smith which used participants from the same BASE cohort.

The largest and most recent of the previous studies used data from the Australian Longitudinal Study on Ageing (ALSA), a longitudinal study that started in 1992 following older adults living in and around the Adelaide region of Southern Australia. Sargent-Cox and colleagues (2014) followed 1,507 respondents aged 65-103 years over a

period of 16 years. The study used a multi-item measure to account for self-perceptions of ageing, and demonstrated that baseline self-perceived age predicted risk of mortality after adjustment for covariates, including chronological age, sex, education, partner status, ADL limitations, self-rated health, depressive symptoms and cognitive function. In addition, the study demonstrated that trajectories of self-perceptions of ageing predicted mortality, although the inclusion of demographic factors reduced the predictability of the model.

Only one of the studies did not to find an association between self-perceived age and survival. Lim et al (2013) conducted a study of 292 cancer patients aged 26 to 85 years, receiving chemotherapy at the Mayo Clinic in Minnesota, USA. In accordance with other studies a higher proportion of respondents (63%) reported feeling younger than their age in comparison with feeling the same as their age (19%) or older (15%). Although a high proportion of respondents reported feeling older than their chronological age, in particular older patients, the authors observed no association between self-perceived age and survival over the next 15 months. However, the findings from this study cannot be generalised as the sample comes from a single hospital community and is relatively small in size and therefore the analyses may be underpowered – although the authors do acknowledge this. Moreover, the study participants all had advanced cancer, and this might have affected perceptions of age. Furthermore, the analyses did not account for factors such as SES or psychosocial measures amongst others. A comparison between cancer patients and non-cancer patients might have confirmed whether this finding related only to cancer patients or differed according to long-term condition.

All of the studies, with the exception of Lim et al (2013), demonstrated an association between self-perceived age and survival using both multi-item and single-item measures. The studies using multi-item measures all used Lawton's ATOA sub-scale (Lawton, 1975), while those using the single-item measures varied in their wording. For

example, Markides and Pappas (1982) asked respondents 'we would like to know how old you feel? Would you say young, middle-aged, old or very old?', while the single-item measure used by Kotter-Grühn et al (2009) asked 'how old do you feel?' where respondents were asked to give an age in years. In addition, the eight studies have differed in their geographical scope and have used varying sample sizes, with study samples ranging from 292 to 1,507 respondents. Therefore, it would be important to establish whether the same association is observed using a larger, nationally representative sample. Furthermore, if a single-item measure also demonstrates robust association, it may be a useful tool for identifying individuals at risk and therefore interventions may be possible.

The majority of the studies focused on older adults, however the age ranges varied, with two of the studies focusing only on individuals aged 70 years and over and another covering a wide age range (26 to 85 year olds). It has previously been demonstrated that self-perceived age has a stronger impact on adults aged 40 years and over in comparison with younger adults or those aged under 40 years old (Rubin and Berntsen, 2006). Although a recent meta-analysis of longitudinal studies on self-perceived ageing found that studies with younger samples had a stronger longitudinal association between self-perceived age and survival and health (Westerhof et al., 2014). Therefore, a study covering a wider age range of older adults may help to establish whether the relationship between self-perceived age and survival is observed only in very old age groups in comparison with the younger old age groups. Finally, although these studies have adjusted for a number of covariates, there may be other explanatory factors that account for the association between self-perceived age and mortality. For example, factors such as social engagement and health behaviours, which have not directly been accounted for so far.

5.4 Self-perceptions of age and health status

A number of studies have shown that self-perceptions of ageing are of substantial importance for middle-aged and older adults as they relate to a range of health outcomes and longevity (Demakakos et al., 2007; Kleinspehn-Ammerlahn et al., 2008; Kotter-Grühn et al., 2009; Levy, 2003; Levy et al., 2002b; Maier and Smith, 1999; Sargent-Cox et al., 2014; Uotinen et al., 2005), along with psychological well-being (Keyes and Westerhof, 2012; Mock and Eibach, 2011; Steverink et al., 2001; Westerhof and Barrett, 2005), preventative health behaviours (Levy and Myers, 2004; Wurm, 2008) and cognitive and functional health (Levy et al., 2002a; Sargent-Cox et al., 2012; Stephan et al., 2014; Wurm et al., 2013). It is possible that subjective perceptions of age reflect socio-demographic factors such as wealth and education, along with limitations in social activity, social isolation or lifestyle factors (Barrett, 2003; Infurna et al., 2010; Levy and Myers, 2004; Westerhof and Barrett, 2005), all of which are potentially related to health outcomes. Of particular interest in this review are studies that have evaluated the effect that self-perceived age may have on functional capacity and emotional wellbeing.

Earlier cross-sectional analyses using data from ELSA demonstrated a strong association between self-perceived age and self-rated health (Demakakos et al., 2006) and that respondents who felt younger than their actual age were significantly less likely to report limiting long-standing illness, hypertension and diabetes in comparison with respondents who felt older than their age (Demakakos et al., 2007). These associations held for respondents who reported feeling the same as their actual age with the exception of diabetes, where the difference between feeling older and feeling the same actual age diminished after adjustment for chronological age, sex, wealth and marital status.

A recent meta-analysis of longitudinal studies exploring the relationship between self-perceived age and health and longevity demonstrated that of the 19 studies identified 15 reported significant effects of self-perceived age on health, health behaviours and longevity (Westerhof et al., 2014). The results of the meta-analysis showed that self-perceived age had a stronger effect on health in comparison with survival and that studies with shorter follow-up periods had stronger effects in comparison with studies with longer follow-up periods. Sub-group analyses indicated that there was no significant difference in the effect of the two main measures, subjective or self-perceived age and the multi-item ATOA scale, on health and longevity and those studies with a younger average age showed stronger effects than those with older samples.

5.4.1 Self-perceptions of age and functional capacity

Cross-sectional studies have indicated that individuals who have fewer functional limitations have more positive self-perceptions of ageing (Kim et al., 2012). To the best of my knowledge only a handful of longitudinal studies have investigated the association between self-perceptions of age and future functional capacity (Westerhof et al., 2014). Longitudinal studies investigating the relationship between self-perceived age and functional capacity are set out in Table 5.2. From each study the following characteristics were abstracted: study authors and year of publication, study population & age range, sample source and Country, the length of follow up, details of the self-perceived age measure used, the measure used to assess functional capacity and any covariates included in the study, and finally a brief description of the relevant results.

Table 5.2 Longitudinal studies on self-perceived age and functional capacity

Author & year	Study population & age range	Study & Country	Predictive measure	Follow-up period (years)	Outcome measure/s	Covariates	Results
Wurm and Benyamini (2014)	2,858 respondents aged 40 to 85 years	DEAS, Germany	PEAS	4 years (2008-2011)	Physical functioning (SF-36)	Age, sex, region, education and physical health conditions Self-rated health and depressive symptoms also investigated Optimism considered as a mediator	Respondents with a more negative self-perceived age at baseline were more likely to report a decline in functional capacity over the study period. Optimism regarding the future partially buffers the association.
Spuling et al (2013)	3,038 respondents aged 40-85 years	DEAS, Germany	SPA	6 years (2002-2008)	Physical functioning (SF-36)	Age, sex, region and education	A younger self-perceived age was associated with fewer functional limitations at baseline but no longitudinal association was found between self-perceived age and functional health in either direction.
Sargent-Cox et al (2012a)	1,212 respondents aged 65 years and over	ALSA, Australia	ATOA	16 years (1992-2008)	Objective physical functioning: balance, chair rise and gait speed tests	Age, sex, partner status, domicile status, depressive symptoms, self-rated health and number of health conditions	Negative self-perceptions of ageing were associated with a steeper decline in physical functioning over a 16 period. The results indicate that positive self-perceptions of ageing may be protective of decline in physical functioning.
Moser et al (2011)	1,152 respondents aged 65 years and over	LC65+, Switzerland	ATOA	3 years (2005-2008)	One or more ADL or IADL limitations, falls or hospitalisation	Age, sex, depressive symptoms, number of diagnosed health conditions, income, education, and living alone.	Negative self-perceptions of ageing were predictive of future risk of ADL and IADL limitations. The associations remained after adjustment for all covariates. The association was strongest in the second year of follow-up for both ADLs (OR 2.00, 1.30-3.10) and IADLs (OR1.93, 1.42-2.64)

Author & year	Study population & age range	Study & Country	Predictive measure	Follow-up period (years)	Outcome measure/s	Covariates	Results
Levy et al (2002a)	433 respondents age 50 and over	OLSAR, USA	ATOA	18 years (1977-1995)	Functional limitations (HAS)	Age, sex, race, SES (occupational status and education), self-rated health and loneliness. Perceived control was included as a potential mediator	Respondents with a more positive self-perception of ageing at baseline had better functional capacity over time in comparison with respondents who had a more negative self-perception of ageing. Association remained after controlling for covariates. Self-perceptions of ageing had a greater impact on functional capacity over time than self-rated health, gender, race, and SES.

Abbreviations: ALSA= Australian Longitudinal Study of Ageing; DEAS= German Ageing Survey; LC65+= Lausanne Cohort Study 65+; OLSAR=Ohio Longitudinal Study of Aging and Retirement;

ATOA= Attitude Toward Own Aging subscale; PEAS=Personal Experience of Ageing Scale; SPA=Self-Perceived Age;

ADL=Activities of Daily Living; HAS=Health Scale for the Aged; IADL=Instrumental Activities of Daily Living; SF-36=36-item Short Form Health Survey

The majority of the longitudinal studies reviewed indicate that a negative or an older self-perception of age is typically associated with a decline in functional capacity, compared to a younger or more positive self-perception of ageing. Using data from 433 over 50 years olds in the OLSAR study, Levy et al (2002a) found that respondents with a positive self-perceived age reported better functional capacity than those with more negative perceptions over an 18 year period. Furthermore, the results demonstrated that self-perceptions of ageing had a greater impact on functional health over time than self-rated health, gender, race, and socioeconomic status and the effect of self-perceived age increased with chronological age. Similarly, Sargent-Cox and colleagues (2012a) studied a sample of 1,212 Southern Australians aged 65 and over for a 16 year period and found that having a positive or younger perception of age was potentially protective of declining physical functioning; in this instance physical functioning was measured using a set of objective tests. The authors calculated a summary score based on the results from the individual assessments including balance, gait speed, and chair stand tests. The direction of the association remained after adjustment for covariates including age, sex, depressive symptoms, self-rated health and number of physical health conditions.

A further study of 1,152 Swiss adults aged 65 to 70 years indicated that negative self-perceptions were strongly associated with the risk of future difficulties with one or more Activities of Daily Living (ADL) or Instrumental Activities of Daily Living (IADL) (Moser et al., 2011). At baseline, 436 participants (37.8%) reported a negative self-perceived age and they were more likely to have lower levels of income, to live alone, to have more chronic health conditions, and depressive symptoms in comparison with respondents who had a positive self-perceived age, some of which are also associated functional limitations. The participants were studied for a period of three years and re-interviewed at yearly intervals and any respondents who had any ADL or IADL limitations at baseline were excluded. The results indicated that respondents who had a negative self-perceived age at baseline were more likely to report new ADL or IADL

limitations at follow-up intervals in comparison with those who had a positive self-perception of ageing at the start of the study. The odds ratios of reporting a new ADL or IADL were highest at the second year of follow-up and lowest in the third year of follow-up.

Wurm and Benyamini (2014) observed a similar association using data from the German Ageing Survey (DEAS). Using the multi-item Personal Experience of Ageing Scale to measure negative self-perceptions of ageing (Steverink et al., 2001), the study tracked 2,858 respondents aged 40 to 85 years over a three year period (2008 to 2011). A more negative self-perception of ageing at baseline was associated with a greater decline in functional capacity over the study period in comparison with having a less negative self-perception of ageing. In contrast, a study using data from an earlier cohort of the DEAS found only a cross-sectional association between self-perceived age and functional capacity (Spuling et al., 2013). On this occasion, self-perceived age was measured using a single-item to ascertain how old a respondent felt and the discrepancy between this and their actual age was analysed. The authors only found a cross-sectional association between self-perceived age and functional capacity, with respondents who had a younger self-perceived age having fewer functional limitations. Stratifying the sample by age group – middle-aged (40 to 64) and older-aged (65 and over) – did not alter the observed longitudinal result but the cross-sectional correlation was stronger in the older-aged group in comparison with the middle-aged group.

The four studies that used multi-item measures of self-perceived age all demonstrated a longitudinal association between an individual's self-perception of ageing and functional capacity, both self-reported and objectively measured. In contrast, Spuling et al (2013) used a single-item measure to assess self-perceived age but only found a cross-sectional association between self-perceived age and functional capacity. Therefore, one of my aims would be to replicate the findings of the previous longitudinal studies using data from the ELSA in order to establish whether using a

single-item measure of self-perceived age produces differing results to those studies using a multi-item measure. Further, I aim to extend previous findings by investigating both ADL limitations and impaired mobility in order to establish whether the severity of functional difficulties alters the association.

5.4.2 Self-perceptions of age and emotional health

A number of studies have demonstrated that having a younger or more positive self-perceived age is associated with better emotional health (elevated depressive symptoms or lower levels of life satisfaction). Older adults with younger subjective ages or age identities are more likely to have better subjective wellbeing, life satisfaction and are less likely to demonstrate elevated depressive symptoms (Barak and Stern, 1986; Barrett, 2003; Choi and DiNitto, 2014; Kavirajan et al., 2011; Keyes and Westerhof, 2012; Mock and Eibach, 2011; Westerhof and Barrett, 2005). However, the majority of these studies have been of a cross-sectional design. For example, in one such study comparing adults aged 40 to 74 in both Germany and the USA, Westerhof and Barrett (2005) found that feeling younger than your actual age was associated with increased levels of life satisfaction and positive affect and lower levels of negative affect. Overall, the associations held after statistical adjustment for socio-demographic covariates and both number of chronic health conditions and self-rated health. However, a separate Country analyses indicated that the association between self-perceived age and positive affect only held in the USA and not in Germany. The authors suggest that the stronger emphasis on youthful identities in American culture in comparison with Germany may partially explain the difference. As this was a cross-sectional study it is hard to generalise these findings to other countries.

Longitudinal studies investigating the relationship between self-perceived age and emotional distress are set out in Table 5.3. The key characteristics from these studies and are listed in chronological order, most recent first. From each study the following

133

characteristics were abstracted: study authors and year of publication, study population & age range, sample source and Country, the length of follow up, details of the self-perceived age measure used, outcome measure and any covariates included in the study, and finally a brief description of the relevant results.

Table 5.3 Longitudinal studies on self-perceived age and emotional health

Author & year	Study population & age range	Study & Country	Predictive measure	Follow-up years	Outcome measure	Covariates	Results
Choi and DiNitto (2014)	5,371 respondents aged 65 years and older	NHATS, USA	SPA	1 year (2011-2012)	Depressive symptoms (PHQ-2)	Age, sex, race, number of chronic health conditions, limited ADLs/IADLs, pain limitations, self-rated health and memory	Feeling older than actual age in comparison with feeling same as actual age at baseline was associated with greater depressive symptoms a year later. No association was observed between feeling younger and depressive symptoms.
Wurm and Benyamini (2014)	2,858 respondents aged 40 to 85 years	DEAS, Germany	PEAS	3 years (2008-2011)	Depressive symptoms (15 item German CES-D)	Age, sex, region, education and physical health conditions Optimism considered as a mediator	Respondents with a more negative self-perceived age at baseline were more likely to report an increase in depressive symptoms over the study period.
Spuling et al (2013)	3,038 respondents aged 40 years and over	DEAS, Germany	SPA	6 years (2002-2008)	Depressive symptoms (15 item German CES-D)	Age, sex, region and education	A younger self-perceived age was associated with fewer depressive symptoms. Self-perceived age was also predictive of future depressive symptoms.
Mock and Eibach (2011)	1,170 respondents aged 40 years and over	MIDUS II, USA	SPA	10 years (1994/5-2004/06)	Life satisfaction, positive and negative affect Ageing attitudes	Age, sex, SES (combined education and income score), marital status, employment status, self-rated health and number of health conditions (0-29)	An older subjective age was associated with a higher likelihood of negative affect and lower life satisfaction 10 years later

Abbreviations: DEAS= German Ageing Survey; MIDUS II=National Survey of Midlife in the United States II; NHATS= National Health and Aging Trend Study;

ATOA= Attitude Toward Own Aging subscale from the Philadelphia Geriatric Center Morale Scale; PEAS=Personal Experience of Ageing Scale; SPA=Self-perceived age;

PHQ-2= Patient Health Questionnaire-2; CES-D=Center for Epidemiological Studies Depression Scale

Using data from the US National Health and Aging Trend Study (NHATS), Choi and DiNitto (2014) found a significant longitudinal association between feeling older and higher levels of depressive symptoms. Approximately 70.8% of the sample reported feeling younger than their actual age compared with 18% who felt the same as their age and 6.9% who felt older than their age (4.5% of participants did not provide an answer). The study of 5,371 older adults aged 65 years and over demonstrated that participants who felt older than their actual age had higher depressive at baseline and one year later in comparison with respondents who felt the same as their actual age. In contrast, whilst feeling younger than actual age was protective of depressive symptoms cross-sectionally, the relationship did not remain significant longitudinally.

A study of 2,858 DEAS participants aged 40 to 85 years old demonstrated that participants who had a more negative self-perception of ageing at baseline were more likely to report an increase in depressive symptoms over a three-year period in comparison with respondents who had a less negative self-perception of ageing (Wurm and Benyamini, 2014). The self-perception of ageing was measured using the multi-item personal experience of ageing scale (Steverink et al., 2001). Another German study using data from an earlier cohort of the DEAS, demonstrated that self-perceived age was predictive of future depressive symptoms, with a younger self-perceived age associated with fewer depressive symptoms (Spuling et al., 2013). The study used a single-item of self-perceived age and tracked respondents over a six-year period. A sub-group analyses by age group, showed that the association was stronger in the older age group (65 years and over) in comparison with the middle-aged group (40 to 64 years old). Furthermore, the study revealed that the strongest associations were between self-perceived age and both depressive symptoms and self-rated health in comparison to functional limitations and the number of chronic health conditions.

One study of 40 to 74 year olds using data from the two sweeps of MIDUS II demonstrated that having an older subjective age was associated with a higher likelihood of negative affect and lower life satisfaction 10 years later (Mock and Eibach, 2011). The study of 1,170 respondents also demonstrated that an individual's attitude towards ageing moderated the association between feeling older and wellbeing. In other words, the effect of the observed association between self-perceived age and wellbeing was dependent upon ageing attitudes – if respondents had more negative attitudes towards ageing then feeling older than their age had a negative impact upon wellbeing but if they had more favourable attitudes towards ageing then feeling older did not have such a negative impact on wellbeing.

The studies identified indicate that there is evidence to support a longitudinal association between self-perceptions of ageing and emotional health. Individuals who feel older than their chronological age or have more negative self-perceptions of ageing are more likely to have higher levels of depressive symptoms or poorer wellbeing in comparison with individuals who feel younger than their age or who have more positive self-perceptions of ageing. However, the longitudinal association was not uniform and the length of follow-up varied in each study. For example, Choi and DiNitto (2014) found no longitudinal association between feeling younger than actual age and lower depressive symptoms but that having an older subjective age was associated with higher depressive symptoms a year later.

To my knowledge no previous studies have investigated the association between self-perceived age and emotional distress in older adults in England. Therefore, it would be useful to replicate the findings of these studies in a large, nationally representative sample. The evidence from both the cross-sectional and longitudinal studies indicates that self-perceived age and emotional health are strongly correlated but it would be interesting to establish whether individuals' who have an older self-perceived age are

at a greater risk of becoming more depressed over time or whether having depressive symptoms increases the likelihood of having an older subjective age.

5.5 Self-perceived age and health: direction of the association and potential pathways

Only a handful of longitudinal studies have examined the direction of the association between self-perceived age and health outcomes. Although there has been much research around self-perceptions of ageing, very few of these studies have attempted to test the direction of the relationship between self-perceived age and health (Kotter-Grühn, 2015). Those studies that have suggest that self-perceived age exerts a stronger influence on health than the converse relationship (Levy et al., 2002a; Sargent-Cox et al., 2012; Spuling et al., 2013; Wurm et al., 2007). However, it is plausible that there is a reciprocal relationship between self-perceived age and health - that health experiences or changes in health inform an individual's self-perception of ageing. This may be through both positive and negative feedback loops. For example, functional limitations associated with poorer health may in turn contribute to self-perceived age, specifically, feeling older than actual age, as it could be argued that functional health serves as a reminder of ageing.

Table 5.4 sets out the key characteristics from key longitudinal studies which have focused on the direction of the association between self-perceived age and health, in particular those studies that have focused on functional capacity and emotional health. The studies are listed in chronological order, most recent first. From each study the following characteristics were abstracted: study authors and year of publication, study population & age range, sample source and country, the length of follow up, details of the self-perceived age measure used, outcome measure and any covariates included in the study, and finally a brief description of the relevant results.

Table 5.4 Longitudinal studies investigating the causal pathway between self-perceived age and health

Author & year	Study population & age range	Study & year	Predictive measure	Follow-up years	Outcome measure	Covariates	Results
Spuling et al (2013)	3,038 respondents aged 40 years and over	DEAS, Germany	SPA	6 years (2002-2008)	Functional health (SF-36); depressive symptoms; physical health; and self-rated health	Age, sex, region and education	Baseline self-perceived age predicted future physical, mental and self-rated health but not functional limitations, while only self-rated health predicted future self-perceived age. The strongest associations were found for self-rated health and depressive symptoms. Respondents with a younger self-perceived age were more likely to have better health outcomes in comparison with respondents who had an older self-perceived age. With the exception of depressive symptoms, the associations between self-perceived age and health outcomes were stronger in the older age group (65 years and over) in comparison with the middle-aged group (40 to 64 years).
Sargent-Cox et al (2012)	1,212 respondents aged 65 years and over	ALSA, Australia	ATOA	16 years (1992-2008)	Objective physical functioning (balance, chair rise and gait speed tests)	Age, sex, partner status, domicile status, depressive symptoms, self-rated health and number of health conditions	Poor self-perceptions of ageing at baseline were associated with a steeper decline in physical functioning over the study period. However, baseline physical functioning did not predict future self-perceptions of ageing.
Wurm et al (2007)	1,286 respondents aged 40-85	DEAS, Germany	PEAS	6 years (1996-2002)	Chronic health conditions	Age, sex, place of residence, partner status, education and occupational prestige Control beliefs	Ageing-related cognitions predicted changes in physical health and vice versa but regression weights indicate that ageing related cognitions have a stronger effect on changes in health than the other way around.

Author & year	Study population & age range	Study & year	Predictive measure	Follow-up years	Outcome measure	Covariates	Results
Levy et al (2002a)	433 respondents age 50 and over	OLSAR, USA	ATOA	18 years (1977-1995)	Functional limitations (HAS)	Age, sex, race, SES (occupational status and education), self-rated health and loneliness.	Respondents with more positive self-perceptions of ageing at baseline had better functional capacity over time in comparison with respondents who had more negative self-perceptions of ageing. Supplementary analyses indicated that the reverse association was not found – baseline functional capacity did not predict self-perceptions of ageing over time.

Abbreviations: ALSA= Australian Longitudinal Study of Ageing; DEAS= German Ageing Survey; OLSAR=Ohio Longitudinal Study of Aging and Retirement; ATOA= Attitude Toward Own Aging subscale from the Philadelphia Geriatric Center Morale Scale (Lawton, 1975); PEAS=Personal Experience of Ageing Scale (Steverink et al., 2001); SPA=Self-perceived age; HAS=Health Scale for the Aged; SF-36=36-item Short Form Health Survey

As noted in section 5.4.1, both Levy et al (2002a) and Sargent-Cox et al (2012) were able to demonstrate an association between self-perceptions of ageing and future functional capacity. In supplementary analyses, Levy and colleagues found that while self-perceptions of ageing predicted ADL limitations over time that the reverse effect was not observed. Functional capacity did not predict self-perceived age over time. A similar finding was observed by Sargent-Cox and colleagues using objective measures of functional capacity.

Wurm et al (2007) demonstrated that self-perceptions of ageing predict changes in physical health and vice versa but regression weights indicate that self-perceptions of ageing have a stronger effect on changes in health than the other way around. 1,286 participants aged 40 to 85 years old were asked a series of questions to assess their positive and negative views on ageing. One set of questions assessed to what extent participants associated ageing with physical losses, for example, "ageing means to me that I am less healthy" or "I cannot make up for my physical losses". The second scale assessed to what extent they saw it as a time for personal development, for example, "ageing means to me that my capabilities are increasing" or "I can still learn new things". Both scales were significant predictors of health after adjustment for socio-demographic and psychological factors. Negative self-perceptions of ageing, or the view that ageing is associated with physical losses, were significantly related to an increase in physical illnesses over the next six years. Whereas positive self-perceptions of ageing, or views that ageing was a time for personal development, was protective. It was associated with a decline in or fewer physical health conditions over the time.

A later German study of 3,038 over 40 year olds found that self-perceived age predicted physical, mental and self-rated health but not functional limitations whilst only self-rated health predicted self-perceived age (Spuling et al., 2013). However, this

study revealed some differences between the older-aged (65 years and over) and middle-aged (40 to 64 years) participants. Overall, there was an association between subjective age and the number of physical health conditions but when the authors' stratified the sample by age; self-perceived age only predicted physical health conditions in the middle-aged group, while physical health conditions only predicted self-perceived age in the older group. In the total sample, depressive symptoms were predictive of self-perceived age, however when the sample was divided into the two age groups, the association no longer reached statistical significance. Whilst on the opposite pathway, self-perceived age predicted future depressive symptoms in both age groups. The results divided by age group therefore suggest that there is some reciprocity in the relationship between self-perceived age and health outcomes but that the effects are stronger in one direction over another and that they are dependent on a number of factors, such as, age and the type of health outcome assessed. Therefore, investigating the direction of the association between self-perceived age and health further would enable us to establish whether there is a reciprocal relationship. The evidence reviewed above indicates that there is some reciprocity but that the type of health outcome investigated may influence this. Differential exposure to environmental factors may play a role here also. Therefore, a future study should take account of a wide range of explanatory variables, including, socio-demographic characteristics, psychological indicators and physical health, as these may affect or explain some of the differences in the findings observed previously.

5.6 Pathways

The pathways between self-perceived age and longevity are not yet fully understood (Sargent-Cox et al., 2014). It has also been argued that self-perceptions of age is a lens through which age-related changes are interpreted, and these interpretations can affect future health and health behaviours through psychological and behavioural pathways (Sargent-Cox et al., 2014). Consistent with this, older adults with a positive self-perception of age are more likely to use preventive health behaviours, follow medical advice therefore improving health outcomes (Levy and Myers, 2004). Another explanation is that feeling younger may reflect resilience (or mastery), sense of control or satisfaction with aging (Kotter-Grühn et al., 2009; Westerhof and Barrett, 2005). Having a positive self-perception of age may buffer the impact of a serious health event and other negative life events (Wurm et al., 2008). It has also been suggested that a 'will to live' may partially explain the relationship between self-perceived age and longevity (Levy et al., 2002b). Levy and colleagues argue that the will to live is one of the perspectives on ageing that is internalised from a young age and maintained over the life course. Societal attitudes to and stereotypes of ageing reinforce negative perceptions of ageing and thereby contribute to self-perceived age.

Wurm et al (2013) suggest that interventions after serious health events should address negative self-perceptions of ageing through communicating more positive views of ageing and positive health behaviours. They argue that negative self-perceptions of age are not necessarily detrimental to health but become more so after a serious health event. At this point they risk becoming a self-fulfilling prophecy and therefore interventions at this point may be beneficial to health and recovery. Interventions at this point should address negative views of ageing and expectations through the communication of positive messages about ageing and expectations of ageing. Therefore, having more positive views of ageing may influence health

behaviours or lead to a change in health behaviours. Whereas if an individual attributes ill health to old age they are less likely to engage in positive health behaviours and interventions should therefore address this.

5.7 What frameworks exist to explain these relationships?

In this section I will discuss recent theories of ageing and how these may provide a basis for our understanding of possible pathways and mechanisms between self-perceptions and attitudes to ageing and health, along with testable hypotheses.

5.7.1 Stereotype embodiment theory

As discussed previously in Chapter 2, Levy (2009) argues that stereotypes of ageing are embodied when their assimilation from the surrounding culture leads to self-definitions that in turn influence functioning and health. She has proposed that stereotypes become: internalised across the lifespan; can operate unconsciously; gain salience from self-relevance; and, utilise multiple pathways. It is argued that these ageing stereotypes become ageing self-stereotypes in older age, in turn influencing an individual's conceptions of ageing and old age. At this point they can be defined as self-perceptions of ageing. As these age-related stereotypes are assimilated over the life course, they may gain relevance at older ages and affect actual ageing experiences almost unknowingly.

Levy proposes that ageing self-stereotypes, and in turn self-perceptions of ageing, may influence health outcomes through three main pathways: physiological, psychological and behavioural. For example, ageing self-stereotypes can affect the autonomic nervous system leading to heightened cardiovascular responses to stress (Levy, 2009; Levy et al., 2000); influence expectations about ageing which in turn can lead to self-fulfilling prophecies (Levy and Leifheit-Limson, 2009); and through the adoption of or

144

engaging in certain health behaviours (Levy and Myers, 2004). A number of studies

can be identified which support age-stereotype embodiment (Hess et al., 2004; Kotter-

Gruhn and Hess, 2012; Levy et al., 2009) and demonstrate how it has a greater

relevance for older adults in comparison to middle-aged and younger adults. For

example, Hess et al (2004) found no evidence that the priming of implicit ageing

stereotypes had any effect on the memory test performance of younger adults (17 to 27

years old), whereas the same experiment showed an effect on the recall of older adults

(57 to 81 years old). Levy and colleagues (2009) demonstrated that negative age

stereotypes internalised or held earlier in adulthood can impact cardiovascular health

when they reach older age (aged 60 and over). Empirical studies on self-stereotypes of

ageing have investigated its potential role in health and functional outcomes (Levy et

al., 2006, 2000; Levy and Leifheit-Limson, 2009; Meisner, 2012). However, alone

stereotype embodiment theory only focuses on the development of age stereotypes

and how these eventually become internalised and self-stereotypes of ageing (Diehl et

al., 2014).

5.7.2 Awareness of Ageing

More recently Diehl and colleagues have proposed the concept Awareness of Ageing,

building on their previous work on Awareness of Age-Related Change (AARC) (Diehl et

al., 2014; Diehl and Wahl, 2010). The authors argue that despite self-perceptions of

ageing being a much studied area, it lacks cohesive definitions for many of the

concepts used and no clear conceptual framework is employed. Their concept of

Awareness of Ageing attempts to address some of these shortcomings.

As seen in figure 5.2, Diehl et al (2014) propose that numerous factors, including

societal norms and socio-economic status along with age-related change, may

influence our Awareness of Ageing and that these in turn may affect developmental

outcomes, including psychological wellbeing and longevity. It is proposed that these different constructs, attitudes to ageing, ageing stereotyped and self-perceptions of age, are interlinked as signified by circle 4, along with Awareness of Age-Related Change (AARC). The authors argue that Levy's stereotype embodiment theory informs part of this conceptual model. As seen below, age stereotypes and attitudes to age are regarded as implicit (as proposed in Levy's Stereotype embodiment theory), while self-perceptions of age are seen to be explicit or conscious.

Diehl and colleagues model synthesises a number of previous theories and conceptual models, including Baltes and Baltes (1990) model of selective optimization with compensation (SOC), AARC and stereotype embodiment theory. It proposes potential pathways that require further investigation, in particular to ascertain the direction of many of these relationships.

Figure 5.2 Awareness of Ageing in the context of life-span developmental processes and outcomes (Diehl et al., 2014)
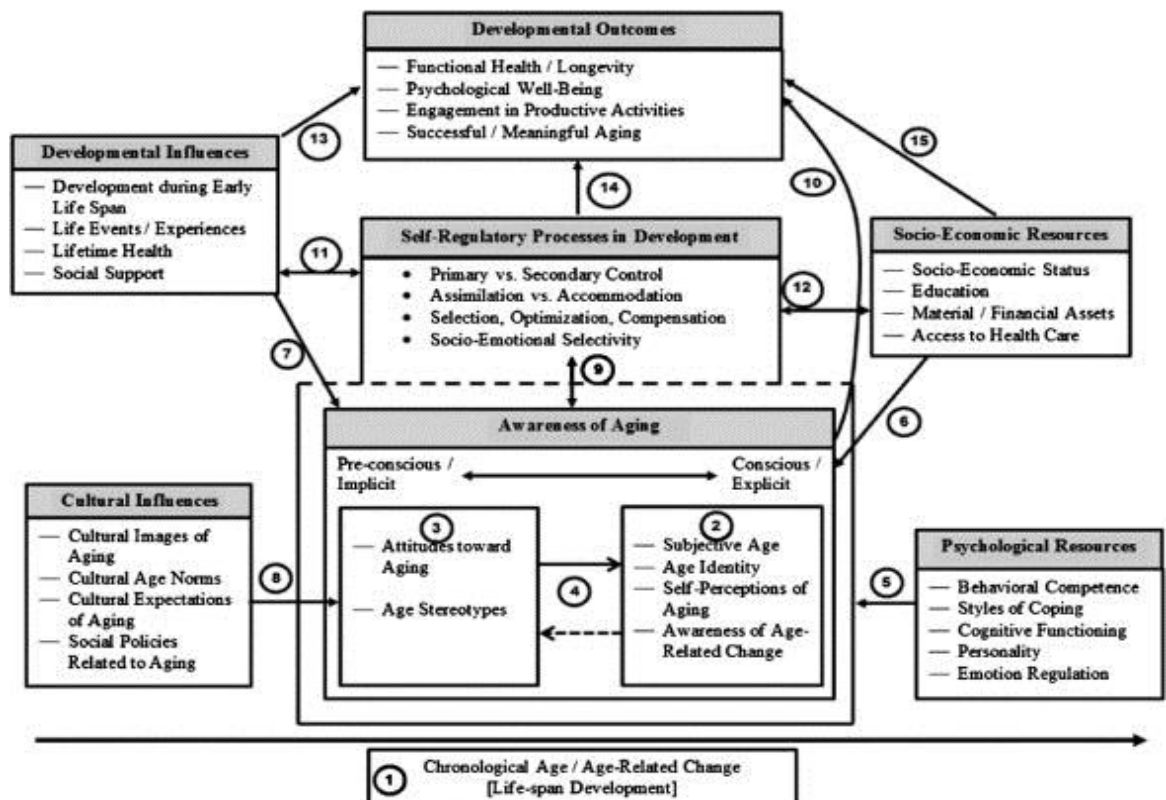
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It partially addresses arguments put forward by Rubin amongst others that an age span developmental view is needed (Rubin and Berntsen, 2006). Self-perceptions of age, along with our own attitudes to age and ageing are not static and will be influenced by developmental changes along with cultural factors, socio-economic resources and experiences amongst others across the life-course. However, as the authors acknowledge the Awareness of Ageing model does not explicitly address the influence of social and cultural factors.

5.8   Evidence from empirical studies on interventions

The results from empirical studies on addressing negative ageing stereotypes and self-perceptions of ageing do show potential, however data on their effectiveness over time are still to be established (Kotter-Grühn, 2015). A number of studies have explored the role of physical activity as a potential intervention to change perceptions of ageing (Beyer et al., 2015; Klusmann et al., 2012; Wolff et al., 2013). For example, one experimental study demonstrated that an intervention which increased participation in physical activity could help to counteract negative perceptions of ageing (Klusmann et al., 2012). The study involving 247 German women aged 70-93 years old, took part over a six month period. The women were randomly divided into three groups: one group participated in an exercise course; and two control groups – one active and the other passive. Changes in self-perceptions of age were measured before and after the intervention and the group who had the exercise intervention had less ageing dissatisfaction in comparison with the other two groups. The authors concluded that participation had an indirect effect on self-perceived age. It increased motivation and indirectly increased positive perceptions of ageing. Therefore, studies such as this highlight the potential role that health behaviour interventions may have in overcoming negative self-perceptions of ageing.

Drawing on the potential role of ageing stereotypes, evidence from empirical studies has demonstrated that resistance to negative age stereotypes may potentially help to protect against the development of psychiatric conditions (Levy et al., 2014c), therefore having implications for future interventions for emotional health. Similarly, an experimental study conducted by Stephan et al (2013) demonstrated that inducing a younger self-perceived age or increased hand grip strength between the first and second measurement, therefore such interventions may potentially be possible for other functional limitations, along with other health outcomes. Further, an experimental study conducted by Swift and colleagues (2012) demonstrated that age-related social comparisons may also activate negative stereotypes of ageing. 56 participants aged 67 to 98 years old were randomly assigned to either the experimental or control groups. In the experimental group, participants were informed that their grip strength performance would be compared to that of younger adults whilst in the control group they were not. The grip strength of the older adults in the primed group was impaired by up to 50% in comparison with the control group, indicating that stereotypes of ageing when activated can have an important effect on functional capacity. In this experiment, it is argued that the negative age stereotypes were activated via stereotype threat through just being told that their performance would be compared to that of younger adults.

5.9 Conclusion

There are several gaps identified in the existing literature. To my knowledge, no prior longitudinal studies have used nationally representative samples from the UK in their investigations of self-perceived age and its association with health and longevity. Using data from the English Longitudinal Study of Ageing (ELSA) will be beneficial to aid our understanding of self-perceptions of ageing and how these may impact upon our health and longevity. Few previous studies have used nationally representative samples and using data from ELSA will enable the examination of a wider range potentially explanatory factors. Whilst a number of studies have looked at the association between

self-perceptions of age and health outcomes, many have used multi-item measures and few have considered the direction of the association between self-perceived age and health status. Furthermore, conducting studies using a single-item measure may add to our current understandings of the potential mechanisms or pathways between these self-perceptions of age and future health outcomes. In particular, it will be useful to identify potential measures that can be used to identify those most at risk of reduced health.

6 Feeling old vs being old: associations between self-perceived age and mortality (Study 3)

6.1 Introduction

Self-perceived age or subjective age is an important feature of later life, since it is relevant to appraisals of health and physical limitations, satisfaction with ageing, cognitive fitness and wellbeing (Larzelere et al., 2011; Levy, 2009). It is a multi-dimensional construct thought to reflect how old people feel they are, adaption to age-related changes across the adult life course, and an individual's wellbeing and faith they have in the future (Kleinspehn-Ammerlahn et al., 2008; Levy, 2009; Wiest et al., 2011). Discrepancies between chronological age and self-perceived age are often wider in older age than earlier in life (Kotter-Grühn et al., 2009) and previous research has shown that older adults tend to feel younger than their chronological age (Wurm et al., 2008). Self-perceived age has been found to be a better predictor of physical and cognitive functioning in older age than chronological age, and its effect increases with chronological age (Levy et al., 2002a; Wurm et al., 2008).

Longitudinal population studies have demonstrated that older people who feel younger than their age have more favourable health outcomes, including reduced mortality (Kotter-Grühn et al., 2009; Levy et al., 2002a, 2002b; Sargent-Cox et al., 2014, 2012; Westerhof et al., 2014). For example, Uotinen et al (2005) studied a sample of Finnish men and women aged 64-84 years for a 13 year period, and found that mortality was lower in those who felt younger than their age after statistical adjustment for chronological age, sex, education, chronic illness, cognitive function and depressive symptoms. The majority of studies of self-perceived age and survival have used multi-item questionnaires to assess subjective age (Kotter-Grühn et al., 2009; Levy et al., 2002b; Levy and Myers, 2005; Maier and Smith, 1999; Sargent-Cox et al., 2014).

6.1.1 Aims and objectives

The first aim of this study was to test the association between a simple single-item measure of self-perceived age and survival over an average 99 month follow-up period in a representative sample of men and women aged 50 and over in England. The advantage of using a single-item measure is that it is short and simple and it can easily be used to gauge how an individual may feel about their ageing experience, whether more negative or positive. The predictive validity of this measure has previously been shown to be good (Diehl et al., 2014). I analysed all-cause mortality and deaths from cardiovascular disease and cancer, and assessed reverse causality (imminent death leading to perceptions of being older) by repeating analyses after excluding deaths within the first 12 months of baseline. A shortened version of this study was published in *JAMA Internal Medicine*.

My second aim was to understand the mechanisms underlying associations between self-perceived age and mortality. It is possible that subjective perceptions of age reflect existing health problems (Demakakos et al., 2007; Uotinen et al., 2005; Westerhof and Barrett, 2005), poor physical function and psychological distress (Keyes and Westerhof, 2012; Levy et al., 2002a; Sargent-Cox et al., 2012), socio-demographic factors such as wealth and education, limitations in social activity and social isolation, impaired cognitive function or lifestyle factors (Infurna et al., 2010; Levy and Myers, 2004; Westerhof and Barrett, 2005), all of which are potentially related to health outcomes. For example, poor physical function might make people feel that they are older, and impaired physical function has been shown to predict future mortality (Studenski et al., 2011). Using data pooled from nine cohort studies, Studenski and colleagues demonstrated that gait speed was associated with survival in older adults, with increased survival found in individuals with a faster gait speed. Similarly, the association between depressive symptoms and an increased risk of mortality in older

adults has been well established (Cuijpers et al., 2013; Saz and Dewey, 2001), and the presence of elevated depressive symptoms may have an affect an individual's subjective ageing experience. I therefore tested the extent to which the association of self-perceived age and mortality was reduced when these factors were taken into account, separately and in combination.

Based on the previous literature, the hypotheses tested in this study are:

1) Respondents who felt older than their actual age would have a higher risk of mortality over the follow-up period of 8-9 years compared with respondents who felt younger than their actual age.

2) The association between self-perceived age and mortality would be reduced once physical health, functional limitations, impaired cognitive function, depressive symptoms, health behaviours and level of social engagement were accounted for. I predicted that existing health problems, functional limitations, health behaviours and psychological distress would explain most of the association.

6.2   Methods

This study involved analysis of people who took part in the second wave (2004-5) of the English Longitudinal Study of Ageing (ELSA). The first wave included a representative sample of 11,391 adults from private households who had participated in the Health Survey for England in 1998, 1999 or 2001. The second wave of ELSA involved 8,780 core participants, 81.5% of eligible respondents. Attrition was greater among those with no educational qualifications, people of non-white ethnicity, and those with longstanding limiting illness.

8,414 core participants consented to mortality follow-up and of these 6,965 (82.8%) completed the self-perceived age measure. Individuals who did not complete this measure tended to be older; 34.9% of respondents aged 80 or older did not provide self-perceived age data, compared with 12.8% of those less than 60 years old (P<0.001) (Table 6.1). They were also less wealthy, less educated, reported poorer self-rated health, and were more likely to die over the follow-up period (33.7% vs 16.3%) than those who completed the measure (all P<0.001). The only non-significant differences were for respondents with a doctor diagnosis of cancer, chronic lung disease or clinical depression, which may reflect the smaller proportion of participants reporting these health conditions in the sample overall. Data were missing on one or more covariates for 476 individuals, primarily wealth (336), depressive symptoms (62), and loneliness (46). The analytic sample therefore comprised 6,489 participants.

Table 6.1 Characteristics of respondents who did not complete self-perceived age measure

	N	%	*P* value
Total	1,499	17.2%	0.001
Age			
50-59	306	12.3%	0.001
60-69	353	12.8%	
70-79	421	20.1%	
80 +	369	34.9%	
Sex			
Male	606	16.0%	0.005
Female	843	18.3%	
Education			
Lower	788	24.2%	0.001
Intermediate	412	13.2%	
Higher	248	12.2%	
Wealth			
Lowest 1	418	27.8%	0.001
2	339	20.6%	
3	271	16.1%	
4	206	12.2%	
Highest 5	187	10.5%	
Ethnicity			
White	1,365	16.6%	0.001
Non-white	83	47.2%	
Self-rated health			
Fair/poor	541	23.1%	
Excellent/good	822	13.8%	0.001
Long-standing limiting illness			
Yes	669	22.0%	
No	780	14.5%	0.001
Coronary heart disease			
Yes	185	24.4%	
No	1,264	16.5%	0.001
Stroke			
Yes	87	33.9%	0.001
No	1,362	16.7%	
Diabetes			
Yes	156	22.8%	
No	1,293	16.7%	0.001
Cancer			
Yes	59	20.7%	0.113
No	1,390	17.1%	
Arthritis			
Yes	573	18.5%	0.017
No	876	16.5%	
Chronic lung disease			
Yes	62	19.1%	
No	1,387	17.1%	0.352
History of depressive symptoms			
Yes	22	18.5%	0.681
No	1,422	17.2%	
Elevated depressive symptoms			
Yes	304	23.8%	
No	1,009	14.5%	0.001
Impaired mobility			
Yes	973	19.3%	
No	476	14.1%	0.001

	N	%	*P* value
Impaired activities of daily living			
Yes	440	27.8%	0.001
No	1,009	15.2%	
Marital status			
Married	704	12.7%	0.001
Unmarried	745	25.8%	
Social isolation			
Low	244	6.5%	0.001
High	218	6.8%	
Social and cultural activities			
≥ 1 activity	230	15.9%	0.001
< 1 activity	270	18.6%	
Lonely			
Low	270	6.8%	0.001
High	246	7.1%	
Immediate recall (mean)		4.84 (+0.05)	0.001
Verbal fluency (mean)		16.82 (+0.19)	0.001
Delayed recall (mean)		3.26 (+0.06)	0.001
Smoking			
Current smoker	263	20.7%	0.001
Non-smoker	1,178	16.5%	
Alcohol			
≥ 1/day	67	3.9%	0.001
< 1/day	329	5.9%	
Vigorous or moderate activity			
≥ 1/week	844	13.4%	0.001
< 1/week	520	25.5%	

6.2.1 Measures

Independent variable: self-perceived age

As part of the self-completion questionnaire in Wave 2, respondents were asked 'How old do you feel you are?'. It followed questions on subjective social position and work but preceded questions on ideal age (what age you would like to be) and ageing experience. There were wide variations in response to this question as illustrated in Figure 6.1 responses ranged from 10 years old to 120 years old, with a mean self-perceived age of 56.8 (SD 13.3) years indicated by the dashed line.

Figure 6.1 Distribution of self-perceived age
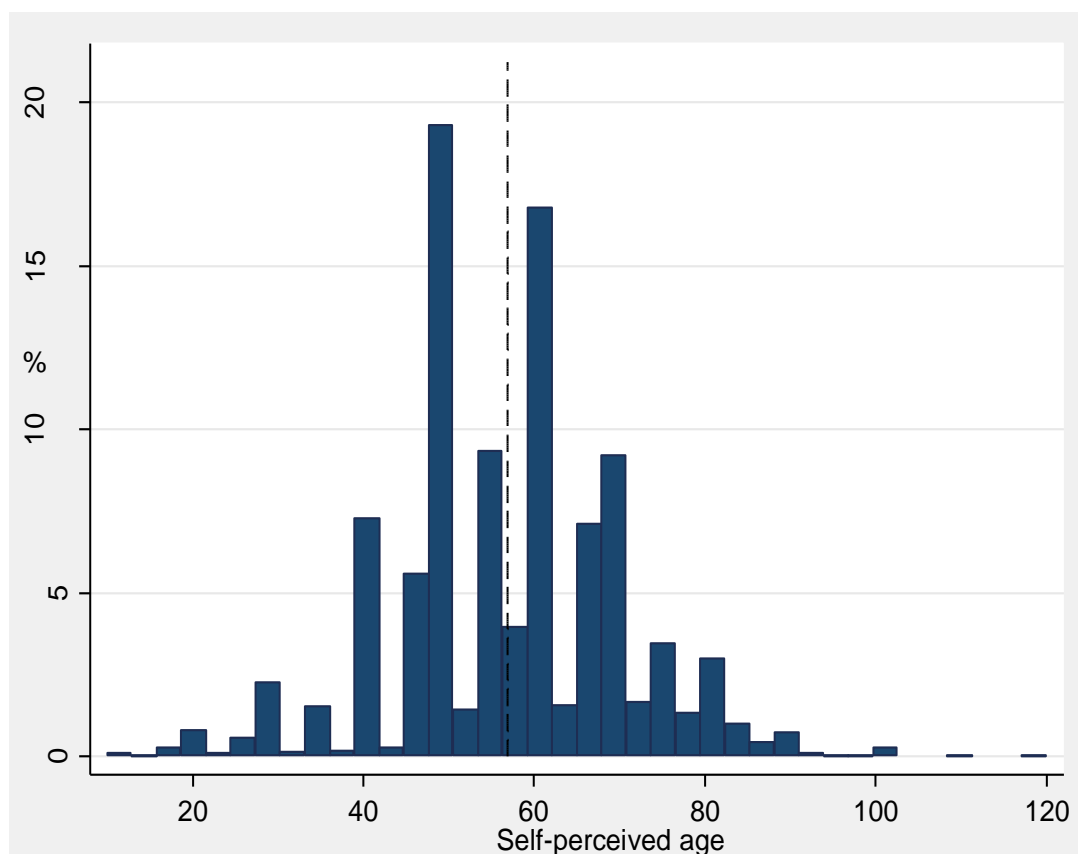
Note: dashed line indicates mean self-perceived age

In contrast, figure 6.2 depicts the chronological ages of the respondents, with the proportion at older ages declining steadily, where the mean age was 65.8 years old (SD 9.3). The anomaly at age 90 is due to ELSA top coding respondents ages when

they reach 90 years and over to protect the survey participants' identities as there is only a small proportion in this age group.

Figure 6.2 Distribution of chronological age
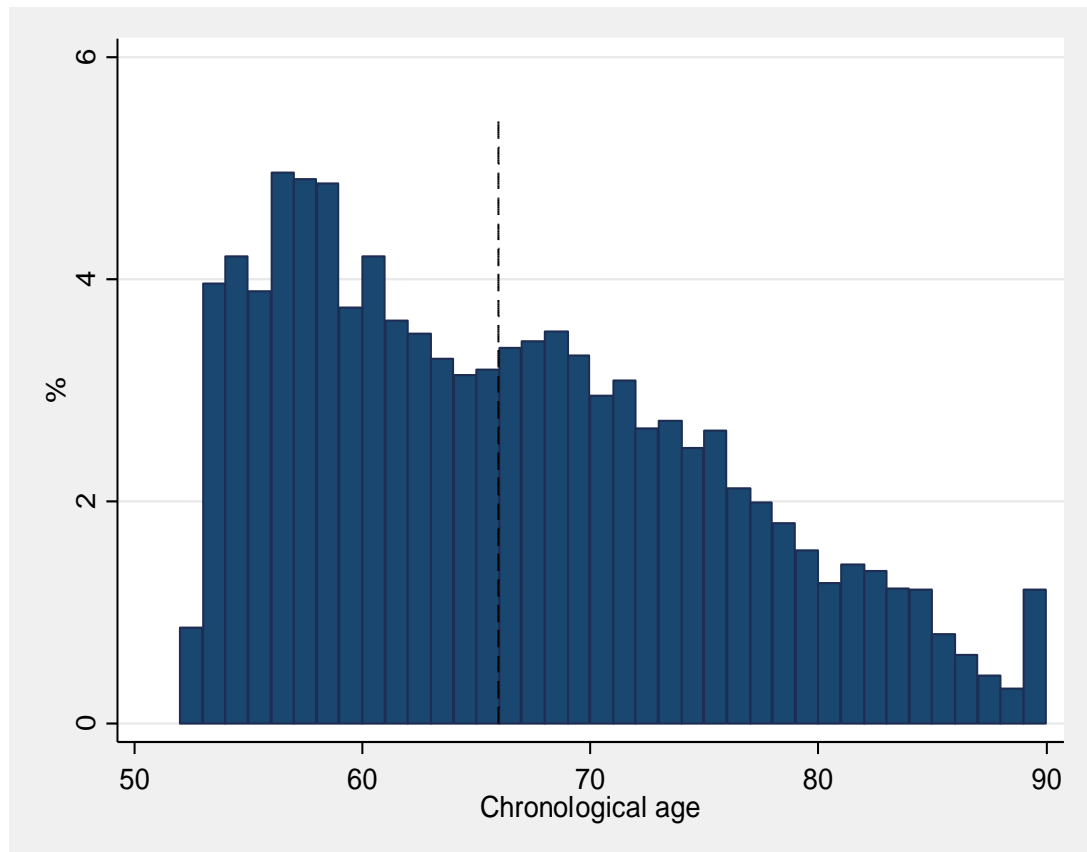
Note: dashed line indicates mean age of respondents

The discrepancy between self-perceived age and chronological was calculated and as can be seen in Figure 6.3 the difference between the two figures is negatively skewed, with a high concentration of respondents reporting feeling about the same as their chronological age or a few years younger. The mean difference between self-perceived age and chronological age was -9.1 years (SD 10.7). Due to the pronounced skewness of the distribution of the discrepancy between respondents' self-perceived age and chronological age I decided to derive categorical variables. Respondents were divided into three groups: those whose self-perceived age was close to their chronological age (one year older to two years younger), those who felt more than one year older than

their chronological age, and those who felt three or more years younger than their actual age. I excluded the answers of 21 individuals who said that they felt that they were younger than 10 years old because of uncertainty about whether they had understood the question or had responded frivolously. I reasoned that individuals might give an answer of a year or two either side of their actual age to indicate that they felt the same as their current age. Similar cut-points have been used by Uotinen et al. (2006), in this instance a discrepancy score between -1 and 1 was used to indicate feeling the same as chronological age. While questions in other surveys asked individuals if they felt about the same age, somewhat older or somewhat younger (Hubley and Russell, 2009) therefore I thought that giving a year or two either side of self-perceived age equalling actual age made it more comparable. Approximately 3.4% of respondents felt one year older than their actual age and the same proportion felt 1 or 2 years younger.

Figure 6.3 Distribution of the discrepancy between self-perceived age and chronological age
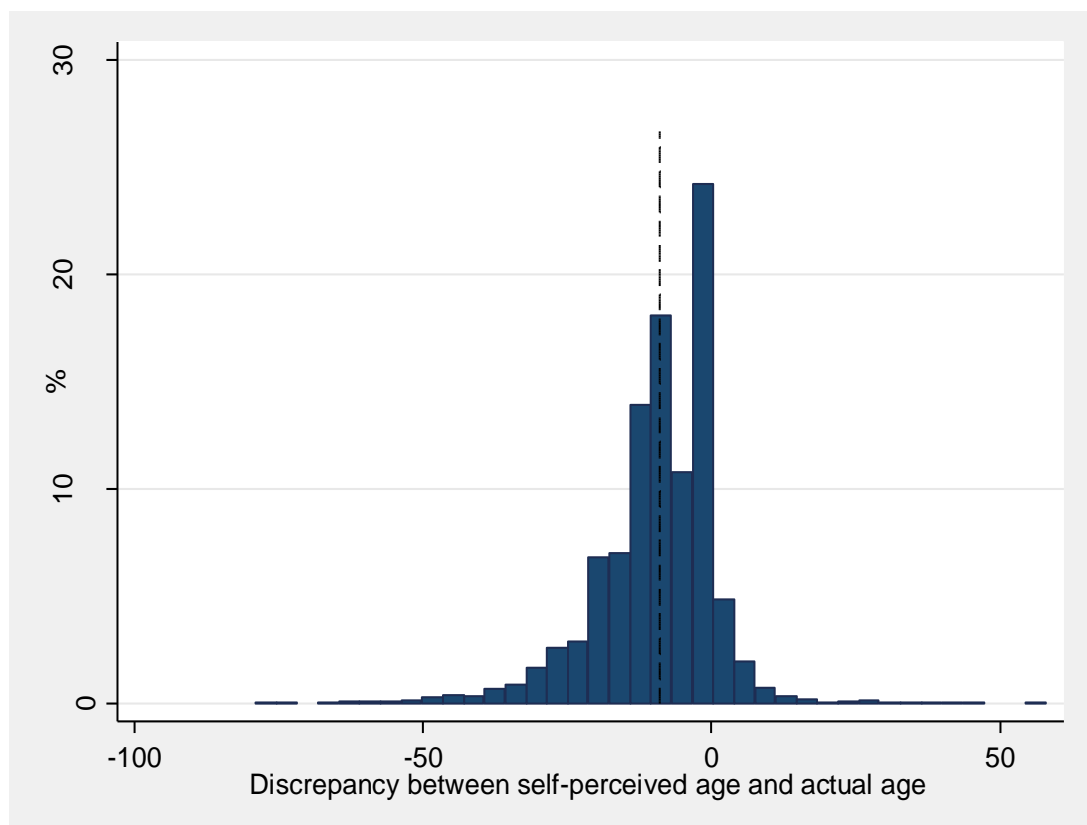
Note: dashed line indicates mean number of years between self-perceived age and chronological age

Outcome variable: mortality

Mortality data were obtained from the National Health Service (NHS) central data registry for individuals who gave consent for mortality follow-up. Data on all-cause mortality up to March 2013 were analysed, together with two major causes of death as defined at chapter level by ICD-10: cancer (colon, lung, female breast, prostate, other), and cardiovascular disease (myocardial infarction, coronary heart disease, cerebral infarction, other).

Covariates

The covariates considered in this study were identified from the literature as potentially influencing mortality and of being associated the exposure variable, self-perceived age. There is evidence that self-perceptions of age reflect existing health problems, poor physical function and psychological distress (Demakakos et al., 2007; Keyes and Westerhof, 2012; Levy et al., 2002a; Sargent-Cox et al., 2012; Uotinen et al., 2005), socio-economic status (SES), limitations in social activity, social isolation, impaired cognitive function and health behaviours (Infurna et al., 2010; Levy and Meyers, 2004; Westerhof and Barrett, 2005), all of which are potentially related to health outcomes and mortality.

Socio-demographic measures

Data were obtained on age, sex, ethnicity (white/non-white) and education, based on highest qualification achieved (no qualifications/ qualified below degree level/ degree or equivalent). Marital status was classified into married or equivalent versus other (never married, divorced, separated, or widowed). Total non-pension net wealth was categorised into quintiles for the purposes of analysis, as detailed previously in chapter three.

Physical health

Baseline health was assessed using three sets of measures included in the main ELSA interview. Firstly, self-rated health was measured by asking respondents to rate their health on a five-point scale: excellent, very good, good, fair or poor, and was subsequently categorised into fair/poor, or good to excellent. Second, participants were asked if they suffered from one or more long-standing illnesses, and if these illnesses limited daily activities; the two questions were combined to form a dichotomous variable (presence or absence of limiting long-standing illness). Thirdly, respondents were asked if they had a doctor diagnosis of coronary heart disease (CHD), cancer, stroke, diabetes, arthritis and chronic lung disease.

Emotional distress

Emotional distress was assessed as the presence of a doctor diagnosis of clinical depression, and by scores of four or more on the 8-item Center for Epidemiological Studies Depression Scale (CES-D) (Steffick, 2000). The CES-D scale includes eight questions about depressive symptoms experienced during the week before the interview (Radloff, 1977). Respondents were asked whether or not they felt: (a) depressed; (b) everything was an effort; (c) their sleep was restless; (d) happy; (e) lonely; (f) they enjoyed life; (g) sad; or (h) everything was an effort, for much of the time. Items d and f were reverse coded and a summary score was derived, with total scores ranging from 0 to 8. Scores of four or more were used to indicate elevated depressive symptoms and it has previously been demonstrated that this cut off point is equivalent to scores of 16 or more on the 20-item version of the CES-D scale (Steffick, 2000).

Social engagement

Social engagement was assessed with three measures. First, I created an index of social isolation by giving a point if the respondent the respondent was not married or

living with a partner, had less than monthly contact (including face-to-face, telephone or written/e-mail contact) with each of children, other family members, and friends, and if they did not participate in organisations such as social clubs or resident groups, religious groups or committees (Steptoe et al., 2013b). Scores ranged from 0 to 5, with higher scores indicating greater social isolation. Second, loneliness was measured using the three-item, short form of the Revised UCLA loneliness scale (Hughes et al., 2004). Respondents were asked how often they felt they lacked companionship, felt left out or felt isolated from others around them with response options of hardly ever, some of the time and never. Scores ranged from 3 to 9 with higher scores indicating greater loneliness. For the purposes of analysis, participants were divided by median split into those with low and high social isolation, and individuals with high and low loneliness scores. Third, participation in social and cultural activities was assessed by asking participants how often they went to the cinema, ate outside their home, went to an art gallery or museum, or attended the theatre, a concert or the opera. Respondents were given a point for every response of about once a month or more frequently, and scores were averaged. It should be noted that although loneliness and social isolation can be seen to be related, the two measures have previously been used together in other research and the association between the two has been shown to be small to moderate (Cornwell and Waite, 2009; Shankar et al., 2011).

Functional limitations

Functional limitations at baseline were assessed using two sets of questions which asked respondents whether they had difficulties with 10 common leg and arm functions and whether health problems interfered with six activities of daily living (ADLs). The ten mobility items were: walking 100 yards; getting up from a chair after sitting for long periods; climbing several flights of stairs without resting; climbing one flight of stairs without resting; stooping, kneeling or crouching; pulling or pushing large objects like a living-room chair; lifting or carrying weights over 10 pounds, like a heavy bag of

groceries; reaching or extending arms above shoulder level; sitting for about two hours; and picking up a small coin from a table. A 'yes' to any of the questions was coded as a positive response for impaired mobility. Limited ADLs were measured using a scale originally developed by Katz and colleagues (Katz et al., 1963). During the main ELSA interview respondents were asked whether they had difficulty with any of six ADLs: dressing, walking across a room, bathing or showering, eating, getting in or out of bed and using the toilet. A 'yes' to any question was coded as a positive response for limited ADLs.

Health behaviours

Health behaviours measured included smoking (current or not current), alcohol consumption frequency over the past year (daily, or almost daily/ less than daily) and participation in physical activity. Respondents were asked about the frequency of their participation in moderate and vigorous physical activities, with response options of more than once per week, once per week, one to three times per month, hardly ever. Responses to the two questions were combined and a dichotomous variable was derived indicating whether respondents participated in moderate to vigorous leisure-time activity once a week or less than once a week.

Cognitive function

Cognitive function at baseline was assessed with a battery of interviewer-administered tests. Three measures were used to assess memory and executive function that are known to be sensitive to age-related decline: immediate recall (number of ten aurally presented words recalled); delayed recall (recall of these same words after performance of intervening tasks); and verbal fluency, measured by the number of animals listed in one minute (Banks et al., 2006).

6.2.2   Statistical analyses

I divided participants into three groups: those whose self-perceived age was close to their chronological age (one year older to two years younger), those who felt more than one year older than their chronological age, and those who felt three or more years younger than their actual age. I compared the baseline characteristics of respondents in the three perceived age groups using chi-squared test for linear trend for categorical variables and analysis of covariance for continuous variables. Having checked that the proportional hazards assumption was not violated, Cox proportional hazard regression models were used to estimate the relative risk of all-cause mortality associated with self-perceived age, where feeling younger than chronological age was used as the reference category. Survival time was measured in months from date of interview to date of death, or to follow-up in March 2013. A series of nine models were fitted. The first model adjusted for age and sex. In model 2, socio-demographic characteristics (wealth, education and ethnicity) were added to the first model. In subsequent models emotional distress (model 3), cognitive function (model 4), social engagement (model 5), physical health (model 6), mobility (model 7), and health behaviour (model 8) were added to the baseline model of age and sex. In the final fully adjusted model (model 9) age, sex, wealth, ethnicity, baseline fair or poor self-rated health, longstanding limiting illness, CHD, cancer, arthritis, impaired mobility and activities of daily living, social isolation, social activities, loneliness, delayed recall, verbal fluency, smoking and physical activity were adjusted for, since these were the items that independently predicted mortality in models 2 - 8.

Three sensitivity analyses were carried out. First, the analyses were repeated excluding deaths within the first 12 months of baseline to assess whether imminent death leads to perceptions of being older. Second, whether the associations between self-perceived age and mortality were related to chronological age was assessed by

carrying out separate analyses of participants who were aged less than 70 or ≥70 at baseline. Third, I tested whether associations with self-perceived age were confined to the two major causes of death (cardiovascular disease and cancer). For these categories the associations with self-perceived age were analysed after adjustment for age and sex, and in fully adjusted models.

6.3   Results

The mean age of respondents was 65.79 ± 9.3 years, and the mean self-perceived age was 56.82 ± 13.3 years. On average, therefore, participants felt that they were 8.96 years younger than their actual age. I found a modest positive association between chronological age and the difference from self-perceived age (r = 0.11, P<0.001), indicating that the difference was larger in older participants. When I divided participants into the three self-perceived age groups, the majority (69.6%) felt three or more years younger than their actual age, with 25.6% having a self-perceived age close to their chronological age, and 4.8% who felt more than one year older than their chronological age. As can be seen in table 6.1, the self-perceived ages of the three groups were strikingly different, ranging from 52.3 years for those who felt younger, to 72.3 years for those who felt older; this despite the fact that participants who felt older were slightly younger than the other groups. The respondents who felt older than their age had lower wealth, more limited education, poorer self-rated health, suffered from more serious illnesses, had more mobility problems and impaired activities of daily living, and were more likely to be lonely and report depressive symptoms than those who felt younger than their age. I found that participants who felt younger than their age were more likely to be women, engaged in more social/cultural activity, had higher scores on cognitive tests of memory and executive function, and were more likely to be non-smokers and be physically activity than those who felt the same or older than their chronological age.

A notable wealth gradient was observed in the feeling younger than chronological age and feeling older groups. In the feeling younger group, the proportion of respondents who reported feeling younger increased markedly with each wealth quintile, ranging from 16% in the lowest quintile to 22.5% in the highest. While in the feeling older group the opposite gradient was observed, ranging from 27.8% in the lowest wealth quintile to 9.9% in the highest quintile. I observed a different pattern for education, with fewer respondents in all three self-perceived age groups educated to degree level or above. However, the proportion in the higher education groups was higher in the feeling younger group and the same as actual age group (both 26.3%) in comparison with the feeling older than their actual age group (16.3%).

Table 6.2 Characteristics of the three perceived age groups: percent mortality adjusted for age and sex (95% confidence intervals) or N (percent)

	Younger than chronological age (n = 4515)	About the same as chronological age (n = 1661)	Older than chronological age (n = 313)	*P* value
Age (years)	65.8 ± 9.2	66.0 ± 9.5	63.8 ± 9.2	0.001
Perceived age (years)	52.3 ± 11.9	66.1 ± 9.5	72.3± 13.2	0.001
Sex				
Male	1979 (43.8%)	840 (50.6%)	152 (48.6%)	0.001
Female	2536 (56.2%)	821 (49.4%)	161 (51.4%)	
Ethnicity (white)	4479 (99.2%)	1631 (98.2%)	305 (97.4%)	0.001
Wealth				
Lowest 1	723 (16.0%)	312 (18.8%)	87 (27.8%)	0.001
2	870 (19.3%)	311 (18.7%)	83 (26.5%)	
3	944 (20.9%)	310 (18.7%)	59 (18.8%)	
4	963 (21.3%)	366 (22.0%)	53 (16.9%)	
Highest 5	1015 (22.5%)	362 (21.8%)	31 (9.9%)	
Education				
Lower	1533 (34.0%)	620 (37.3%)	145 (46.3%)	0.001
Intermediate	1792 (39.7%)	603 (36.3%)	117 (37.4%)	
Higher	1189 (26.3%)	437 (26.3%)	51 (16.3%)	
Self-rated health				
Fair or poor	838 (18.6%)	547 (32.9%)	212 (67.7%)	0.001
Long-standing limiting illness	1247 (27.6%)	674 (40.6%)	219 (70.0%)	0.001
Coronary heart disease	144 (3.2%)	70 (4.2%)	21 (6.7%)	0.001
Cancer	129 (2.9%)	60 (3.6%)	11 (3.5%)	0.14
Stroke	94 (2.1%)	67 (4.0%)	18 (5.8%)	0.001
Diabetes	244 (5.4%)	127 (7.6%)	45 (14.4%)	0.001
Arthritis	1469 (32.5%)	625 (37.6%)	169 (54.0%)	0.001
Chronic lung disease	50 (1.1%)	34 (2.0%)	14 (4.5%)	0.001
Impaired mobility	2397 (53.1%)	1074 (64.7%)	257 (82.1%)	0.001
Impaired activities of daily living	677 (15.0%)	370 (22.3%)	149 (47.6%)	0.001
History of depressive symptoms	62 (1.4%)	27 (1.6%)	7 (2.2%)	0.20

	Younger than chronological age (n = 4515)	About the same as chronological age (n = 1661)	Older than chronological age (n = 313)	*P* value
Elevated depressive symptoms	760 (16.8%)	417 (25.1%)	171 (54.6%)	0.001
Married	3112 (69.0%)	1218 (73.0%)	208 (66.5%)	0.15
Social isolation	2136 (47.3%)	731 (44.0%)	161 (51.4%)	0.54
Lonely	1940 (43.0%)	804 (48.4%)	224 (71.6%)	0.001
Social /cultural activity	0.72 ± 0.78	0.65 ± 0.74	0.52 ± 0.67	0.001
Immediate recall	5.86 ± 1.7	5.65 ± 1.7	5.48 ± 1.7	0.001
Delayed recall (n)	4.57 ± 2.0	4.25 ± 2.1	3.97 ± 2.0	0.001
Verbal fluency (n)	20.57 ± 6.2	20.15 ± 6.5	18.98 ± 6.2	0.001
Current smoker	592 (13.1%)	223 (13.4%)	64 (20.4%)	0.009
Vigorous or moderate activity ≥ 1/week	3803 (84.2%)	1152 (69.4%)	172 (55.0%)	0.001
Alcohol ≥ 1/day	1132 (25.2%)	407 (24.7%)	50 (16.1%)	0.008

Over the average follow-up period of 99 months, there were 1,030 deaths (15.9%). The crude mortality rate was 14.3% in participants who felt younger than their actual age, 18.5% in those who felt about the same as their actual age, and 24.6% in those who felt older (Table 6.3). Compared with feeling younger, feeling about the same as actual age was associated with a 29% increased risk, and feeling older than actual age with a 159% increased risk of mortality after adjusting for age and sex (Table 6.3, model 1). Adjustment for socioeconomic factors including wealth, education and ethnicity (model 2), emotional distress (model 3), cognitive function (model 4), and social engagement (model 5) had limited effects on the associations between self-perceived age and mortality, reducing the risk of feeling older than actual age by 12 – 23%. But adjustment for physical health measures (self-rated health, limiting long-standing illness, and diagnosis of serious illness at baseline) reduced the hazard ratio in those who felt older than their actual age from 2.59 (95% CI 2.04 - 3.28, model 1) to 1.70 (95% CI 1.32 - 2.17, model 6), reducing the effect of feeling older than actual age by 56%. The difference in risk between groups feeling younger and feeling about the same as actual age was eliminated once physical health had been taken into account. Statistical adjustment for impaired mobility at baseline (model 7) and for health behaviours including smoking, physical activity and alcohol intake (model 8) also had pronounced effects on the associations between self-perceived age and mortality, reducing the risk of mortality in the feeling older group by around 33% and 42% respectively.

Table 6.3 Self-perceived age and all-cause mortality risk

Perceptions of age	Younger than chronological age (n = 4515)	About the same as chronological age (n = 1661)		Older than chronological age (n = 313)	
Death (%)	646 (14.3%)	307 (18.5%)		77 (24.6%)	
		Hazard ratio (95% CI)	**_P_ value**	**Hazard ratio (95% CI)**	**_P_ value**
Model 1 (age, sex)	Reference	1.29 (1.12 – 1.47)	0.001	2.59 (2.04 – 3.28)	0.001
Model 2: age, sex + sociodemographic factors[1]	Reference	1.27 (1.10 – 1.45)	0.001	2.36 (1.86 – 3.00)	0.001
Model 3: age, sex + emotional distress[2]	Reference	1.22 (1.07 – 1.40)	0.004	2.23 (1.75 – 2.85)	0.001
Model 4: age, sex + social engagement[3]	Reference	1.25 (1.09 – 1.44)	0.001	2.33 (1.83 – 2.96)	0.001
Model 5: age, sex + cognitive function[4]	Reference	1.24 (1.08 – 1.42)	0.002	2.30 (1.81 – 2.92)	0.001
Model 6: age, sex + physical health[5]	Reference	1.06 (0.92 – 1.22)	0.43	1.70 (1.32 – 2.17)	0.001
Model 7: age, sex + mobility[6]	Reference	1.18 (1.03 – 1.36)	0.017	2.07 (1.62 – 2.62)	0.001
Model 8: age, sex + health behaviour[7]	Reference	1.21 (1.05 – 1.38)	0.007	1.93 (1.52 – 2.46)	0.001
Model 9: fully adjusted[8]	Reference	1.05 (0.91 – 1.20)	0.51	1.41 (1.10 – 1.82)	0.007

Notes: [1] Wealth, education, and ethnicity [2] Clinical depression in part two years and current depressive symptoms

[3] Marriage, social isolation, social activities, and loneliness [4] Immediate recall, delayed recall, verbal fluency

[5] Baseline fair or poor self-rated health, longstanding limiting illness, CHD, cancer, diabetes, chronic lung disease, stroke and arthritis

[6] Baseline impaired mobility and activities of daily living [7] Smoking, physical activity, and alcohol consumption

[8] Age, sex, wealth, ethnicity, baseline fair or poor self-rated health, longstanding limiting illness, CHD, cancer, arthritis, impaired mobility and activities of daily living, social isolation, social activities, loneliness, delayed recall, verbal fluency, smoking and physical activity

In the fully adjusted model, I combined the measures in the separate analyses that were independently associated with mortality in models 1 to 8. The measures included were age, sex, wealth, ethnicity, baseline fair or poor self-rated health, longstanding limiting illness, CHD, cancer, arthritis, impaired mobility and activities of daily living, social isolation, social activities, loneliness, delayed recall, verbal fluency, smoking and physical activity. I found that feeling older than actual age remained a significant independent predictor of mortality (HR 1.41, 95% CI 1.10 - 1.82), while feeling about the same as chronological age was not associated with increased mortality, in comparison with the participants who felt younger than their actual age. Apart from self-perceived age, the factors that were independently associated with greater mortality in the final model were older age, being male, poor self-rated health, presence of limiting long-standing illness, a baseline diagnosis of cancer, impaired mobility, social isolation and smoking, while ethnic minority status, a diagnosis of arthritis, high verbal fluency and physical activity were associated with reduced mortality (Table 6.4). Therefore, an individual who feels older than their actual age has a 41% risk of death at any given point over the follow-up period in comparison with someone who feels younger than their actual age with factors such as existing health problems, functional capacity and being male increasing the risk of dying over the follow-up period. Alternatively, this could be calculated to indicate that individuals who feel older than their age have a 58% chance of dying first over the whole follow-up period in comparison with an individual who feels younger than their age.

Table 6.4 Cox regression on mortality in fully adjusted model

Factor	Adjusted Hazard Ratio (95% CI)	P value
Self-perception of age		
Younger	1.00	
About the same	1.05 (0.91-1.20)	0.51
Older	1.41 (1.10-1.82)	0.007
Age	1.10 (1.10-1.11)	<0.001
Sex (male)	0.52 (0.46-0.59)	<0.001
Wealth		
1 (lowest)	1.00	
2	0.89 (0.72-1.10)	0.30
3	0.87 (0.72-1.07)	0.18
4	0.76 (0.62-0.92)	0.006
5 (highest)	0.96 (0.80-1.15)	0.63
Ethnicity (White)	0.28 (0.10-0.88)	0.029
Self-rated health (fair to poor)	1.26 (1.08-1.47)	0.004
Limiting long-standing	1.49 (1.28-1.74)	<0.001
Coronary heart disease	1.23 (0.98-1.55)	0.071
Cancer	2.35 (1.86-2.97)	<0.001
Arthritis	0.77 (0.67-0.89)	<0.001
Impaired mobility	1.42 (1.19-1.70)	<0.001
Impaired activities of daily	1.05 (0.90-1.22)	0.55
Depressive symptoms	1.02 (0.87-1.18)	0.84
Social isolation	1.16 (1.06-1.26)	<0.001
Social/cultural activities	0.95 (0.86-1.04)	0.26
Loneliness	1.02 (0.89-1.17)	0.77
Delayed recall	0.96 (0.94-1.01)	0.16
Verbal fluency	0.98 (0.97-0.99)	0.017
Smoking	1.60 (1.34-1.90)	<0.001
Physical activity	0.65 (0.56-0.75)	<0.001

I repeated the analyses after excluding the 945 deaths that occurred within 12 months of baseline assessment, as shown in Table 6.5. 26.3% of respondents who felt older than their age died within this period compared with 13.4% of respondents who felt younger and 16.3% of respondents who felt about their age. In comparison with those who felt younger than their actual age, the risk of dying in participants who felt older than their actual age was 2.68 (95% CI 2.09 - 3.42) after adjusting for age and sex, falling to 1.50 (95% CI 1.15 - 1.95) in the fully adjusted model. The smaller increase in risk among those who felt about the same as their actual age was no longer present in the fully adjusted model - HR 1.25 (95% CI 1.08-1.44) after adjustment for age and sex compared with HR 1.03 (95% CI 0.89-1.19) in the final model. In the fully adjusted model, the pattern of results was very similar to that shown for the full sample (Table 6.4). The individual predictors of mortality in the final model were similar to those found in the full sample. For example, older age, being male, poor self-rated health, presence of a limiting long-standing illness, a baseline diagnosis of cancer, impaired mobility, social isolation and smoking all remained significant predictors of mortality. Thus, the association between feeling older and risk of dying was not due to participants in the terminal phases of their lives rating themselves as older than their real age.

Table 6.5 Cox regression on mortality, excluding deaths within 12 months of baseline (945 deaths)

Factor	Adjusted Hazard Ratio (95% CI)	P value
Self-perception of age:		
Younger	1.00	
About the same	1.03 (0.90-1.19)	0.70
Older	1.50 (1.15-1.95)	0.003
Age	1.11 (1.10-1.12)	<0.001
Sex (male)	0.53 (0.46-0.61)	<0.001
Wealth		
1 (lowest)	1.00	
2	0.91 (0.73-1.14)	0.43
3	0.92 (0.74-1.13)	0.40
4	0.77 (0.63-0.95)	0.013
5 (highest)	0.94 (0.78-1.15)	0.56
Ethnicity (White European)	0.21 (0.05-0.84)	0.027
Self-rated health (fair to poor)	1.24 (1.05-1.45)	0.011
Limiting long-standing illness	1.44 (1.23-1.69)	<0.001
Coronary heart disease	1.26 (0.99-1.60)	0.052
Cancer	2.10 (1.62-2.73)	<0.001
Arthritis	0.80 (0.69-0.92)	0.002
Impaired mobility	1.47 (1.22-1.77)	<0.001
Impaired activities of daily living	1.05 (0.90-1.23)	0.55
Depressive symptoms	1.02 (0.87-1.20)	0.78
Social isolation	1.16 (1.06-1.27)	<0.001
Social/cultural activities	0.94 (0.84-1.04)	0.22
Loneliness	1.01 (0.88-1.17)	0.85
Delayed recall	0.96 (0.93-0.99)	0.041
Verbal fluency	0.99 (0.98-1.00)	0.091
Smoking	1.70 (1.42-2.03)	<0.001
Physical activity	0.70 (0.61-0.82)	<0.001

The remaining sensitivity analyses are summarised in Table 6.6. When the sample was divided into those aged 70 and over or less than 70, the associations were stronger in the older participants; however, the number of deaths in the younger category was small (276 vs 754 deaths). Of the respondents who were aged 70 and over at baseline, 59.6% of individuals of who felt older than their actual age died compared with 32.4% of those felt younger than their actual age. In comparison with those who felt younger than their actual age, the risk of dying in participants who felt older than their age was 2.53 (95% CI 1.87-3.42) after adjustment for age and sex, falling to 1.54 (95% CI 1.12-2.18) in the final fully adjusted model. While for individuals who felt about the same as their actual age, the risk of dying fell from 1.24 (1.06-1.45) after adjustment for age and sex, to 1.04 (0.88-1.22) in the fully adjusted model and it was no longer significantly different to those who felt younger than their actual age. In the case of individuals aged under 70, 13.1% of respondents who felt older than their actual age died, compared with 5.5% who felt younger than their actual age, the hazard ratio for those who felt older in the fully adjusted model was 1.23 (95% CI 0.80-1.88).

The analyses of separate broad causes of death showed no association between self-perceived age and death from cancer, but strong relationships were found for deaths from cardiovascular disease. For example, 4.5% of individuals who felt younger than their actual age died from cardiovascular causes over the follow-up period, compared with 10.2% of those felt older than their actual age, and the hazard ratio for those who felt older in the fully adjusted model was 1.55 (95% CI 1.01-2.38). The number of deaths from cancer over the follow-up period was slightly higher in comparison with deaths from cardiovascular diseases – 363 vs 327. However, the differences between the three self-perceived age groups was smaller, with 6.7% of individuals who felt older than their actual age dying from cancer in comparison with 6.2% who felt their age and 5.3% who felt younger than their age. In comparison with those who felt younger than their actual age, the risk of dying of cancer in participants who felt older than their

actual age and who felt about their age was not statistically significant after adjustment for age and sex.

Table 6.6 Self-perceived age and mortality - subgroup analyses

Percent mortality adjusted for age and sex (95% confidence intervals) and adjusted hazard ratio (HR) with 95% confidence intervals

	Younger than chronological age	About the same as chronological age	Older than chronological age
Age ≥ 70 years (754 deaths):			
Percent died	32.4 (30.1-34.6)	37.6 (34.1-41.1)	59.6 (49.9-69.4)
HR (age, sex)	1.00 (reference)	1.24 (1.06-1.45)	2.53 (1.87-3.42)
HR (fully adjusted[1])	1.00 (reference)	1.04 (0.88-1.22)	1.54 (1.12-2.18)
Age < 70 years (276 deaths):			
Percent died	5.5 (4.6-6.3)	7.5 (6.0-8.9)	13.1 (10.0-16.2)
HR (age, sex)	1.00 (reference)	1.39 (1.07-1.82)	2.67 (1.80-3.94)
HR (fully adjusted[1])	1.00 (reference)	1.09 (0.82-1.43)	1.23 (0.80-1.88)
Death from cancer (363 deaths):			
Percent died	5.3 (4.6-6.0)	6.2 (5.1-7.3)	6.7 (4.2-9.2)
HR (age, sex)	1.00 (reference)	1.20 (0.95-1.51)	1.54 (0.96-2.46)
HR (fully adjusted[1])	1.00 (reference)	1.03 (0.81-1.30)	1.13 (0.69-1.84)
Death from cardiovascular disease (327 deaths):			
Percent died	4.5 (3.9-5.1)	5.6 (4.6-6.6)	10.2 (7.9-12.5)
HR (age, sex)	1.00 (reference)	1.30 (1.02-1.65)	3.10 (2.09-4.63)
HR (fully adjusted[1])	1.00 (reference)	1.09 (0.85-1.39)	1.55 (1.01-2.38)

Notes: [1] Adjusted for age, sex, wealth, ethnicity, baseline fair or poor self-rated health, longstanding limiting illness, CHD, cancer, arthritis, impaired mobility and activities of daily living, social isolation, social activities, loneliness, delayed recall, verbal fluency, smoking and physical activity

6.4 Discussion

In this study I found that self-perceived age predicted all-cause and cardiovascular mortality in a nationally representative sample of older adults over a follow-up period of 99 months. Feeling older than actual age was associated with a 41% increase in mortality hazard after adjusting for all covariates, while feeling about the same as chronological age was not associated with increased mortality, in comparison with the participants who felt younger than their actual age. This confirms the findings of earlier research which demonstrated that positive self-perceptions of age relate to lower hazards of dying up to 23 years after baseline measurements (Kotter-Grühn et al., 2009; Levy et al., 2002b; Maier and Smith, 1999; Markides and Pappas, 1982; Sargent-Cox et al., 2014; Uotinen et al., 2005). As expected, the strength of the association between self-perceived age and mortality was reduced once existing health problems, functional limitations and health behaviours were accounted for. Although the addition psychological distress did also reduce the strength of the association, it explained less of the relationship between self-perceived age and mortality in comparison with existing health problems, functional capacity and health behaviours.

Feeling younger was associated with higher SES, fewer illness and mobility problems, more social engagement, less depression, better cognitive function and a healthier lifestyle. Similar patterns have been shown previously (Demakakos et al., 2007; Kotter-Grühn et al., 2009; Levy et al., 2002a; Sargent-Cox et al., 2014). Since many of these factors are related to survival, they might account for the association with mortality. The results of our multivariate analyses revealed that the strongest confounding effects were for pre-existing physical illness. Taking baseline physical health into account reduced the effect of feeling older than actual age by 56%, and completely accounted for the difference between feeling younger and feeling about the same as chronological age. This suggests that illness has a marked impact on how old people feel at more

advanced ages. Factors such as SES, social engagement, depression and cognitive function had a limited impact on the association of self-perceived age with mortality. I observed stronger effects of baseline mobility impairment and health behaviours, which reduced the risk of feeling older than actual age by 33% and 42% respectively. However, it is notable that even when all these factors were taken into account, feeling older than actual age was still associated with a 41% increase in risk of dying over the next eight years. A positive correlation between age and difference from self-perceived age was observed, as noted in previous studies (Kotter-Grühn et al., 2009; Wurm et al., 2008); this placed more of the older people in the 'feeling younger' group, militating against associations with mortality.

When the sample was divided into those aged 70 and over or less than 70, the associations between self-perceived age and mortality were stronger in the older participants. This in part might be explained by the smaller number of deaths in the younger category - 276 compared to 754 deaths in the older age group. Equally it could indicate that self-perceived age is more important when health is more vulnerable. Individuals might relate their self-perceived age to more important aspects of functioning at older ages, rather to general reflections of ageing tiredness and lethargy to which they may have adapted to. For example, Uotinen and colleagues (2005) in their study over 65 years olds demonstrated a stronger association between self-perceptions of physical age and mortality in comparison with self-perceived mental age. Analyses of separate causes of death showed a strong relationship between self-perceived age and cardiovascular death, but no association between self-perceived age and cancer mortality. The finding that self-perceived age was not associated with deaths from cancer is broadly in line with a recent study of 292 cancer patients receiving chemotherapy. The study revealed no association between self-perceived age and survival over a 15 month period (Lim et al., 2013). However, the study covered a wide age range (26 to 85 years) and did not adjust for factors such as, SES or

psychosocial measures amongst others, so there may have been other factors accounting for their finding. I found the differences between the three self-perceived age groups was smaller in this group in comparison with the cardiovascular deaths group and all-cause mortality suggesting that the processes involved may differ. In the cardiovascular mortality group, the risk of mortality in the feeling older group was higher (HR 1.55, 95% CI 1.01-2.38) in comparison with all-cause mortality (HR 1.41, 95% CI 1.10-1.82).

6.4.1 Possible mechanisms and implications

The pathways between self-perceived age and mortality are not yet fully understood (Sargent-Cox et al., 2014). The observation that self-perceived age predicted deaths from cardiovascular diseases but not from cancer suggests that focused mechanisms might be involved. A number of possible pathways have been proposed in the literature, including the adoption of preventive health behaviours, resilience, and a will to live. Positive perceptions of ageing have been shown to predict a range of prudent health behaviours over a follow-up period of 20 years (Levy and Myers, 2004). In this study, I found that smoking, physical inactivity and alcohol consumption were related to self-perceived age, but only partly accounted for the association with mortality. I did not measure a number of other health behaviours such as healthy dietary choice and weight maintenance, or adherence to medical advice. Including these factors might have led to a stronger impact of behaviour on the association between self-perceived age and mortality. Another explanation is that feeling younger may reflect resilience, mastery, sense of control and satisfaction with aging (Kotter-Grühn et al., 2009; Westerhof and Barrett, 2005). Having a positive self-perception of age may buffer the impact of serious health events and other negative life events (Wurm et al., 2008). Wurm and colleagues demonstrated that having a more positive self-perception of ageing had a beneficial effect on life satisfaction and self-rated health even after a

serious health event, with the implication of this being that having a more positive attitude towards ageing can act as a protective psychological resource at older ages.

It has also been suggested that a 'will to live' may partially explain the relationship between self-perceived age and longevity (Levy et al., 2002b). Another recent study using ELSA demonstrated that anticipating shorter survival was an important predictor of mortality (Adams et al., 2014). In this study, participants where asked what their chance was of living between 1 and 25 years longer. The exact number of years asked was dependent upon the respondent's actual age (for example, a respondent aged between 66 and 69 was asked if they thought would live until they were 80). Participants who felt they had a high chance of living longer (66% and over) also had a higher likelihood of survival in comparison with individuals who had a lower anticipated survival (less than 33% chance). Levy et al (2002b) argue that the will to live is one of the perspectives on ageing that is internalized from a young age and maintained over the life course. Societal attitudes to and stereotypes of ageing reinforce negative perceptions of ageing and thereby contribute to self-perceived age.

Evidence from empirical studies suggests that self-perceived age has the potential to be changed so interventions may be possible (Sarkisian et al., 2007; Stephan et al., 2013). This could be achieved by identifying individuals who feel older than actual age, targeting of health messages, and promoting positive health behaviours and attitudes to ageing. If a person says that he or she feels older than they are, this could be a warning sign that special efforts should be made to understand the factors underlying this perception.

6.4.2 Strengths and weaknesses of study

There are no studies in the literature on self-perceived age and mortality of a similar size or national scope. This study used data from a nationally representative survey, and I was able to control for a range of health and demographic measures. One of the problems in interpreting longitudinal observational studies is that associations might be due to reverse causality, where the outcome (death or imminent death) causes different values of the exposure measure (self-perceived age). It is conceivable that individuals nearing death because of serious illness might rate themselves as older than they are (Kotter-Grühn et al., 2009), resulting in an apparent predictive association between self-perceived age and mortality. Maier and Smith (1999) have argued that as individuals become more aware of declining physical or cognitive health that they will negatively attribute these phenomena to ageing and this may be reflected in their reported self-perceived age. I reasoned that if this process was operating, it would likely occur among individuals who died within a few months of baseline assessments. However, when I omitted deaths within the first year following assessment, the association between self-perceived age and mortality remained the same as in the full cohort. This suggests that reverse causality was not a major factor in the results I observed. But it does not rule out the possibility that other factors were operating. There may be unmeasured confounders and biological correlates that I have not accounted for in the present analyses.

A key limitation of this study is response bias. In particular 17.2% of the sample did not provide data on self-perceived age. Individuals who did not complete the measure tended to older, less wealthy, less educated, reported poorer self-rated health and they were more likely to die over the follow-up period in comparison with those who completed the self-perceived age measure. I do not know why these participants failed to complete the measure. However, based on the observation that the same covariates

characterise those who felt older than their actual age, it is probably that they resemble this high risk group. It is notable that the mortality rate in people who did not provide self-perceived age was 33.7%, higher even than those who felt older than their chronological age (24.6%). Consequently their exclusion is likely to have led to an underestimation of the impact of feeling older than actual age. A further possible limitation is that I used a single item to measure self-perceived age. Some authorities have argued that the construct is multidimensional (Kotter-Grühn et al., 2009; Sargent-Cox et al., 2012; Steverink et al., 2001), so it may not be captured in a single measure. For example, a single measure may not accurately reflect simultaneous perceived age related gains and losses (Diehl et al., 2014; Diehl and Wahl, 2010; Spuling et al., 2013). However, a recent meta-analysis investigating the longitudinal association between self-perceived age and health and longevity found no significant difference in the strength of predications using a single-item measure of self-perceived age in comparison with a multi-item measure (Westerhof et al., 2014). Equally the item I used is simple and brief, so has potential as a practical measure.

6.5   Conclusions

This study confirms that self-perceived age is an important predictor of all-cause mortality and death from cardiovascular disease. The associations remained after taking physical health and mobility into account and self-perceived age still predicted mortality whether or not deaths in the first 12 months after baseline were excluded or not. Research in this area offers the opportunity to understand better the mechanisms through which positive self-perceptions of age are associated with longevity.

7 Is the relationship between self-perceived age, emotional wellbeing and functional capacity bidirectional? (Study 4)

7.1 Introduction

This study aims to build on Study 3, where it was shown that feeling older than actual age was associated with an increased risk of mortality even after controlling for physical health measures. The objective of the current study is to try to understand this relationship further, in particular, to investigate whether self-perceptions of age influence emotional wellbeing and functional capacity. Both these factors are on the pathway to frailty and disability and therefore may serve as indicators of poorer health at older ages. Westerhof and Tulle (2007) argue that self-perceived age may affect health and ultimately mortality through psychosocial factors, such as, subjective wellbeing, social interaction and health behaviours. It is plausible in each case there is a bidirectional relationship. People with impaired daily functioning and mobility restrictions may feel older than their actual age and conversely feeling older might lead to beliefs that one's activities are limited, and make individuals perceive impairments more vividly. In the case of emotional wellbeing, depressed mood could make you feel older, and conversely if you feel old it might make you feel depressed.

The relevance of these factors is consistent with Levy's stereotype embodiment theory, which describes the processes through which appraisals of the ageing process could lead to feeling older (Levy, 2009). It has also been argued that self-perceptions of age is a lens through which age-related changes are interpreted, and these interpretations can affect future health and health behaviours through psychological and behavioural pathways (Sargent-Cox et al., 2012). Consistent with this, older adults with positive self-perceptions of age are more likely to use preventive health behaviours, follow medical advice therefore improving health outcomes (Levy and Myers, 2004). Further,

while I could have selected a number of other factors in this study, both functional capacity and emotional wellbeing are potentially malleable so are worth focusing on since they might be targets for interventions.

7.1.1 Functional capacity

Declining physical function can serve as an indicator of current health status and frailty (Clegg et al., 2013). Evidence from a systematic review highlighted that cognitive function, depression, social isolation, co-morbidities or disease burden, poor self-rated health, smoking and low levels of physical activity are associated with declining functional health (measured variously as limited ADLs and impaired mobility) at older ages (Stuck et al., 1999). Poorer social economic status and chronological age may have an important impact on functional capacity while higher educational status may be protective (Stuck et al., 1999). Impaired mobility may also be indicative of poorer physical health, health behaviours and co-morbidities (Guralnik et al., 1993; Stenholm et al., 2015).

Impaired functional capacity can affect an individual's everyday life therefore it is conceivable that individuals who have experienced difficulties with ADLs or who have impaired mobility may have an older self-perceived age in comparison with those who have not experienced any difficulties. A recent study of 1,212 over 65 year olds found that having a positive or younger perception of age was potentially protective of declining physical functioning over a 16 year period; in this instance physical functioning was measured using a set of objective tests (Sargent-Cox et al., 2012). In an earlier study of 433 over 50 year olds, a similar finding was observed where respondents with a positive self-perceived age reported better (self-reported) functional capacity than those with more negative perceptions over an 18 year period (Levy et al., 2002a). While Moser and colleagues (2011) demonstrated that respondents who had a

negative self-perceived age at baseline were more likely to report new ADL or IADL limitations at follow-up intervals in comparison with those who had a positive self-perception of ageing.

7.1.2 Emotional wellbeing

Evidence from reviews suggest that some of the key predictors of depressive symptoms at older ages include female sex, functional limitations, cognitive impairments, poor self-rated health, chronic health conditions and lack of social networks, along with prior emotional distress (Cole and Dendukuri, 2003; Djernes, 2006). To my knowledge only a handful of longitudinal studies have investigated the association between self-perceptions of age and emotional health (Westerhof et al., 2014). However, both have been shown to be strongly correlated, with individuals who feel younger or have a positive self-perceived age being less likely to demonstrate elevated depressive symptoms (Barak and Stern, 1986). Older adults with younger subjective ages or age identities are more likely to have better subjective wellbeing and life satisfaction (Barrett, 2003; Keyes and Westerhof, 2012; Mock and Eibach, 2011; Westerhof and Barrett, 2005).

One study of 40 to 74 year olds using data from MIDUS II demonstrated that having an older subjective age was associated with a higher likelihood of negative affect and lower life satisfaction 10 years later (Mock and Eibach, 2011). The study also demonstrated that if an individual had more negative attitudes to ageing the effects of feeling older on life satisfaction and negative affect held whereas having a more positive attitude to ageing attenuated the effect of feeling older than actual age on wellbeing. Drawing on the potential role of ageing stereotypes, evidence from empirical studies has demonstrated that resistance to negative age stereotypes may potentially

help to protect against the development of psychiatric conditions (Levy et al., 2014c), therefore having implications for future interventions for emotional health.

7.1.3   The direction of the association between self-perceived age and health

Although there has been much research in this area, very few of these studies have attempted to test the direction of the relationship between self-perceived age and health (Kotter-Grühn, 2015), and to my knowledge only a handful of longitudinal studies have examined the direction of the relationship between self-perceived age, emotional wellbeing and functional capacity. As discussed in chapter five, those studies that have explored this relationship suggest that self-perceived age exerts a stronger influence on health than the converse relationship (Levy et al., 2002a; Sargent-Cox et al., 2012; Spuling et al., 2013; Wurm et al., 2007).

7.1.4   Confounders and covariates

A number of socio-demographic and health measures have been identified in the literature as potentially influencing the association between self-perceived age and both emotional distress and functional capacity or of being correlated with the exposure. It is important that these factors are taken into account in the analyses. Besides age and sex I will also control for socio-demographic characteristics such as wealth and education which have been argued to shape self-perceived age (Barrett, 2003) and have a well-documented influence on emotional distress (Cole and Dendukuri, 2003) and functional capacity (Stuck et al., 1999; Wahrendorf et al., 2013). Furthermore, retirement is an important life transition for adults in this age group and in turn it may have important implications for an individual's self-perceived role in society and their attitudes to ageing.

As indicated earlier, a number of studies have investigated the association between self-perceived age and physical health (Demakakos et al., 2007; Jang et al., 2004; Spuling et al., 2013; Wurm et al., 2007). These studies have demonstrated that having an older or negative self-perceived age is associated with increased likelihood of reporting poorer health. While others have shown that having a positive age perception can aid recovery after a serious health event (Levy et al., 2006, 2000; Wurm and Benyamini, 2014) and that feeling younger than actual age can be protective of cognitive decline in older adults (Levy, 2003; Stephan et al., 2015a, 2014).

Self-rated health has been shown to be predictive of functional capacity and emotional distress (Idler and Kasl, 1995), and of being strongly correlated with self-perceived age and it could be argued to reflect many similar elements (Beyer et al., 2015). Although it could be argued that both concepts have many similarities (and may involve similar self-assessments), evidence suggests that they are not a proxy for one another (or that self-perceptions of ageing are not a proxy for self-rated health). For example, previous studies have demonstrated that self-perceived age still predicted functional health over time independent of self-rated health (Levy et al., 2002a) and self-rated health mediated the association between self-perceived age and health in a study of older adults in Korea (Jang et al., 2004). Further, as shown in the previous study the inclusion of self-rated health in the model helped to ensure that self-perceived age is not just a proxy for this well established measure which has been demonstrated to be strongly predictive of mortality (Levy and Myers, 2005).

One of the potential mechanisms previously identified in the relationship between self-perceived age and mortality are health behaviours, in particular having a positive view of ageing or feeling younger increases the likelihood of participating in physical activity or of adopting healthier behaviours over time (Beyer et al., 2015; Levy and Myers,

2004; Wurm et al., 2010). Conversely, having lower age expectations is associated with lower participation in physical activity (Sarkisian et al., 2005).

Finally, I will take into account social engagement, which is strongly correlated with emotional wellbeing (Kawachi and Berkman, 2001), and may have important implications for individuals with limited functional capacity (Steptoe et al., 2013b) or who feel older than their actual age. While few, if any, studies have specifically examined the role of social engagement in relation to self-perceptions of ageing, only a handful have adjusted for factors such as loneliness and social networks in their analyses. For example, in a study of older Koreans, social networks were positively correlated with self-perceptions of age (Jang et al., 2004) and social isolation has been shown to be associated with older subjective ages and poorer satisfaction with ageing (Kleinspehn-Ammerlahn et al., 2008; Steverink et al., 2001). Further lack of social contacts has been identified as a risk factor for reduced functional capacity or disability, and living alone to be associated with negative self-perceptions of ageing (Moser et al., 2011).

In summary, in this study I plan to include a range of covariates that may play a role in the relationships being analysed, and many of which have not been included together in similar studies before. Many of these previous studies have only adjusted for a handful of covariates.

7.1.5   Aims and objectives

The review of the literature identified some limitations and gaps in the current literature on self-perceptions of ageing. My study aims to investigate the direction of the association between self-perceived age and (a) emotional wellbeing and (b) two indicators of functional capacity: ADLs and mobility. Figure 7.1 sets out the predicted

direction of the prospective associations between self-perceived age and emotional wellbeing and functional capacity.

Figure 7.1 Predicted directions of the associations between self-perceived age and emotional wellbeing and functional capacity

2008   2012

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┌──────────────────┐                              ┌──────────────────┐
│      ADLs        │                              │      ADLs        │
│ Impaired Mobility│                              │ Impaired Mobility│
└──────────────────┘                              └──────────────────┘

┌──────────────────┐                              ┌──────────────────┐
│                  │                              │                  │
│      SPA         │                              │      SPA         │
│                  │                              │                  │
└──────────────────┘                              └──────────────────┘

┌──────────────────┐                              ┌──────────────────┐
│    Emotional     │                              │    Emotional     │
│    Wellbeing     │                              │    Wellbeing     │
└──────────────────┘                              └──────────────────┘
```
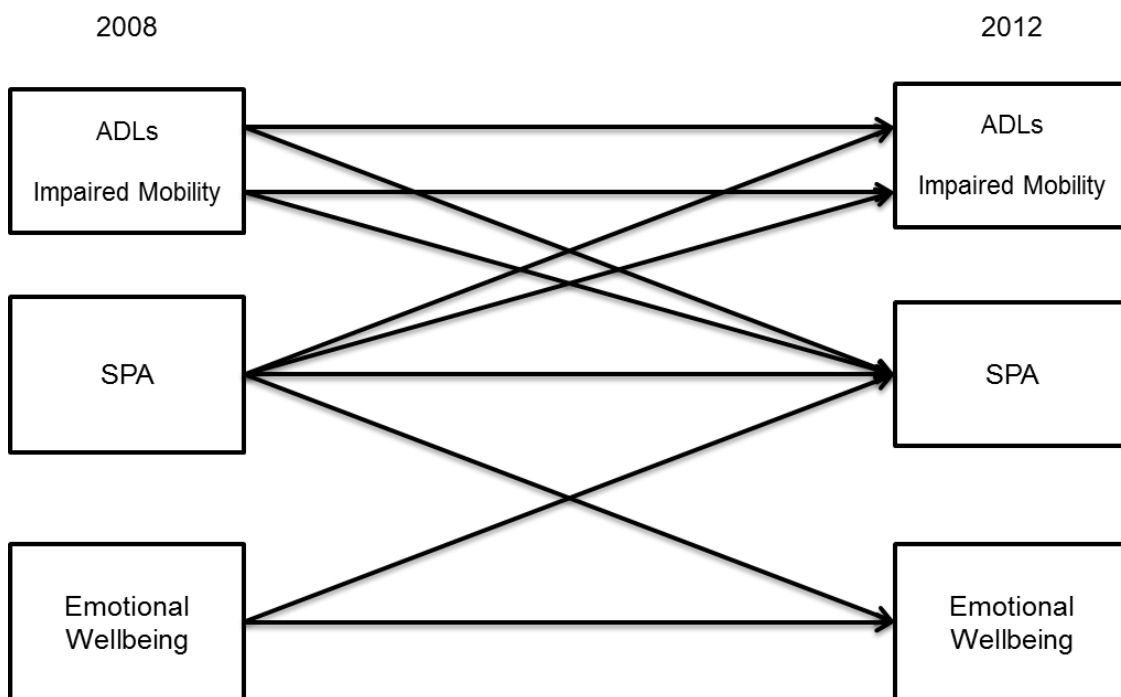
Solid lines indicate hypothesised associations

Notes: ADLs=activities of daily living; SPA= self-perceived age

The specific objectives of this study are:

1) To investigate whether self-perceived age is associated with elevated depressive symptoms four years later, while adjusting for baseline depressive symptoms and a number of important covariates identified in the literature including chronological age, sex, socio-demographic characteristics, cognitive function, social engagement, functional capacity, physical health and self-rated health.

2) To investigate whether self-perceived age is associated with limited functional capacity four years later. I will use to two measures of functional capacity, ADL

limitations and impaired mobility and adjust for a number of key covariates including chronological age, sex, socio-demographic characteristics, cognitive function, social engagement, depressive symptoms, physical health and self-rated health.

3) To investigate whether or not there is a bidirectional relationship in each case. In each instance I will account for the baseline level of the dependent variable and a number of important covariates identified in the literature including chronological age, sex, socio-demographic characteristics, cognitive function, social engagement, physical health and self-rated health.

I aim to test the following hypotheses:

1) Individuals who feel older than their actual age at baseline will be more likely to report elevated depressive symptoms four years later in comparison with those who feel younger or about the same as their actual age.

2) Individuals who feel older than their actual age at baseline will be more likely to report ADL limitations and impaired mobility four years later in comparison with those who feel younger or about the same as their actual age.

3) Older adults who report elevated depressive symptoms at baseline will feel older than their chronological age four years later.

4) Older adults who report two or more ADLs or impaired mobility at baseline will feel older than their chronological age four years later.

7.2 Methods

7.2.1 Sample

This study involved analysis of people who took part in the fourth (2008-09) and sixth (2012-13) waves of the English Longitudinal Study of Ageing (ELSA). ELSA is a national cohort study which began in 2002 to study ageing and health in adults aged 50 years and over living in England (Steptoe et al., 2013a). The fourth wave of ELSA involved 9,886 core participants, 89.5% of eligible respondents.

Of the 11,050 respondents who completed the main interview in the fourth wave, 6,623 (59.9%) were core members from the original cohort. A further 972 (8.8%) and 2,291 (20.7%) were added as part of refreshment samples in waves three and four respectively, thus giving a total of 9,886 core members. The 1,164 (10.5%) remaining respondents were either young (aged under 50 years old), old or new partners of the core members and are not included in this analysis (Hussey et al., 2010). Attrition was greater amongst those with no educational qualifications, lower levels of wealth, a longstanding limiting illness, and those who were widowed or separated.

7.2.2 Measures

Self-perceived age

In contrast to Wave 2, ELSA participants were asked 'How old do you feel you are?' as part of the main computer assisted personal interview (CAPI) carried out in participants' homes at Waves 4 and 6. It directly followed questions on emotional health and preceded the question on ideal age. As in my earlier analyses, respondents were divided into three groups: those whose self-perceived age was close to their chronological age (one year older to two years younger), those who felt more than one year older than their chronological age, and those who felt three or more years younger

190

than their actual age. 11 individuals who said that they felt that they were younger than 10 years old were excluded from analyses because of uncertainty about whether they had understood the question. Although the self-perceived age question was asked in a different part of the ELSA survey at Wave 4 in comparison to Wave 2, a similar proportion of respondents reported feeling younger, older and about the same as their actual age.

Depressive symptoms

Depressive symptoms were measured using the eight-item Center for Epidemiological Studies Depression Scale (CES-D), detailed in the previous chapter. Scores of four or more were used to indicate elevated depressive symptoms (Steffick, 2000).

Limited activities of daily living (ADLs)

Difficulties with ADLs were measured using a scale originally developed by Katz and colleagues (Katz et al., 1963). During the main ELSA interview respondents were asked whether they had difficulty with any of six ADLs: dressing, walking across a room, bathing or showering, eating, getting in or out of bed and using the toilet. A 'yes' to any question was coded as a positive response for limited activities of daily living. Participants who reported having difficulty with two or more of these items were defined as having difficulties with ADLs. Having two or more limited ADLs could be seen to indicate a moderate impairment and may also have greater implications for access to health and social care in comparison with having a single limitation. It is worth noting that using scores of one or more or modelling ADL scores as a continuous variable produced similar results to those presented in this study.

Impaired mobility

As part of the main ELSA interview respondents were asked whether they had difficulties with 10 common leg and arm functions. The ten items are: walking 100

yards; getting up from a chair after sitting for long periods; climbing several flights of stairs without resting; climbing one flight of stairs without resting; stooping, kneeling or crouching; pulling or pushing large objects like a living-room chair; lifting or carrying weights over 10 pounds, like a heavy bag of groceries; reaching or extending arms above shoulder level; sitting for about two hours; and picking up a small coin from a table. A 'yes' to any of the questions was coded as a positive response for impaired mobility. The distribution of mobility scores was highly skewed so a cut-off point of two or more was selected for this measure.

7.2.3   Covariates

As discussed above, a number of socio-demographic and health measures have been identified in the literature as potentially influencing each dependent variable and as potentially being associated with each exposure. The covariates I considered in this study were:

Socio-demographic variables adjusted for in the analyses included age, sex, education, wealth and current employment status. Education was measured by the highest educational qualification attained and divided into three groups - low (no educational qualifications), intermediate (O Levels, Certificate of Secondary Education or equivalent), and high (A Levels or equivalent through to higher degrees). Wealth was measured by total non-pension net wealth categorised into quintiles. Current work status indicated whether or not a respondent was currently employed (full-time, part-time, or self-employed), retired or in another situation (for example, unemployed or looking after the home or family).

Physical health was assessed using three measures. Firstly, self-rated health was rated as excellent, very good, good, fair and poor, and was subsequently dichotomised

into fair/poor, or good to excellent. Secondly, participants were asked if they suffered from one or more long-standing illnesses, and if these illnesses limited daily activities; the two questions were combined to form a dichotomous variable (presence or absence of limiting long-standing illness). Lastly, the number of serious doctor-diagnosed health problems were measured (coronary heart disease (CHD), cancer, stroke, diabetes, arthritis and chronic lung disease). A point was given for each diagnosis referred to, giving a possible score of 0 to 6.

Health behaviours assessed included smoking (current/ not current) and physical activity. Physical activity was coded as a dichotomous variable based on moderate to vigorous leisure-time activity reported once a week or less than once a week.

Cognitive function was measured in terms of memory, combining scores for immediate recall (number of ten aurally presented words recalled) and delayed recall (recall of these same words after performance of intervening tasks).

Social engagement was assessed using two measures: social isolation and loneliness. The two measures are detailed in Chapter 6 and as before participants were divided by median split into those with low and high social isolation, and individuals with high and low loneliness scores.

7.2.4   Statistical analyses

Participants were divided into three groups: those whose self-perceived age was close to their chronological age (one year older to two years younger), those who felt more than one year older than their chronological age, and those who felt three or more years younger than their actual age. Firstly, I compared the baseline characteristics of respondents in the three perceived age groups using chi-squared tests for categorical

variables and analysis of covariance for continuous variables. Next I conducted a series of multivariate regression models with elevated depressive symptoms, ADL limitations, impaired mobility and self-perceived age as the outcome variables.

Self-perceived age as predictor of elevated depressive symptoms, ADL limitations or impaired mobility

I fitted nine logistic regression models for each of three outcome variables (elevated depressive symptoms, ADL limitations and impaired mobility at wave 6). Separate analyses were carried out for depression, limited ADLs and mobility impairments. The first model adjusted for age, sex, self-perceived age and either baseline depressive symptoms, ADL limitations or impaired mobility. In model 2 I added socio-demographic characteristics (wealth, education and work status) to the first model. In subsequent models I added cognitive function (model 3) and social engagement (model 4). In model 5, I added ADLs & mobility to the baseline model of age, sex, self-perceived age and baseline depressive symptoms. For the analyses of limited ADLS and impaired mobility I added elevated depressive symptoms in model 5. Subsequently, I added health behaviours (model 6), and finally in models 7 and 8 I added physical health (number of doctor diagnosed health conditions and the presence of a longstanding limiting illness) and self-rated health to the baseline model of age, sex and baseline measure. In the final fully-adjusted model I adjusted for all covariates. I chose this method in order to see the impact of the different groups of covariates on the baseline model and to gauge which had the greatest effect on the association between self-perceived age and emotional wellbeing, ADL limitations or impaired mobility.

Elevated depressive symptoms, ADL limitations or impaired mobility as predictors of self-perceived age

Using multinomial regression I fitted the same nine models as before, but in this instance self-perceived age at wave six was the outcome variable and depressive symptoms, ADL limitations and impaired mobility at wave four were each independent variables. Separate analyses were carried for depression, limited ADLs and mobility impairments. The first model adjusted for age, sex, baseline self-perceived age and either baseline elevated depressive symptoms, limited ADLS or impaired mobility. In model 2 I added socio-demographic characteristics (wealth, education and work status) to the first model and in models 3 and 4 I added measures of cognitive function and social engagement respectively. In model 5, I added limited ADLs & mobility to the baseline model of self-perceived age, chronological age, sex and elevated depressive symptoms and for the models investigating functional capacity I added elevated depressive symptoms to the baseline models of self-perceived age, chronological age, sex and either limited ADLs or impaired mobility (model 5). In subsequent models I added health behaviours (model 6), physical health (number of doctor diagnosed health conditions and the presence of a longstanding limiting illness, model 7) and self-rated health (model 8) to the baseline models. In the final model (model 9) I adjusted for all previous measures.

7.3 Results

7.3.1 Baseline characteristics and missing data

Out of 9,886 core participants who completed an interview at Wave 4, 7,834 also completed an interview four years later. Overall, 7,144 (92.1%) completed the self-perceived age measure at both Waves 4 and 6, and 487 (6.2%) had missing data on

depressive symptoms. A total of 1,953 participants had missing data on one or more covariates giving a final sample size of 5,191 (66.3%). Variables with the most missing data besides the self-perceived age question were social isolation (1,201), loneliness (1,018), elevated depressive symptoms (487), smoking (836), wealth (178), education level (163), recall (162) and self-rated health (135). The remaining measures either had less than 0.1% or no missing data. The two measures with highest proportion of missing data, social isolation and loneliness, were included in the self-completion questionnaire which respondents had to return by post and which has a lower overall response rate (84% of the 9,886 core respondents at wave 4) in comparison with the main CAPI interview (Cheshire et al., 2012a). Table 7.1 reports the prevalence of missing values (item non-response) for each of the incomplete variables. It is evident that most of the missing data on the key dependent and independent variables is a result of attrition from the study, rather than selective non-response to these items.

Individuals who did not complete the self-perceived age measure tended to be older, less wealthy, less educated and reported poorer self-rated health in comparison with those who completed the self-perceived age measure. A similar pattern was observed for participants who left the study. They were also more likely to be older, less wealthy, less educated, to have poorer self-rated health and to have poorer health. In relation to the outcome variables, a higher proportion reported depressive symptoms, and had higher impaired mobility and ADL scores.

Table 7.2 reports the sample characteristics at wave four (2008-09) and the cross-sectional associations with self-perceived age. At baseline, 74.2% of respondents felt younger than actual age, 20.6% felt about the same as actual age and 5.2% felt older. A significantly higher proportion of participants who felt older than their actual age reported having a limiting long standing health condition, fair to poor self-rated health, elevated depressive symptoms, impaired mobility and to have difficulty with two or

more activities of daily living (ADLs). They were more likely to be lonely, socially isolated and to be current smokers in comparison with those who feel younger than their actual age or the same as their actual age. Further, higher proportions of this group had lower levels of wealth and were not married. The bivariate association between self-perceived age and self-rated health was particularly marked with 70.4% of participants who felt older than their actual age reporting fair to poor self-rated health in comparison with 16% of those who felt younger and 29.5% of participants who felt about the same as their chronological age. In contrast, those who felt younger than their actual age were more likely to be retired, have a higher mean recall score and to participate in moderate to vigorous physical activity once a week or more. Education level, mean chronological age and sex were not significantly different between the three groups. These correlates are similar to patterns of correlates of self-perceived ageing described in chapter 6 for wave 2 of ELSA.

Overall, 36.5% of ELSA participants had mobility impairments and 6.5% reported two or more limited ADLs at baseline. Respondents in the ELSA sample had more difficulties with mobility in comparison with ADLs, a finding that is consistent with an analysis of over 70 year olds in the US Health and Retirement Study (HRS) (Fonda and Herzog, 2004). Both limited ADLs and mobility were heavily skewed, with 93.5% and 63.6% of participants scoring 0 or 1 at wave four. At baseline 11.6% of respondents had scores of four or more on the CES-D indicating elevated depressive symptoms. However, of the ELSA respondents who felt older than actual age at baseline, 55.9% reported elevated depressive symptoms, in comparison with 7.6% of those who felt younger and 15.0% of those who felt about the same as their chronological age.

Table 7.1 Prevalence of missing values of each variable of interest

	Wave 4 (n=9,886)		Wave 6 (n=7,834)	
	N	%	N	%
Self-perceived age				
Complete	9,298	94.1	7,343	93.7%
Item non-response	588	5.9	491	6.3%
Elevated Depressive Symptoms				
Complete	9,462	95.7	7,453	95.1%
Item non-response	424	4.3	381	4.9%
Limited activities of daily living (ADLs)				
Complete	9,880	99.9	7,831	99.96%
Item non-response	6	0.1	3	0.04%
Impaired mobility				
Complete	9,879	99.9	7,831	99.96%
Item non-response	7	0.1	3	0.04%
Wealth				
Complete	9,589	97.0		
Item non-response	297	3.0		
Education				
Complete	9,672	97.8		
Item non-response	214	2.2		
Work Status				
Complete	9,877	99.9		
Item non-response	9	0.1		
Doctor diagnosed health condition				
Complete	9,810	99.2		
Item non-response	76	0.8		
Limiting long standing health condition				
Complete	9,880	99.9		
Item non-response	6	0.1		
Self-rated health				
Complete	9,585	97.0		
Item non-response	301	3.0		
Social isolation				
Complete	8,023	81.2		
Item non-response	1,863	18.8		
Loneliness				
Complete	8,252	83.5		
Item non-response	1,634	16.5		
Recall				
Complete	9,542	96.5		
Item non-response	344	3.5		
Current Smoker				
Complete	8,820	89.2		
Item non-response	1,066	10.8		
Vigorous or moderate activity ≥ 1/week				
Complete	9,881	99.95		
Item non-response	5	0.05		

Table 7.2 Baseline characteristics of participants according to self-perceived age group

	Feels younger than actual age (n=3,853)	Feels the same as actual age (n=1,068)	Feels older than actual age (n=270)	P value
Age (years)	65.7 ± 8.5	64.6 ± 8.5	63.1 ± 8.8	0.711
Perceived Age (years)	49.0 ± 12.9	64.5 ± 8.6	75.9 ± 14.7	0.001
Male Female	2,073 (53.8)	575 (53.8)	157 (58.2)	0.379
Wealth				
Lowest 1	493 (12.8)	144 (13.5)	82 (30.4)	0.001
2	711 (18.4)	189 (17.7)	73 (27.0)	
3	808 (21.0)	200 (18.7)	41 (15.2)	
4	894 (23.2)	245 (22.9)	44 (16.3)	
Highest 5	947 (24.6)	290 (27.2)	30 (11.1)	
Education				
Lower	845 (21.9)	244 (22.9)	94 (34.8)	0.001
Intermediate	1,245 (32.3)	333 (31.2)	83 (30.7)	
Higher	1,763 (45.8)	491 (46.0)	93 (34.4)	
Employment Status				
Retired	2,149 (55.8)	561 (52.5)	122 (45.2)	0.001
employed	1,338 (34.7)	375 (35.1)	73 (27.0)	
other	366 (9.5)	132 (12.4)	75 (27.8)	
Married	2,663 (69.1)	772 (72.3)	161 (59.6)	0.001
Limiting long standing health condition	988 (25.6)	416 (39.0)	202 (74.8)	0.001
Doctor diagnosed health conditions	0.6 ± 0.7	0.7 ± 0.8	1.1 ± 0.9	0.001
Self-rated health (fair to poor)	615 (16.0)	315 (29.5)	190 (70.4)	0.001
Recall	10.97 ± 3.2	10.92 ± 3.3	9.89 ± 3.6	0.048
Limited activities of daily living (2 or more)	166 (4.3)	93 (8.7)	80 (29.6)	0.001
Impaired mobility (2 or more)	1,200 (31.1)	485 (45.4)	207 (76.7)	0.001
Elevated depressive symptoms	293 (7.6)	160 (15.0)	151 (55.9)	0.001
High social isolation	1,812 (47.0)	519 (48.6)	157 (58.2)	0.002
High loneliness	1,771 (46.0)	565 (52.9)	200 (74.1)	0.001
Vigorous or moderate activity ≥ 1/week	3,235 (84.0)	836 (78.3)	153 (56.7)	0.001
Current smoker	474 (12.3)	126 (11.8)	65 (24.1)	0.001

7.3.2 Self-perceived age as a predictor of future elevated depressive symptoms, ADL limitations or impaired mobility

Self-perceived age was associated with elevated depressive symptoms, limited ADLs and impaired mobility four years later. However, the association between self-perceived age and impaired mobility was no longer significant once all covariates had been taken into account.

Depressive symptoms

Table 7.3 summarises the logistic regression models for the prospective relationship between self-perceived age and elevated depressive symptoms. Of those respondents who felt younger than their actual age at wave 4, 8.5% had elevated depressive symptoms at wave 6, this increased to 12.5% for those who felt about the same as their actual age and to 41.1% for those who felt older than their actual age. Compared with feeling younger, feeling about the same as actual age was associated with a 28% increased odds, and feeling older than actual age with a 242% increased odds of elevated depressive symptoms four years later after adjusting for age and sex (model 1). After adjustment for socio-demographic characteristics (model 2) the association was reduced by around 27%. The addition of cognitive function (model 3) social engagement (model 4) and health behaviours (model 6) had limited effects on the association between self-perceived age and emotional symptoms. Statistical adjustment for functional capacity (limited ADLs and impaired mobility, model 5) reduced the odds of reporting elevated depressive symptoms by around 37% in the feeling older than actual age group (OR 2.52, 95% CI 1.84-3.47, $p<0.001$). Adjustment for functional capacity attenuated the difference between those who felt younger and those who felt about the same as their actual age (OR 1.15, 95% CI 0.91-1.44, $p=0.24$).

In the feeling older group, the association between self-perceived age and elevated depressive symptoms was reduced by about 42% when physical health measures (limiting longstanding illness, number of doctor diagnosed health conditions) were included in the model (models 7) (OR 2.41, 95% CI 1.76-3.30, p<0.001) and by around 48% after adjustment for self-rated health (OR 2.27, 95% CI 1.65-3.13, p<0.001). The difference in odds between groups feeling younger and feeling about the same as actual age was eliminated when physical health and self-rated health had been taken into account.

In the fully adjusted model (model 9) I combined the measures included in the separate analyses. In total 47% of the variance was associated in depressive symptoms associated with self-perceived age is accounted for by these covariates. However, self-perceived age had an independent association with future depressive symptoms after all these covariates were taken into account, with an 82% greater odds of significant depressive symptoms among people who felt older than their actual age at baseline. While feeling the same as actual age was not associated with elevated depressive symptoms, in comparison with those who felt younger than actual age (OR 1.08, 95% CI 0.86-1.37, p=0.50). These results indicate that the association between self-perceived age and elevated depressive symptoms four years later is only partly explained by baseline covariates of self-perceived age but that of these the presence of physical health problems, functional limitations and poor self-rated health had the strongest influence on the relationship. In the final model, other significant predictors of elevated depressive symptoms were chronological age, lower wealth, an existing limiting health condition, higher levels of loneliness and female sex (table 7.6).

Table 7.3 Odds ratios of elevated depressive symptoms four years later by self-perceived age (95% CI)

Self-perception of age	Younger than chronological age	Same as chronological age	Feels older than chronological age
Elevated depressive symptoms (%)	328 (8.5)	133 (12.5)	111 (41.1)
Model 1 age, sex & baseline elevated depressive symptoms	Reference	1.28 (1.02-1.61)*	3.41 (2.51-4.64)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.29 (1.03-1.62)*	2.77 (2.02-3.80)***
Model 3: model 1 + cognitive function[2]	Reference	1.27 (1.01-1.59)*	3.20 (2.34-4.36)***
Model 4: model 1 + social engagement[3]	Reference	1.26 (1.00-1.58)*	3.16 (2.31-4.31)***
Model 5: model 1 + functional limitations[4]	Reference	1.15 (0.91-1.44)	2.52 (1.84-3.47)***
Model 6: model 1 + health behaviours[5]	Reference	1.26 (1.00-1.58)*	2.99 (2.19-4.09)***
Model 7: model 1 + physical health[6]	Reference	1.12 (0.89-1.41)	2.41 (1.76-3.30)***
Model 8: Model 1 + self-rated health	Reference	1.11 (0.88-1.39)	2.27 (1.65-3.13)***
Model 9: fully-adjusted[7]	Reference	1.08 (0.86-1.37)	1.82 (1.31-2.54)***

Notes: * p <0.05; ** p <0.01; *** p <0.001

[1] Wealth, education, and work status

[2] Combined score for immediate and delayed recall

[3] Social isolation and loneliness

[4] Impaired mobility and ADLs

[5] Smoking and physical activity

[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)

[7] Age, sex, wealth, baseline elevated depressive symptoms, impaired mobility and ADLs, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

ADL limitations

Table 7.4 shows the results for the prospective association between self-perceived age and ADL limitations four years later. For respondents who felt younger than their actual age at baseline, 5.9% reported having two or more limited ADLs four years later. This increased to 9.5% and 31.3% for those who felt about the same as their actual age and who felt older than their chronological age, respectively. In first model I adjusted for age, sex, self-perceived age and existing ADL difficulties. Compared with feeling younger, feeling about the same as actual age was associated with a 39% increased odds, and feeling older than actual age with a 337% increased odds of ADL limitations four years later. After adjustment for socio-demographic characteristics (model 2), the odds ratios were reduced but the association remained strongly significant for those who feel older (OR 3.68, 95% CI 2.55-5.31, p<0.001) and moderately in those who feel the same as their chronological age (OR 1.40, 95% CI 1.07-1.85, p=0.02).

Adjustment for cognitive function (model 3), social engagement (model 4) and health behaviours (model 6) had limited effects on the associations between self-perceived age and ADL limitations reducing the associations for those who felt older by between 7% to 22%. The strength of the association was reduced by around 31% with the addition of depressive symptoms (model 5), but the odds ratios for both those who feel the same as their chronological age (1.33, 95% CI 1.01-1.75, p=0.04) and feel older (3.32, 95 CI 2.27-4.87, p<0.001) remained significant.

Statistical adjustment for physical health measures (limiting long-standing illness, and diagnosis of serious illness at baseline) reduced the odds ratio in those who felt older than their actual age by around 55% to 2.53 (95% CI 1.76-3.64, p<0.001, model 7). The association was reduced by a further 4% with the addition of self-rated health to the baseline model (model 8). The difference in odds between groups feeling younger

and feeling about the same as actual age was eliminated when physical health measures and self-rated health (models 7 and 8) were taken into account.

In the final fully adjusted model (model 9), I found that feeling older than actual age remained a significant independent predictor of ADL limitations (OR 1.67, 95% CI 1.13-2.47, p=0.009), while feeling about the same as chronological age was not associated with ADL difficulties, in comparison with the participants who felt younger than their actual age (OR 0.99, 95% CI 0.74-1.32, p=0.93). In the final model, 61% of the variance was accounted by all covariates. Apart from self-perceived age, the factors that were independently associated with ADL limitations in the final model were having fair to poor self-rated health, an existing limiting health condition, participation in vigorous to moderate physical activity less than once a week and having existing difficulties with ADLs (table 7.6).

Table 7.4 Odds ratios of ADL limitations four years later by self-perceived age (95% CIs)

Self-perception of age	Younger than chronological age	Same as chronological age	Feels older than chronological age
ADL limitations (%)	229 (5.9%)	101 (9.5%)	86 (31.9%)
Model 1: age, sex + baseline activities of daily living (ADLs)	Reference	1.39 (1.06-1.83)*	4.37 (3.06-6.26)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.40 (1.07-1.85)*	3.68 (2.55-5.31)***
Model 3: model 1 + cognitive function[2]	Reference	1.37 (1.04-1.80)*	4.12 (2.87-5.90)***
Model 4: model 1 + social engagement[3]	Reference	1.36 (1.03-1.82)*	3.90 (2.72-5.61)***
Model 5: model 1 + elevated depressive symptoms[4]	Reference	1.33 (1.01-1.75)*	3.32 (2.27-4.87)***
Model 6: model 1 + health behaviours[5]	Reference	1.34 (1.01-1.76)*	3.62 (2.52-5.21)***
Model 7: model 1 + physical health[6]	Reference	1.13 (0.85-1.49)	2.53 (1.76-3.64)***
Model 8: model 1 + self-rated health	Reference	1.11 (0.84-1.48)	2.39 (1.66-3.45)***
Model 9: fully-adjusted[7]	Reference	0.99 (0.74-1.32)	1.67 (1.13-2.47)**

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[1] Wealth, education, and work status

[2] Combined score for immediate and delayed recall

[3] Social isolation and loneliness

[4] Elevated depressive symptoms

[5] Smoking and physical activity

[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)

[7] Age, sex, wealth, elevated depressive symptoms, ADLs, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

Impaired mobility

The results for the association between self-perceived age and impaired mobility are reported in Table 7.5. I found that of those respondents who felt younger than their actual age at wave 4, 36.7% had impaired mobility at wave 6, this increased to 46.4% for those who felt about the same as their actual age and to 73.3% for those who felt older than their actual age. In the baseline model (model 1) I adjusted for age, sex and existing mobility difficulties. In this model self-perceived age was associated with impaired mobility for both feeling about the same age (1.22, 95% CI, 1.02-1.45, p=0.03) and feeling older (2.52, 95% CI 1.80-3.53, p<0.001). Statistical adjustment for socio-demographic characteristics (model 2) reduced the association by around 24% for those who felt older than actual age (2.15, 95% CI 1.52-3.03, p<0.001) but remained at a similar level for those who felt about the same age. The addition of cognitive function (model 3), social engagement (model 4) and health behaviours (model 6) had limited effects on the association between self-perceived age and impaired mobility reducing the association by between 7% and 18% in those who felt older than their actual age. The odds ratios changed little for feeling the about same as actual age. Adjustment for emotional distress (model 5) eliminated the association between self-perceived age and impaired mobility for those who felt about the same age in comparison to feeling younger than actual age. For those who felt older, the odds ratios declined by 39% to 1.93 (95% CI 1.36-2.75, p<0.001).

Once physical health measures (limiting long-standing illness and number of doctor diagnosed health conditions) were included (model 7), the association between self-perceived age and impaired mobility was reduced to non-significance for feeling the same age (OR 1.10, 95% CI 0.92-1.32, p=0.31) and but not for feeling older (OR 1.74, 95% CI 1.22-2.48, p=0.002). The addition of self-rated health (model 8) reduced the association further for those who felt older (1.59, 95% CI 1.11-2.27, p=0.01). In the final model (model 9) the association was reduced to non-significance for those who felt

older than actual age (1.14, 95% CI 0.77-1.68, p=0.51). These results indicate that the

association between self-perceived age and future mobility impairment is largely

explained by baseline covariates of self-perceived age, particularly the presence of

physical health problems and poor self-rated health. The total variance in the final

model was 55% indicating that around 45% of the relationship between self-perceived

age and impaired mobility was explained by other factors not accounted for in this

model.

In the final model, independent predictors of impaired mobility four year later included

the presence of limiting long-standing illness, a doctor diagnosed chronic health

condition, being a current smoker and having fair to poor self-rated health (table 7.6)

Table 7.5 Odds ratios of impaired mobility four years later by self-perceived age (95% CIs)

Self-perception of age	Younger than chronological age	Same as chronological age	Feels older than chronological age
Impaired mobility (%)	1,413 (36.7%)	496 (46.4%)	198 (73.3%)
Model 1: age, sex & baseline impaired mobility	Reference	1.22 (1.02-1.45)*	2.52 (1.80-3.53)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.24 (1.04-1.47)*	2.15 (1.52-3.03)***
Model 3: model 1 + cognitive function[2]	Reference	1.21 (1.02-1.44)*	2.42 (1.73-3.39)***
Model 4: model 1 + social engagement[3]	Reference	1.20 (1.01-1.43)*	2.37 (1.69-3.33)***
Model 5: model 1 + elevated depressive symptoms[4]	Reference	1.18 (0.99-1.40)	1.93 (1.36-2.75)***
Model 6: model 1 + health behaviours[5]	Reference	1.21 (1.01-1.43)*	2.26 (1.60-3.19)***
Model 7: model 1 + physical health[6]	Reference	1.10 (0.92-1.31)	1.74 (1.22-2.48)**
Model 8: model 1 + self-rated health	Reference	1.09 (0.91-1.30)	1.59 (1.11-2.27)*
Model 9: fully-adjusted[7]	Reference	1.04 (0.87-1.25)	1.14 (0.77-1.68)

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[1] Wealth, education, and work status; [2] Combined score for immediate and delayed recall

[3] Social isolation and loneliness;

[4] Elevated depressive symptoms

[5] Smoking and physical activity

[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)

[7] Age, sex, wealth, elevated depressive symptoms, impaired mobility, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

Table 7.6 Results of logistic regression analysis for elevated depressive symptoms, limitations in activities of daily living and impaired mobility four years later (95% CIs)

Factor	Elevated depressive symptoms (CES-D)		Impaired activities of daily living (ADLs)		Impaired mobility	
	OR	*P* value	OR	*P* value	OR	*P* value
Self-Perceived Age						
Younger	Ref		Ref		Ref	
About the same	1.08 (0.86-1.37)	0.503	0.99 (0.74-1.32)	0.933	1.04 (0.87-1.25)	0.664
Older	1.82 (1.31-2.54)	0.001	1.67 (1.13-2.47)	0.009	1.14 (0.77-1.68)	0.505
Age (years)	1.00 (0.98-1.01)	0.572	1.02 (1.01-1.04)	0.006	1.04 (1.03-1.06)	0.001
Male	Ref		Ref		Ref	
Female	1.44 (1.16-1.77)	0.001	1.00 (0.78-1.29)	0.991	1.64 (1.40-1.92)	0.001
Wealth						
Lowest 1	Ref		Ref		Ref	
2	0.75 (0.56-1.01)	0.056	0.93 (0.65-1.35)	0.723	0.92 (0.71-1.19)	0.515
3	0.69 (0.51-0.95)	0.023	1.31 (0.90-1.89)	0.159	0.80 (0.62-1.04)	0.100
4	0.85 (0.62-1.16)	0.302	1.07 (0.72-1.59)	0.738	0.86 (0.66-1.12)	0.264
Highest 5	0.62 (0.44-0.88)	0.007	1.05 (0.68-1.63)	0.813	0.68 (0.52-0.90)	0.006
Education						
Lower	Ref		Ref		Ref	
Intermediate	0.81 (0.63-1.05)	0.112	1.04 (0.77-1.41)	0.791	1.00 (0.82-1.23)	0.968
Higher	0.94 (0.72-1.23)	0.658	0.88 (0.63-1.21)	0.430	0.93 (0.75-1.14)	0.469
Employment Status						
Retired	Ref		Ref		Ref	
employed	0.84 (0.63-1.13)	0.256	0.70 (0.46-1.06)	0.090	0.91 (0.74-1.12)	0.397
other	1.72 (1.30-2.27)	0.001	1.31 (0.93-1.85)	0.124	1.10 (0.85-1.42)	0.469
Recall	0.97 (0.94-1.00)	0.065	0.99 (0.93-1.03)	0.789	0.99 (0.97-1.02)	0.664
Impaired ADLs	1.02 (0.74-1.40)	0.923	6.32 (4.73-8.45)	0.001	5.96 (5.08-7.00)	0.001

Factor	Elevated depressive symptoms (CES-D)		Impaired activities of daily living (ADLs)		Impaired mobility	
	OR	*P* value	OR	*P* value	OR	*P* value
Impaired mobility	1.09 (0.85-1.40)	0.519				
Elevated depressive symptoms	3.30 (2.62-4.17)	0.001	1.17 (0.86-1.59)	0.324	1.27 (0.98-1.64)	0.065
Social Isolation	1.18 (0.97-1.44)	0.095	1.32 (1.04-1.69)	0.025	0.98 (0.85-1.14)	0.794
Loneliness	2.07 (1.66-2.57)	0.001	1.18 (0.91-1.54)	0.202	1.14 (0.98-1.32)	0.094
Physical activity	0.92 (0.73-1.16)	0.475	0.74 (0.57-0.97)	0.027	0.83 (0.68-1.01)	0.065
Smoking	1.34 (1.03-1.75)	0.028	1.06 (0.75-1.497)	0.747	1.34 (1.07-1.68)	0.012
Limiting long standing health condition	1.58 (1.23-2.02)	0.001	3.27 (2.40-4.45)	0.001	2.18 (1.82-2.60)	0.001
Doctor diagnosed health conditions	1.01 (0.89-1.16)	0.830	0.99 (1.00-1.33)	0.066	1.55 (1.39-1.73)	0.001
Self-rated health (fair to poor)	1.59 (1.24-2.04)	0.001	2.30 (1.73-3.07)	0.001	1.85 (1.50-2.29)	0.001

Notes: CES-D= Center for Epidemiological Studies Depression scale; OR= odds ratio; CI= confidence intervals

7.3.3 Elevated depressive symptoms, ADL limitations or impaired mobility as predictors of future self-perceived age

Elevated depressive symptoms, ADL limitations and impaired mobility at baseline predicted future self-perceived age independently of baseline self-perceived age and demographic factors. However, once covariates had been taken into account only impaired mobility remained a significant independent predictor of self-perceived age. Results for the models using self-perceived age as the dependent variable are reported in tables 7.7-7.10. In each model feeling younger than actual age was the reference group.

Elevated depressive symptoms

Table 7.7 summarises the multinomial regression models testing whether elevated depressive symptoms are associated with self-perceived age four years later. 8.8% of participants who felt younger than their actual age had elevated depressive symptoms at baseline, compared with 14.8% of those who felt who felt about the same as actual age and 33.2% who felt older at baseline. For participants with elevated depressive symptoms relative to those without, the relative risk for feeling older than actual age relative to feeling younger than chronological age was 2.37 (95 % CI 1.77-3.18, p<0.001) in the baseline model adjusted for age, sex and self-perceived age at wave 4 (model 1). The relative risk of feeling their actual age was not significantly different from feeling younger than actual age (RRR 1.23, 95% CI 0.97-1.56, p=0.09). Adjustment for socio-demographic factors (wealth, education and current work status, model 2), cognitive function (immediate and delayed recall, model 3) and social engagement (social isolation and loneliness, model 4) had modest effects on the association between elevated depressive symptoms and self-perceived age. But the addition of functional limitations (ADL limitations and impaired mobility) reduced the significance of the relationship and lowered the relative risk ratios (RRR) of having an older self-perceived age by around 41% to 1.82 (95% CI 1.35-2.46, p<0.001).

After adjustment for physical health measures (limiting long-standing illness and number of doctor diagnosed health conditions, model 7), participants who had elevated depressive symptoms were still more likely to have an older self-perceived age four years later in comparison with those without depressive symptoms (RRR 1.95, 95% CI 1.46-2.62, p<0.001). The inclusion of self-rated health reduced the association by around 49% to 1.71 (1.26-2.31, p=0.001). However, in the final fully-adjusted model (model 9) the relationship between elevated depressive symptoms and feeling older than actual age four years later was reduced to non-significance (1.31, 95% CI 0.95-1.80, p=0.09). These results indicated that the relationship between elevated depressive symptoms and self-perceived age is partly explained by existing functional capability and physical health. In total, 45% of the variance of the association between elevated depressive symptoms and feeling older than actual age is accounted for by all covariates.

Table 7.7 Relative rate ratios from multinomial regression of self-perceived age four years later on elevated depressive symptoms (95% CIs)

Elevated depressive symptoms	Younger than chronological age	Same as chronological age	Feels older than chronological age
Elevated depressive symptoms at W4 (%)	341 (8.8%)	140 (14.8%)	123 (33.2%)
Model 1 age, sex & baseline self-perceived age	Reference	1.23 (0.97-1.56)	2.37 (1.77-3.18)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.23 (0.96-1.56)	2.00 (1.49-2.70)***
Model 3: model 1 + cognitive function[2]	Reference	1.20 (0.94-1.52)	2.24 (1.67-3.00)***
Model 4: model 1 + social engagement[3]	Reference	1.18 (0.92-1.51)	1.99 (1.47-2.69)***
Model 5: model 1 + functional limitations[4]	Reference	1.14 (0.89-1.45)	1.82 (1.35-2.46)***
Model 6: model 1 + health behaviours[5]	Reference	1.19 (0.94-1.52)	2.07 (1.54-2.78)***
Model 7: model 1 + physical health[6]	Reference	1.14 (0.89-1.45)	1.95 (1.46-2.62)***
Model 8: model 1 + self-rated health	Reference	1.06 (0.83-1.36)	1.71 (1.26-2.31)***
Model 9: fully-adjusted[7]	Reference	1.01 (0.78-1.30)	1.31 (0.95-1.80)

Notes: * p <0.05; ** p <0.01; *** p <0.001

[1] Wealth, education, and work status

[2] Combined score for immediate and delayed recall

[3] Social isolation, loneliness and marital status

[4] Impaired mobility and ADLs

[5] Smoking and physical activity

[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)

[7] Age, sex, wealth, baseline elevated depressive symptoms, impaired mobility and ADLs, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

ADL limitations

Table 7.8 summarises the multinomial regression models testing whether ADL limitations at baseline predict self-perceived age four years later. The results are similar to those found for elevated depressive symptoms. 4.5% of participants who felt younger than their actual age had ADL limitations at baseline, compared with 7.8% of participants who felt about the same as actual age and 24.5% of respondents who felt older. Model 1 indicates that after taking age, sex and self-perceived age at baseline into account, there was an association between baseline ADL limitations and feeling older than actual age (RRR 3.14, 95% CI 2.28-4.34, p<0.001) in comparison with feeling younger than actual age, while the effect of same as actual age was not significant (RRR 1.23, 95% CI 0.90-1.67, p=0.20)

Adjustment for socio-demographic factors (wealth, education and current work status, model 2) reduced the risk of feeling older by 31%. Cognitive function (immediate and delayed recall) and social engagement (social isolation and loneliness) and had modest effects on the association between ADL limitations and feeling older than actual age (models 3 and 4), reducing the risk of feeling older than actual age by around 10%. The addition of elevated depressive symptoms (model 5) and health behaviours (physical activity and smoking) lowered the relative risk ratios of having an older self-perceived age by around 20% and 30% respectively but did not reduce the significance of the association.

After adjustment for physical health measures (limiting long-standing illness and number of doctor diagnosed health condition, model 7), participants who had ADL limitations at baseline were still more likely to have an older self-perceived age four years later in comparison with those without limitations (RRR 2.06, 95% CI 1.47-2.88, p<0.001). The addition of self-rated health to the baseline model (model 8) reduced the relative risk ratio further (by 55%) to 1.96 (1.40-2.75, p<0.001). This indicates that existing health explains most of the association. In the fully adjusted model (model 9), I

found that ADL limitations were no longer a statistically significant independent predictor of feeling older than actual age (RRR 1.42, 95% CI 0.99-2.02, p=0.056). The association between limited ADLs and feeling about the same as actual age (RRR 0.88, 95% CI 0.63-1.22, p=0.44) remained insignificant. 55% of the variance was accounted for in final model, therefore indicating that around 45% of the variance is still unaccounted for by these factors.

Table 7.8 Relative risk ratios for multinomial logistic regression of limitations in ADLs on self-perceived age four years later (95% CIs)

Impaired activities of daily living	Younger than chronological age	Same as chronological age	Feels older than chronological age
Unadjusted	174 (4.5%)	74 (7.8%)	91 (24.5%)
Model 1: age, sex & baseline self-perceived age	Reference	1.23 (0.90-1.67)	3.14 (2.28-4.34)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.20 (0.88-1.65)	2.47 (1.77-3.44)***
Model 3: model 1 + cognitive function[2]	Reference	1.19 (0.87-1.62)	2.95 (2.13-4.08)***
Model 4: model 1 + social engagement[3]	Reference	1.20 (0.88-1.64)	2.90 (2.10-4.01)***
Model 5: model 1 + elevated depressive symptoms[4]	Reference	1.18 (0.86-1.61)	2.72 (1.96-3.78)***
Model 6: model 1 + health behaviours[5]	Reference	1.13 (0.83-1.55)	2.51 (1.80-3.52)***
Model 7: model 1 + physical health[6]	Reference	1.02 (0.74-1.40)	2.06 (1.47-2.88)***
Model 8: model 1 + self-rated health	Reference	0.95 (0.69-1.31)	1.96 (1.40-2.75)***
Model 9: fully-adjusted[7]	Reference	0.88 (0.63-1.22)	1.42 (0.99-2.02)

Notes: * p <0.05; ** p <0.01; *** p <0.001
[1] Wealth, education, and work status; [2] Combined score for immediate and delayed recall
[3] Social isolation, loneliness and marital status
[4] Elevated depressive symptoms
[5] Smoking and physical activity
[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)
[7] Age, sex, wealth, elevated depressive symptoms, ADLs, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

Impaired mobility

Table 7.9 summarises the multinomial regression models testing whether impaired mobility at baseline predicts self-perceived age. 31.1% of participants who felt younger than their actual age had mobility difficulties at baseline, compared with 45% of participants who felt about the same as actual age and 70.9% who felt older. For participants with impaired mobility, the relative risk for feeling older than actual age relative to feeling younger than chronological age was 3.05 (95 % CI 2.35-3.93, p<0.001) in the baseline model adjusted for age, sex and self-perceived age at wave 4 (model 1). The relative risk for feeling about the same as actual age relative to feeling younger was 1.44 (95% CI 1.22-1.70, p<0.001).

The inclusion of socio-demographic factors (wealth, education and current work status, model 2) reduced the relative risk of feeling older than actual age by 22% (RRR 2.61, 95% CI 2.00-3.40, p<0.001). By contrast, the RRR for feeling the same as actual age was not affected (RRR 1.48, 95% 1.24-1.75, p<0.001). Adjustment for cognitive function (immediate and delayed recall), social engagement (social isolation and loneliness) and elevated depressive symptoms (models 3 to 5) had a limited effect on the relative risk ratios of having an older self-perceived age, reducing the risk of feeling older than actual age by 8 – 11%. The addition of health behaviours (smoking and physical activity) to the baseline line model (model 6) reduced the relative risk of feeling older by 19%. In the case of feeling the same as actual age, the relative risk ratios were not affected.

After adjustment for physical health measures (limiting long-standing illness and number of doctor diagnosed health condition, model 7), the relative risk ratio for feeling older than actual age was reduced by 45% (2.12, 95% CI 1.58-2.85, p<0.001) and by 27% for those who felt the same as their chronological age (1.32, 95% CI 1.09-1.60, p=0.004). The addition of self-rated health to the baseline model (model 8) reduced the risk of feeling older by around 44% and of feeling than same as actual age by 43%. In

the final fully adjusted model (model 9) respondents with impaired mobility remained significantly more likely to report feeling either older than their actual age (RRR 1.64, 95% CI 1.20-2.24, p=0.002) or the same as their chronological age (RRR 1.25, 95% CI 1.03-1.53, p=0.025) than younger in comparison to those without mobility difficulties. In total, around 46% of the variance was accounted in the final model.

Table 7.10 shows the fully adjusted models for each of the three predictors, elevated depressive symptoms, and impaired mobility and ADL limitations. Besides baseline self-perceived age and impaired mobility, other independent factors of having an older self-perceived age four years later included chronological age, employment, having a limiting longstanding health condition, lower recall scores, loneliness and fair to poor self-rated health.

Table 7.9 Relative rate ratios from multinomial regression of self-perceived age four years later on impaired mobility (95% CIs)

Impaired mobility	Younger than chronological age	Same as chronological age	Feels older than chronological age
Unadjusted	1,204 (31.1%)	425 (45.0%)	263 (70.9%)
Model 1: age, sex, impaired mobility & baseline self-perceived age	Reference	1.44 (1.22-1.70)***	3.05 (2.35-3.94)***
Model 2: model 1 + socio-demographic factors[1]	Reference	1.48 (1.24-1.75)***	2.61 (2.00-3.40)***
Model 3: model 1 + cognitive function[2]	Reference	1.41 (1.20-1.67)***	2.88 (2.22-3.73)***
Model 4: model 1 + social engagement[3]	Reference	1.43 (1.21-1.69)***	2.84 (2.19-3.69)***
Model 5: model 1 + elevated depressive symptoms[4]	Reference	1.43 (1.21-1.69)***	2.83 (2.18-3.67)***
Model 6: model 1 + health behaviours[5]	Reference	1.41 (1.19-1.67)***	2.66 (2.04-3.47)***
Model 7: model 1 + physical health[6]	Reference	1.32 (1.09-1.60)**	2.12 (1.58-2.85)***
Model 8: model 1 + self-rated health	Reference	1.26 (1.05-1.50)*	2.14 (1.62-2.83)***
Model 9: fully-adjusted[7]	Reference	1.25 (1.03-1.53)*	1.64 (1.21-2.24)**

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

[1] Wealth, education, and work status

[2] Combined score for immediate and delayed recall

[3] Social isolation, loneliness and marital status

[4] Elevated depressive symptoms

[5] Smoking and physical activity

[6] Longstanding limiting illness and number of doctor diagnosed health conditions (CHD, cancer, diabetes, chronic lung disease, stroke and arthritis)

[7]Age, sex, wealth, elevated depressive symptoms, impaired mobility, social isolation, loneliness, recall, smoking, physical activity, longstanding limiting illness, doctor diagnosed health conditions and self-rated health

Table 7.10 Relative risk ratios for multinomial logistic regression of self-perceived age four years later on depressive symptoms, ADL limitations and impaired mobility in fully adjusted model (95% CIs)

	Feels the same as actual age at W6 vs Feeling younger than actual age						Feels older than actual age at W6 vs Feeling younger than actual age					
	Depressive Symptoms		ADLS		Impaired Mobility		Depressive Symptoms		ADLs		Impaired Mobility	
	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*
Self-perceived age at W4												
Younger	Ref		Ref		Ref		Ref		Ref		Ref	
About the same	6.58 (5.56-7.77)	0.001	6.65 (5.63-7.86)	0.001	6.56 (5.55-7.76)	0.001	3.52 (2.65-4.68)	0.001	3.61 (2.72-4.80)	0.001	3.53 (2.66-4.70)	0.001
Older	4.60 (3.23-6.54)	0.001	4.68 (3.29-6.66)	0.001	4.55 (3.20-6.47)	0.001	9.88 (6.70-14.57)	0.001	10.25 (6.96-15.11)	0.001	10.04 (6.81-14.78)	0.001
Elevated depressive symptoms	**1.01 (0.78-1.30)**	**0.938**	1.02 (0.79-1.31)	0.891	1.00 (0.78-1.29)	0.998	**1.31 (0.95-1.80)**	**0.094**	1.32 (0.96-1.81)	0.088	1.34 (0.98-1.84)	0.065
Impaired ADLs	0.83 (0.59-1.16)	0.272	**0.88 (0.63-1.22)**	**0.437**			1.30 (0.91-1.86)	0.147	**1.42 (0.99-2.02)**	**0.056**		
Impaired mobility	1.27 (1.04-1.55)	0.018			**1.25 (1.03-1.53)**	**0.025**	1.59 (1.16-2.18)	0.004			**1.64 (1.21-2.24)**	**0.002**
Age (years)	1.00 (0.99-1.02)	0.472	1.01 (0.99-1.02)	0.362	1.00 (0.99-1.02)	0.478	1.07 (1.05-1.09)	0.001	1.07 (1.06-1.09)	0.001	1.07 (1.05-1.09)	0.001
Male	Ref		Ref		Ref		Ref		Ref		Ref	
Female	0.87 (0.74-1.03)	0.099	0.90 (0.77-1.06)	0.204	0.87 (0.74-1.02)	0.107	0.95 (0.74-1.23)	0.698	1.01 (0.78-1.30)	0.946	0.94 (0.73-1.21)	0.635

	Feels the same as actual age at W6 vs Feeling younger than actual age						Feels older than actual age at W6 vs Feeling younger than actual age					
	Depressive Symptoms		ADLS		Impaired Mobility		Depressive Symptoms		ADLs		Impaired Mobility	
	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*
Wealth												
Lowest 1	Ref		Ref		Ref		Ref		Ref		Ref	
2	1.01 (0.76-1.34)	0.928	1.01 (0.76-1.34)	0.928	1.02 (0.77-1.35)	0.891	0.98 (0.69-1.38)	0.901	0.98 (0.70-1.39)	0.921	0.97 (0.69-1.36)	0.855
3	1.11 (0.84-1.47)	0.478	1.10 (0.83-1.45)	0.522	1.11 (0.84-1.48)	0.451	0.56 (0.38-0.83)	0.004	0.55 (0.37-0.82)	0.003	0.55 (0.37-0.82)	0.003
4	0.95 (0.71-1.26)	0.705	0.94 (0.70-1.25)	0.646	0.95 (0.71-1.27)	0.735	0.70 (0.47-1.03)	0.071	0.70 (0.47-1.03)	0.067	0.69 (0.47-1.02)	0.064
Highest 5	1.27 (0.95-1.69)	0.104	1.25 (0.94-1.67)	0.126	1.28 (0.96-1.70)	0.096	0.60 (0.39-0.94)	0.024	0.59 (0.38-0.92)	0.020	0.59 (0.38-0.93)	0.021
Education												
Lower	Ref		Ref		Ref		Ref		Ref		Ref	
Intermediate	1.04 (0.84-1.30)	0.708	1.04 (0.84-1.30)	0.700	1.04 (0.84-1.30)	0.708	0.77 (0.56-1.04)	0.089	0.77 (0.56-1.04)	0.092	0.76 (0.56-1.04)	0.087
Higher	1.19 (0.95-1.49)	0.132	1.18 (0.94-1.48)	0.144	1.19 (0.95-1.49)	0.140	1.02 (0.74-1.40)	0.910	1.01 (0.73-1.38)	0.971	1.03 (0.75-1.41)	0.876
Employment Status												
Retired	Ref		Ref		Ref		Ref		Ref		Ref	
employed	0.93 (0.74-1.16)	0.517	0.92 (0.74-1.15)	0.477	0.93 (0.75-1.16)	0.530	1.69 (1.16-2.48)	0.006	1.66 (1.13-2.42)	0.009	1.67 (1.15-2.44)	0.008
other	0.80 (0.60-1.06)	0.115	0.80 (0.60-1.06)	0.120	0.79 (0.60-1.05)	0.106	1.75 (1.23-2.49)	0.002	1.76 (1.23-2.50)	0.002	1.78 (1.25-2.53)	0.001
Recall	0.96 (0.94-0.99)	0.006	0.96 (0.94-0.99)	0.005	0.96 (0.94-0.99)	0.007	0.95 (0.92-0.99)	0.022	0.95 (0.92-0.99)	0.018	0.95 (0.92-0.99)	0.020

	Feels the same as actual age at W6 vs Feeling younger than actual age						Feels older than actual age at W6 vs Feeling younger than actual age					
	Depressive Symptoms		ADLS		Impaired Mobility		Depressive Symptoms		ADLs		Impaired Mobility	
	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*	RRR	*P*
Social Isolation	1.20 (1.03-1.41)	0.020	1.21 (1.03-1.41)	0.019	1.21 (1.03-1.41)	0.020	1.12 (0.88-1.43)	0.345	1.13 (0.89-1.44)	0.322	1.12 (0.88-1.43)	0.350
Loneliness	1.02 (0.86-1.20)	0.837	1.03 (0.87-1.21)	0.763	1.02 (0.87-1.20)	0.832	1.32 (1.01-1.72)	0.039	1.34 (1.03-1.75)	0.028	1.32 (1.01-1.72)	0.039
Physical activity	0.91 (0.74-1.13)	0.393	0.90 (0.73-1.11)	0.311	0.93 (0.75-1.14)	0.472	0.86 (0.65-1.14)	0.295	0.83 (0.63-1.10)	0.206	0.84 (0.63-1.10)	0.203
Smoking	0.94 (0.73-1.20)	0.604	0.93 (0.73-1.19)	0.574	0.94 (0.73-1.20)	0.613	1.36 (0.97-1.90)	0.073	1.35 (0.97-1.89)	0.076	1.35 (0.96-1.89)	0.081
Limiting long standing health condition	1.11 (0.90-1.36)	0.335	1.18 (0.97-1.44)	0.094	1.10 (0.89-1.35)	0.379	1.46 (1.07-1.99)	0.016	1.65 (1.23-2.22)	0.001	1.49 (1.10-2.02)	0.011
Doctor diagnosed health conditions	0.96 (0.85-1.07)	0.452	0.98 (0.88-1.10)	0.742	0.95 (0.85-1.07)	0.429	0.99 (0.85-1.15)	0.881	1.03 (0.88-1.20)	0.719	0.99 (0.85-1.16)	0.928
Self-rated health (fair to poor)	1.56 (1.25-1.94)	0.001	1.61 (1.29-2.00)	0.001	1.54 (1.24-1.92)	0.001	1.70 (1.25-2.30)	0.001	1.81 (1.34-2.45)	0.001	1.74 (1.29-2.35)	0.001

Notes: ADLs= activities of daily living; RRR= relative risk ratio; p = p-value

7.3.4 Sensitivity analyses

I repeated the analyses using continuously distributed measures of self-perceived age, functional capacity and emotional distress, as shown in Table 7.11. The analyses produced similar findings to those using categorical variables for limited ADLs and elevated depressive symptoms but not for impaired mobility. This suggests that the associations reflect variations in risk across the range of functional capacity and emotional wellbeing rather than only those respondents who have elevated depressive symptoms, limited ADLs or who feel older than their actual age. In the fully-adjusted models self-perceived age predicted future ADL limitations but not the other way around. In the case of mobility, no significant association was observed in either direction, although a higher impaired mobility score was associated with an increase in self-perceived age albeit not statistically significant.

Secondly, using scores of one or more as the cut-off for difficulties with ADLs produced similar results to those using a cut off of two or more ADL limitations although the associations between feeling older than actual age and ADL limitations were no longer statistically significant in the final fully-adjusted models. In addition, the strength of the association between feeling older than actual age and future ADL limitations was weaker in comparison with the model using a cut-off of 2 or more ADLs. Individuals who felt older than actual age were 38% more likely to report one of more ADL limitations four years later in comparison with those who felt younger than their age. Whereas in my previous analyses, individuals who felt older than their actual age were 70% more likely to report two or more ADLs in comparison with respondents who felt younger. A similar pattern was observed in the association between limited ADLs and feeling older than actual age four years later. These observed differences may in part be explained by the higher proportion of respondents who reported having at least one ADL limitations in comparison with two or more difficulties with ADLs.

Table 7.11 Summary of sensitivity analyses

Models using continuous measures of self-perceived age, emotional distress and functional capacity and a lower cut-off point for ADL limitations

		Age, sex & baseline measure		Fully adjusted model	
Linear associations		**β (SE)**	**_P_ value**	**β (SE)**	**_P_ value**
SPA-->ADLs		0.004 (0.001)	<0.001	0.002 (0.001)	0.007
SPA-->CESD		0.008 (0.002)	<0.001	0.003 (0.002)	0.045
SPA-->Mobility		0.004 (0.002)	0.013	0.001 (0.002)	0.651
ADLS-->SPA		1.18 (0.31)	<0.001	0.55 (0.35)	0.115
CESD-->SPA		0.46 (0.14)	0.001	0.08 (0.16)	0.623
Mobility-->SPA		0.48 (0.11)	<0.001	0.27 (0.15)	0.060
One or more ADLs		**OR (95% CI)**	**_P_ value**	**OR (95% CI)**	**_P_ value**
SPA-->ADLs	Younger	1.00		1.00	
	Same age	1.61 (1.32-1.96)	<0.001	1.29 (1.05-1.59)	0.017
	Older	3.24 (2.36-4.44)	<0.001	1.38 (0.98-1.97)	0.069
		RRR (95% CI)	**_P_ value**	**RRR (95% CI)**	**_P_ value**
ADLs-->SPA	Younger	1.00		1.00	
	Same age	1.24 (1.01-1.54)	0.042	0.95 (0.75-1.20)	0.656
	Older	2.53 (1.95-3.27)	<0.001	1.28 (0.95-1.73)	0.099

Notes: ADLs=activities of daily living; CESD=Center for Epidemiological Studies Depression scale; SPA=self-perceived age
CI=confidence interval; OR=odds ratio; RRR=relative risk ratio; SE=standard error

7.4 Discussion

There were consistent reciprocal associations between self-perceived age and the three measures of functional capacity and emotional wellbeing investigated. But in the fully-adjusted models, self-perceived age was associated with elevated depressive symptoms and limited ADLs four years later, but not with impaired mobility. Conversely, after adjustment for covariates baseline impaired mobility but not ADL limitations or depressive symptoms were associated with future self-perceived age, as illustrated in Figure 7.2. Besides impaired mobility other factors associated with self-perceived age four years later were chronological age, having an existing limiting health condition, recall, employment status and self-rated health. The results of the multivariate analyses revealed that the strongest confounding effects were pre-existing functional capacity, physical illness and self-rated health. The findings suggest that functional capacity and emotional wellbeing have complex but important relationships with how old an individual feels.

Figure 7.2 Observed prospective associations between self-perceived age and emotional wellbeing and functional capacity
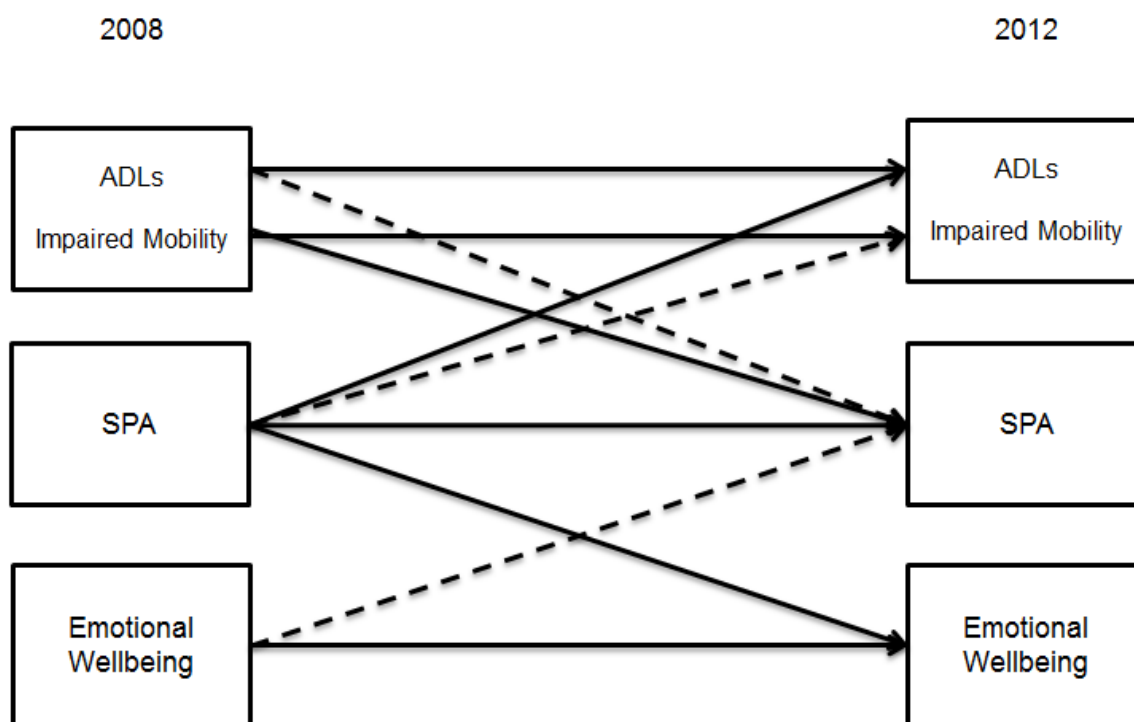
Solid lines indicate significant prospective associations; dashed lines indicate unconfirmed associations

Notes: ADLs=activities of daily living; SPA= self-perceived age

7.4.1 Self-perceived age as a predictor of emotional wellbeing and functional capacity

Self-perceived age was associated with future elevated depressive symptoms and limited ADLs independently of self-rated health and existing health conditions but not with impaired mobility, therefore confirming hypothesis 1 and partly confirming hypothesis 2. The findings persisted after adjustment for a range of key covariates including physical health, self-rated health and baseline functional capacity. Further I controlled for self-rated health, which is strongly correlated with self-perceptions of age, and the relationship still remained for elevated depressive and limited ADLs.

The results for emotional wellbeing are in accordance with other longitudinal studies that have also demonstrated that feeling older than actual age is associated with increased depressive symptoms (Choi and DiNitto, 2014; Spuling et al., 2013). Similarly, individuals who had a negative self-perception of ageing at baseline were more likely to report an increase in depressive symptoms over the study period in comparison with those who had a less negative self-perceived age (Wurm and Benyamini, 2014). The present findings therefore contribute to the existing literature which suggests that self-perceived age is a factor that may influence emotional wellbeing at older ages and extend previous research through adjustment for a wider range of explanatory variables and using the CES-D scale to measure depressive symptoms.

In the case of functional capacity, the results of my study are supported by most but not all of the literature. Previous studies have demonstrated a longitudinal relationship between self-perceptions of age and functional capacity (Levy et al., 2002a; Moser et al., 2011; Sargent-Cox et al., 2012; Wurm and Benyamini, 2014). In contrast, Spuling et al (2013) found that self-perceived age predicted physical health conditions, mental health and self-rated health six years later but not functional limitations where only a cross-sectional association was observed. The cross-sectional results indicated that feeling younger than actual age was related to better functional health. The authors speculate that a six-year lag between measurement occasions may be too long to detect an association between these two variables. However, this does not completely explain the discrepancy. Possible explanations for the contradictory results could relate to the longitudinal sample used in the Spuling et al study. The participants who remained in the study over the six-year period may have had fewer functional limitations in comparison with the original DEAS sample. It is worth mentioning that although the Wurm and Benyamini study also used data from the German Ageing Survey that these data were drawn from a later cohort. There was also higher

proportion of middle-aged adults (58%) in the sample, in comparison with older adults (42%), which might account for result. As would be expected the middle-aged group had better functional health at both time points in comparison with the older age group.

7.4.2 Emotional distress and functional capacity as predictors of self-perceived age

Impaired mobility was associated with self-perceived age four years later independently of self-rated health and existing health conditions but elevated depressive symptoms and ADL limitations were not, partly confirming hypothesis four but not hypothesis three. In line with previous research, I found that self-perceived age was associated with elevated depressive symptoms four years later but not in the opposite direction. This could suggest that those individuals who have an older subjective age may begin to view ageing in a more negative way which in turn may reduce wellbeing and life satisfaction. From the analysis, it seems probable since depression is related to a number of factors that themselves influence self-perceived age, such as, poor self-rated health and functional limitations. However, there is limited evidence to support the findings that functional capacity is associated with future self-perceived age, in part due to fewer existing studies investigating predictors of self-perceived age over time. One of the few studies to have examined the causal pathway between self-perceived age and health found no longitudinal association between self-perceived age and functional capacity in either direction (Spuling et al., 2013). In contrast, both Levy et al (2002a) and Sargent-Cox et al (2012a) found that while baseline self-perceived age predicted both self-reported and observed physical functioning years later, baseline physical functioning did not predict self-perceived age. However, it is conceivable that impaired mobility, which had the strongest effect on self-perceived age, would have a greater impact on individual's ability to carry out day-to-day activities and quality of life and may in turn activate self-stereotypes of ageing, leading some individuals to feel

older than they actually are. This is partly supported by studies which have shown that ageing expectations can have an important impact on future health, for example, in a study measuring women's perceived reasons for new disability, old age was perceived to be main cause of functional decline (Sarkisian et al., 2001)

7.4.3   Explanatory variables

In both parts of the study, existing functional limitations, physical health and self-rated health explained most of the relationship between self-perceived age and elevated depressive symptoms and functional capacity, with factors such as sex, wealth, education, social engagement and recall having a limited effect. This suggests that existing health conditions and functional limitations have a marked effect on how old a person feels they are and is in accordance with previous research.

In the current study higher levels of wealth were protective of future depressive symptoms and impaired mobility but not ADL limitations. Although individuals with higher levels of wealth were less likely to report feeling older than actual age, a dose-response association between wealth and self-perceived age was not observed. Educational level was not associated with self-perceived age four years nor did it explain the relationship between self-perceived age and emotional wellbeing and functional capacity. This is in line with previous studies that have also found inconsistent results, for example, one study found a bivariate association between low income and self-perceived age but not for sex, age or education level (Moser et al., 2011), while others have suggested that social characteristics are not strongly correlated with self-perceived age (Choi et al., 2014; Infurna et al., 2010). The differential patterns suggest that the pathway between self-perceptions of age and functional capacity and elevated depressive symptoms is only partially explained by

existing socio-demographic characteristics. Existing health, psychosocial factors and behaviours may have a stronger role.

Although not statistically significant, the current results showed that respondents who participated in moderate to vigorous physical activity were less likely to feel older, while current smokers were more likely to have an older self-perceived age. A finding consistent with previous research on the role health behaviours in the self-perceptions of ageing, whereby individuals with an older self-perceived age may employ less healthy behaviours and to seek medical care (Levy and Myers, 2004; Wurm et al., 2010). Furthermore, participation in physical activity was protective of future limited ADL, therefore providing further support for the possibility of future interventions.

7.4.4 Strengths and limitations

One of the main strengths of this study is the use of a large sample of older adults living in private households in England. Further, in the analyses I was able to control for a wide range of socio-demographic and health measures. To the best of my knowledge there are no studies in the literature on self-perceived age and emotional and functional health of a similar size or national scope, therefore the results here are more definitive in comparison with earlier studies. One of the problems in interpreting longitudinal observational studies is that associations might be due to reverse causality. However, this study has attempted to partially address this issue by investigating the relationship between self-perceived age and both functional health and depressive symptoms in both directions.

Conversely, there are several limitations to this study. Firstly, there is response bias. In particular, 6.3% of the longitudinal sample did not provide data on self-perceived age. Individuals who did not complete the measure tended to be older, less wealthy, less

educated and reported poorer self-rated health in comparison with those who completed the self-perceived age measure. It is unclear why these participants did not complete the measure. However, based on the observation that the same covariates characterise those who felt older than their actual age, it is probable that they resemble this high risk group. Additionally, in common with many cohort studies there is selective attrition, whereby the remaining participants are less likely to be representative of the whole population. Thirdly, the measures of emotional distress and functional capacity were self-reported and therefore may be subject to recall bias. This could lead to an under or an over-estimation of individuals with depressive symptoms or functional limitations.

As argued in Study 3, a further possible limitation is use of a single item to measure self-perceived age. Some researchers have argued that the construct is multidimensional so it may not be captured in a single measure (Levy et al., 2002b; Maier and Smith, 1999). However, a recent meta-analysis of longitudinal studies investigating the association between self-perceptions of ageing and health and survival found no significant difference between the two measures (Westerhof et al., 2014). Moreover, the item used in this study is simple and brief, so it has the potential to be employed as a practical tool to identify those individuals most at risk. It has previously been demonstrated that the promotion of positive age stereotypes may be a possible mechanism through which older adults may recover from certain functional limitations or disability (Levy et al., 2012). Therefore by identifying those at potential risk may help to target interventions. Evidence from empirical studies suggests that self-perceived age has the potential to be changed so interventions may be possible (Levy et al., 2014b; Sarkisian et al., 2007; Stephan et al., 2013). This could be achieved by identifying individuals who feel older than actual age, targeting of health messages, and promoting positive health behaviours and attitudes to ageing. For example, changing perceptions of ageing might have favourable effects on emotional

health and functional capacity. Conversely, helping people overcome the limitations of functional and mobility impairment might increase morale and optimism about ageing.

The statistical models only explained some of the relationship between self-perceived age, functional capacity and emotional distress. Therefore, the observed associations could be explained by residual confounding due to unmeasured factors that I have not accounted for in this study, such as, chronic pain or long term health conditions like dementia and musculoskeletal conditions besides arthritis. For example, I did not account for how much chronic pain might interfere with activities of daily living, mobility and perceptions of wellbeing (Eggermont et al., 2014). The intensity and persistence of pain was not accounted for in the present study. ELSA does include questions on the frequency and type of pain which could be considered in future studies. Similarly, factors such as deteriorating eyesight or hearing may have an impact on functional capacity (Liljas et al., 2016; Rudberg et al., 1993). All of which could potentially affect individuals assessments of their quality of life and their ability to carry out activities of daily living, along with their self-perceptions of ageing.

7.5 Conclusion

This study has demonstrated that an individual's age identity may have an important effect on both emotional wellbeing and functional capacity. While I found some evidence to support the hypothesis that self-perceived age is bidirectional, this study has been able to show that how old an individual feels they are may affect emotional wellbeing and limit day-to-day activities. It also indicates that further research is required to understand why individuals may perceive themselves to be older or younger than their chronological age and how this measure may be used to identify individuals at risk. Potential areas of future research would include following participants over a longer period of time and modelling repeated measures in order to

establish whether or not the observed associations persist. Further, a comparison with observed functional health measures, such as, grip strength and walking speed would also be beneficial in order to further verify the relationship between self-perceptions of age and functional capacity.

8   General Discussion

My review of the wider literature revealed gaps where older adults' perception of age discrimination has not been studied widely. I noted that empirical research in this area is limited and that few have focused on predictors of age discrimination and how these may shape and influence perceptions. I also established that very few studies have used large, nationally representative samples from England. A further gap was identified in cross-national studies using comparative data from the USA and England. No prior longitudinal studies were identified that had used nationally representative samples from the UK in their investigations of self-perceived age and its association with health and longevity. In addition, few studies had investigated the direction of the association between self-perceived age and functional capacity and emotional distress.

Having identified study gaps, I established the overall objectives of this thesis. These were two-fold: firstly, to investigate perceived age discrimination in older adults, and secondly, to explore what impact self-perceived age may have on health and ultimately longevity. I will first review the main aims and findings of my thesis before assessing the relevance and implications these results may have for policy makers and future research.

8.1   Aims

The aims of this thesis were to examine the evidence for perceived age discrimination (chapter two) and self-perceived age (chapter five) in older adults. Firstly, I sought to identify socio-demographic predictors of perceived age discrimination in older adults in England using data from ELSA (study one), before expanding this to compare levels and correlates of perceived age discrimination in England and the USA (study two). The relationship between self-perceived age and mortality was then examined (study

three). Having concluded that self-perceived age was predictive of future risk of mortality, I then went on to investigate the direction of the association between self-perceived age and health, focusing on emotional distress and functional capacity (study four).

The key questions I sought to address in this thesis were:

Study one:

- What is the prevalence of age discrimination amongst older adults in England?
- What are the key socio-demographics associated with perceived age discrimination?
- In what everyday situations is age discrimination more likely to occur?

Study two:

- Are levels of perceived age discrimination the same in the USA in comparison with England?
- Are the socio-demographic correlates of perceived age discrimination the same in the two countries?
- Do these results differ across five discriminatory situations?

Study three:

- Is feeling older than chronological age associated with an increased risk of mortality over an 8 to 9 year period in comparison with having a younger self-perceived age?
- What mechanisms may help to explain this association?

Study four:

- Are the associations between self-perceived age and (a) emotional health and (b) functional capacity (limited ADLs and impaired mobility) bi-directional?

8.2 Summary of findings

8.2.1 Study one

This was the first study on perceived age discrimination in older adults to use a large-scale survey, nationally representative sample of over 52 years olds in England and added to the findings of previous studies which used smaller sample sizes (Abrams et al., 2011a, 2009; Ray et al., 2006; Sweiry and Willitts, 2012). The results of the analyses indicated that around a third of older adults in England reported perceptions of age discrimination. Perceived age discrimination was associated with older age, higher levels of education, lower levels of household wealth and lack of paid employment. Of the five individual discriminatory situations measured, perceived age discrimination was more prevalent where people were treated with less courtesy (17.7%) and least where they experienced harassment (4.6%). While around ten percent of all participants attributed discrimination in healthcare settings to their age. The analysis of the individual discriminatory situations revealed many similar associations, with education and wealth being the most significant correlates regardless of the discriminatory situation itself.

The study revealed somewhat counterintuitive results for the relationship between perceived age discrimination and these two indicators of SES. The association between wealth and perceived age discrimination followed the direction hypothesised, where individuals with lower levels of wealth were more likely to perceive age discrimination. In contrast the association with education was observed in the opposite direction, with respondents who had higher levels of education more likely to perceive age discrimination in comparison with individuals with lower levels of education. However this was consistent with previous analysis carried out using European Social Survey (ESS) which has also showed that higher levels of education are associated

with higher levels of perceived age discrimination in England but not in other countries (van den Heuvel and van Santvoort, 2011).

8.2.2 Study two

To my knowledge this was the first comparative study of perceived age discrimination in older adults using data from the USA and England. The results of the study revealed that perceptions of age discrimination were significantly higher in England than the USA, with 34.8% of older adults aged 52 years and older in England reporting age discrimination compared with 29.1% in the USA. Contrary to my hypothesis the socio-demographic predictors of perceived age discrimination differed somewhat. In the US sample, perceived age discrimination was more common in older age groups and in individuals with less wealth. This was also the case in the English sample. However, perceived age discrimination was also more likely to be reported by English respondents with higher levels of education and who were currently retired. There were significant differences between the two countries in relation to perceived age discrimination and both age and education. The study samples were restricted to white respondents to ensure the two datasets were as comparable as possible. The prevalence of perceived age discrimination in England was therefore slightly different here in comparison to Study One due to this and that the analyses were unweighted.

In relation to the individual discriminatory situations the results of my study indicated that in both countries age discrimination was perceived most where people were treated with less courtesy and least where people experienced actual harassment. In both instances rates were higher in England in comparison with the USA. Overall, I observed virtually no difference between the countries regarding perceived age discrimination in service settings. In contrast to the other discriminatory situations, a higher proportion of older Americans felt they had been treated as less clever or smart

due to their age, in comparison with older English respondents. This could reflect the greater proportion of Americans with college experience in comparison to England.

One explanation for the observed differences could be that with the more recent implementation of age discrimination legislation in England there has been greater discourse around this in recent years, coupled with the ongoing discussion around an ageing population. Recognising and understanding the nature of discrimination extends the notion that awareness also makes it more reportable. Furthermore, while the USA could be seen to have been acknowledged the importance of age discrimination, its legislation only concentrates on the workplace and has not extended to other social arenas.

8.2.3   Study three

I found that self-perceived age predicted all-cause and cardiovascular mortality but not cancer mortality over a follow-up period of 99 months. The findings from these analyses supported my hypothesis that individuals who felt older than their actual age would have an increased risk of mortality in comparison with respondents who felt younger than their actual age. Feeling older than actual age was associated with a 41% increase in mortality hazard after adjusting for all covariates, while feeling about the same as chronological age was not associated with increased mortality, in comparison with the participants who felt younger than their actual age. The strength of the association between self-perceived age and mortality was reduced once existing health problems, functional limitations and health behaviours were accounted for.

The findings of this study were consistent with earlier research which demonstrated that positive self-perceptions of age relate to lower hazards of dying up to 23 years after baseline measurements (Kotter-Grühn et al., 2009; Levy et al., 2002b; Maier and

Smith, 1999; Markides and Pappas, 1982; Sargent-Cox et al., 2014; Uotinen et al., 2005). It added to the existing literature by using data from a large longitudinal study in England and accounted for a wider range of covariates in order to understand the potential mechanisms that may explain the observed association. The results indicated that emotional distress explained some of the relationship between self-perceived age and mortality, but that more of the association was explained by existing health conditions, functional capacity and health behaviours.

8.2.4 Study four

Following on from Study three, I sought further to understand the role of self-perceived age on health outcomes. I found some evidence to support my hypothesis that there was a bi-directional association between self-perceived age and functional capacity and emotional health. There were consistent reciprocal associations between self-perceived age and the two measures of functional capacity and emotional wellbeing. In the fully-adjusted models, self-perceived age was associated with elevated depressive symptoms and limited ADLs four years later, but not with impaired mobility. Conversely, after adjustment for covariates baseline impaired mobility but not ADL limitations or depressive symptoms were associated with self-perceived age four years later. Besides impaired mobility other factors associated with future self-perceived age were chronological age, having an existing limiting health condition, recall, employment status and self-rated health. The results of the multivariate analyses revealed that the strongest confounding effects were pre-existing functional capacity, physical illness and self-rated health.

The findings of this study have added to the current literature on self-perceived age by observing the relationship between self-perceived age and both functional capacity and depressive symptoms in both directions, in order to further understand the possible

mechanisms between self-perceived age and health. It has also added to the handful of existing studies which have examined the relationship between self-perceived age and functional capacity and self-perceived age and emotional health. In addition, this study attempted to partially address the problem that associations observed might be due to reverse causality by observing the relationships between self-perceived age and functional health and depressive symptoms in both directions.

8.3 Strengths and limitations

8.3.1 Strengths

One of the key strengths of this thesis is that all four studies used data from large scale, nationally representative studies in which I was able to control for a range of explanatory confounders. ELSA collects data from men and women aged 50 years and over living in private households in England on a wide variety of topics. In particular it contains quite detailed economic, health and social measures. The multidisciplinary nature of ELSA allowed me to control for a range of socio-demographic and health measures in my analyses. A good example of this strength is the primary measure of socioeconomic status I used – wealth. Through the involvement of the microeconomists at the Institute for Fiscal Studies, the measure of wealth is more detailed and precise than in other studies. Wealth is a stronger predictor of future mortality in ELSA than other socioeconomic indicators such as education and occupation (Demakakos et al., 2016), highlighting its value as a control variable in my analyses. An additional strength of this thesis is that ELSA uses standardised measures of the key variables of interest, including ADLs, depression, mobility and discrimination, rather than relying on single item or unvalidated questionnaires. Factors such as these help to make the findings of my thesis more generalisable.

Along with the quality of the data and sample size, the longitudinal design of ELSA also enabled me to examine the prospective association between self-perceived age and functional capacity and emotional health. In addition, ELSA is harmonised with other studies of ageing, including HRS, which facilitated the cross-country comparison of perceived age discrimination in older adults.

8.3.2 Limitations

One of the main limitations of my research is selection bias, in particular due to non-response. For example, the analyses of the participants who did not complete the self-perceived age measure indicated that they tended to be older, less wealthy, less educated and more likely to report poorer self-rated health. Many of these characteristics were similar to those held by respondents who felt older than their actual age and therefore this could have led to an underestimation of the impact of feeling older than actual age on health and mortality. Therefore, the decision to restrict the analytic samples to respondents who had completed all the measures of interest, is a limitation of this thesis as the analysed sample was slightly younger, wealthier, and had better health than the ELSA sample as a whole, so my results may not be representative of the population.

A further limitation, and which is also common to many longitudinal studies, is that of selective attrition. In ELSA, attrition was greater amongst those with no educational qualifications, lower levels of wealth, and a longstanding limiting illness. This could reduce the representativeness of the respondents who remained in the study and may have led to a conservative estimate of association between self-perceived age and functional capacity and emotional health.

In addition, there are several shortcomings with the two key measures of interest. For example, the age discrimination measure asked respondents to recall how frequently in the past year they experienced discrimination in five everyday situations which may be subject to recall bias. This may have led to either an underestimation or overestimation of the prevalence of perceived age discrimination, especially given the timeframe of "in the past year" specified in the question. A possible alternative would be to ask respondents about their experiences of discrimination over a shorter period, such as over the past month. A second limitation of the measure is that it does not allow respondents to indicate in which discriminatory situations they perceived discrimination due to their age. Therefore, it is not possible to say with certainty that an individual experienced age discrimination in a particular situation, only the likelihood that they did. It would have been beneficial if the measure had allowed this. Furthermore, it does not really tell us about the actual levels of age discrimination only about perceptions of age discrimination, which could either be an under or over-reporting of the level of actual discrimination.

The version of the everyday discrimination scale used in ELSA does not include the major discriminatory situations questions that are part of the full measure (Kessler et al., 1999; Williams et al., 1997). This part of the measure includes questions pertaining to work, housing and bank services. Of particular interest are the questions on discriminatory experiences in the workplace. It would have been interesting to assess whether or not the respondents currently in work, perceive age discrimination more in this situation in comparison with other discriminatory situations.

In relation to the self-perceived age measure a possible limitation is that it may not reflect the multidimensional aspects of the construct (Kotter-Grühn et al., 2009; Sargent-Cox et al., 2012; Steverink et al., 2001). For example, it could be argued that a single-item measure may not accurately reflect simultaneous perceived age related

gains and losses (Diehl and Wahl, 2010; Spuling et al., 2013). However, as noted earlier, it has been shown to be a robust indicator and a recent meta-analysis investigating the longitudinal association between self-perceived age and health and longevity found no significant difference in the strength of predications using a single-item measure of self-perceived age in comparison with a multi-item measure (Westerhof et al., 2014). Equally the single-item measure used in my analyses has the potential to be employed as a practical tool to identify those individuals most at risk.

Despite these limitations the measures of perceived discrimination and self-perceived age have both been used widely in previous research and have shown good overall validity. For example, the Everyday Discrimination Scale used to measure perceived age discrimination has previously been shown to have good psychometric properties (Krieger et al., 2005). While the self-perceived age measure has been used in a number of studies and has produced consistent results (Westerhof et al., 2014).

A further limitation is that the findings of my thesis are based primarily on self-report measures, and not on objective indicators. The measures used to assess mobility difficulties, limited ADLs, and depression are all self-reported and therefore may be subject to information bias. Therefore, the prevalence of functional limitations and depressive symptoms reported in this thesis should be treated with caution.

Finally, whilst ELSA is acknowledged to be a representative sample of over 50 year olds in England, it contains a very low proportion of black and minority ethnic participants. Therefore, it is difficult to draw any conclusions about the role of race or cultural identity in perceptions of age discrimination and ageing, and in this respect the results of this thesis are limited. This is added to further by the fact that ELSA does not include any individuals living in institutions.

The choice of statistical method I used also has some limitations. For example, in Study 3 the Cox regression model used only takes into account explanatory measures from one time point, and therefore it does not account for any changes in these factors after baseline. In particular, it does not account for any health conditions that may have developed between the time baseline measures were taken and follow-up, some of which may have been associated with mortality.

In the final study it could be argued that due to the complexity of the relationships examined that an alternative statistical method, such as, structural equation modelling may have been more appropriate. However, the analyses I have carried out in study four could be seen to be a first step, with the next being to conduct structural equation modelling including only those variables identified as relevant to the relationship between self-perceived age and functional capacity and elevated depressive symptoms.

In the first two studies it could be argued that linear regression would have been a more appropriate method as the perceived discrimination measure was a scale. However, I chose to dichotomise the responses to measure because the data were skewed, with most participants reporting discrimination less than once a year or never in any of the discriminatory situations. Therefore, logistic regression was the most appropriate method for this analysis because the outcome variable was perceived age discrimination as opposed to incidence of perceived everyday discrimination.

One of the key strengths of this thesis was the use of large sample sizes which reduces the probability of the observed results being due to chance. However, in the analyses of individual discriminatory situations in studies 1 and 2 statistical power maybe an issue as there were very small numbers in some of the groupings. Thus there may not have been sufficient power to detect significant associations in these

sub-group analyses and might account for some of the discrepancies between the results from the overall sample and those from the individual discriminatory situations. A further related consideration is the possible impact of multiple testing. For example, in the sub-group analyses I tested a number of hypotheses at the same time and it could be that some of the observed associations between socio-demographic characteristics and perceived age discrimination may have occurred due to chance.

8.4 Stereotype Embodiment Theory and wider relevance

Theoretical models are important to our understanding of the role of stereotypes in ageism, explaining why someone will treat another person differently due to their age. Particularly pertinent is Becca Levy's Stereotype Embodiment Theory. Levy (2009) argues that stereotypes of ageing are embodied when their assimilation from the wider culture leads to self-definition that in turn influences health and functioning. It offers a clear way to understand how societal attitudes and stereotypes of ageing may inform and shape the perceptions of ageing an individual may hold at older ages and how these age-related stereotypes are assimilated over the life course, may gain relevance at older ages and affect actual ageing experiences almost unknowingly.

I would argue that studies one and two support the notion that perceptions of age discrimination become more relevant at older ages. Older adults who perceived discrimination were more likely to attribute it to their age in comparison with other sociodemographic characteristics and the prevalence increased with age. Study two also helps to demonstrate that because of the subjective nature of perceived age discrimination, the culture of a country may influence these perceptions and the resulting age-related attitudes. The findings of studies three and four go on to demonstrate that negative self-assessments of ageing can have a profound effect on the future health on an individual.

Having established study gaps through a review of the literature, this thesis provides some contribution to a greater understanding of the role of self-perceptions of ageing and age discrimination through an examination of older adults in England using ELSA, as well as a cross-country comparison of perceived age discrimination in England and the USA.

8.5   Relevance for policy and implications for future research

8.5.1   Policy

The results presented in this thesis highlight that age discrimination remains both prevalent and a very real problem for society, with sizeable proportion of older adults in both England and the USA attributing everyday discriminatory situations to their age. The introduction of age discrimination legislation may be one answer to the problem but this has predominantly covered employment. Although steps are being made to address age discrimination in the workplace and in the provision of goods and services through the Equality Act 2010, it is equally important to address ageism in society more broadly. In other words, age discrimination that may be experienced in everyday situations. Further it was shown that self-perceived age can have an important effect on health and ultimately survival at older ages. It is clear that addressing attitudes towards age is of importance. Part of this will mean challenging often negative stereotypes of older people, including how we as individuals perceive older age and ageing in general. To address age discrimination in everyday situations also requires changes in societal attitudes towards older adults and ageing and the dispelling of many of the negative stereotypes of older people and ageing. While another would be to increase engagement of all age groups in the policy making process. This may be

achieved through challenging the often negative stereotypes presented in the media, and through increasing the quality and amount of contact between generations.

Challenging the images and stereotypes of ageing and older adults

Mass media portrayals of older adults have been a variable that may reinforce negative age stereotypes. Recently Levy et al (2014a) evaluated group descriptions on the social media site Facebook and found that over 98% were based on negative age stereotypes. This highlights that many of these negative images persist and need to be challenged, especially as it could be argued that social media platforms offer one method to increase both social interaction and awareness. However, earlier assessments of prime time television in Germany indicate a more mixed picture. Kessler et al. (2004) revealed that older adults were under-represented, in particular older women and those of advanced old age. Although of those represented the portrayal of their social participation and financial resources was very positive. While a later study of portrayal of older adults in TV advertisements also emphasised how more positive portrayals of older age would be equally as beneficial to younger age groups (Kessler et al., 2010). This is particularly pertinent in times of austerity where tensions may be exacerbated. For example, the discourse around pension provision and social care amongst others could be regarded as a burden on public finances which could in turn lead to negative attitudes. Other competing demands on public finances could result in older adults being regarded as a burden on society. This could in turn lead to more commonly held negative attitudes. A further example is the discourse around home ownership in the UK. Older people or 'baby boomers' are seen as having being more fortunate in terms of being able to purchase a home in contrast to younger generations, leading to negative stereotypes around greed and squandering past resources. In these circumstances older people are seen as a homogenous rather than heterogeneous group with differing abilities and needs.

Counteracting negative perceptions of ageing by portraying images of older adults that are more productive, socially engaged and active but at the same time reinforcing that older adults are a diverse group (Kotter-Grühn, 2015). Some of the ways this could be facilitated include public awareness campaigns, through more diverse portrayals of older adults in the media and through education. Part of this also includes discussion of what ageing means and of identifying what age discrimination is. Therefore, educating all age groups is important in this aspect. In healthcare settings this could be addressed through training for healthcare professionals and care providers or through reinforcing existing guidance on equality, such as that included in the General Medical Council's Good Medical Practice. In a recent article Tinker and colleagues argue that social gerontology should be added to the medical training curriculum in order for students to gain a greater understanding of population ageing (Tinker et al., 2016). The authors argue that while it is beneficial for geriatricians it would be advantageous for undergraduate medical students more broadly.

Intergenerational contact and communication

One of the proposed interventions to reduce age discrimination and to address negative stereotypes and perceptions of ageing is through increased intergenerational contact and communication (Abrams et al., 2008, 2006; Christian et al., 2014; Hagestad and Uhlenberg, 2005; North and Fiske, 2012). Stereotypes of older age are argued to reflect the lack of contact between different generations. In common with some but not all previous research I found that respondents who were retired were more likely to perceive age discrimination in comparison with respondents who were currently in employment. One explanation offered for this phenomenon is that this maybe as a result of reduced contact with younger people after leaving paid employment (Abrams et al., 2015).

Voluntary programmes may be one way that greater intergenerational contact could be achieved or facilitated (Christian et al., 2014; Ory et al., 2003). An example of an existing voluntary scheme in the USA is Experience Corps, which is now run in conjunction with the AARP (formerly the American Association of Retired Persons). The scheme started in 1995 in five American cities and it has since expanded to cover twenty-one cities, including Baltimore, New York and Washington DC, and involves trained volunteers aged 50 years and over tutoring children in the early years of school. Its aim is to improve literacy rates of children but it has also been shown to improve the wellbeing and functional capacity of older adults, increase community engagement, as well as to help improve the academic performance and classroom behaviour of children (Fried et al., 2013; Glass et al., 2004; Gruenewald et al., 2015). Although the studies on the scheme have not explicitly evaluated whether or not this contact has altered the children's perceptions of older adults (Kotter-Grühn, 2015) it has had a number of beneficial outcomes for both age cohorts. A review of similar intergenerational educational schemes indicated that such programmes may help to reduce negative age stereotypes but that this was dependent upon factors such as, the length of the programmes and the strength of the bond between the two groups (Aday et al., 1996; Christian et al., 2014). As participation in the Experience Corps scheme and similar programmes have had many beneficial health outcomes it is possible that socially productive activities may be one route to improve self-perceptions of ageing along with reducing negative age stereotypes. However, evaluation of the long-term effect of such interventions would be required along with assessment of their impact on perceptions of age discrimination.

Interventions to change the negative self-perceptions of ageing

The observed association found between self-perceived age, mortality, emotional health and limited ADLs indicates that individuals who have an older self-perceived age may be at greater risk than those who feel younger than their age. Further although the

converse association between functional capacity and depressive symptoms and self-perceived age was weaker it does suggest that interventions may also improve self-perceptions of ageing along with health. Evidence from experimental studies indicates that this may be possible; therefore, identifying those most at risk is of importance. The self-perceived age measure could be a tool that could be used to identify those at risk, and helping to change these perceptions could also improve functional capacity and emotional health and reduce the risk of mortality. As it has been demonstrated that negative age stereotypes held earlier in life can have a negative effect on health later in life (Levy et al., 2009), such interventions would need to be considered earlier in middle age.

The promotion of positive age stereotypes may be a possible mechanism through which older adults may recover from certain functional limitations or disability (Levy et al., 2012). Evidence from experimental studies suggest that implicit priming of age stereotypes can affect the cognitive, physical and psychological performance of older adults (Horton et al., 2008; Meisner, 2012). Levy and colleagues (2014b) demonstrated that respondents who were subliminally exposed to positive age stereotypes over a number of sessions showed improvements in physical function over a period of two months. The study suggests that such an intervention may have the potential to improve health along with an individual's perception of ageing.

While interventions, such as, increasing participation in physical activity may also improve attitudes toward own ageing in older adults. An intervention study demonstrated that women who participated in six-month exercise programme were more likely to improve their ageing satisfaction over a six-month period in comparison with respondents in both the passive and active control groups (Klusmann et al., 2012). Therefore, interventions such as this could mitigate or improve an individual's self-

perception of ageing and in turn could help improve the health outcomes for individuals who feel older than they actually are.

8.5.2   Future research

Future areas of research include investigating the effect of perceived age discrimination over a longer period of time in order to see whether the observed associations hold and to evaluate whether the differences observed between the USA and England remain. Now that later waves of ELSA are available, it would also be possible to look at the association between perceived age discrimination and health outcomes, which could include investigating some of the mechanisms that may explain their relationship. Currently there is still only one wave of data containing the perceived discrimination question in ELSA so it would not be possible to assess repeated measures, unlike in American studies such as HRS.

A second area of future research is to explore in more detail the effect of self-perceived age on health outcomes. In particular, to assess whether or not the relationship observed between self-perceived age and functional capacity holds for objectively observed functional health measures, such as grip strength and walking speed. The only identified study using objectively measured functional health indicated that this might be the case (Sargent-Cox et al., 2012) but using data from ELSA would enable a larger sample of older adults to be observed. As the direction of the relationship between self-perceived health and functional capacity remains unclear, using objectively measured functional health may help to clarify the association.

Further consideration should also be given to cross-cultural comparisons of perceptions of ageing. The commonly held view is that attitudes towards older adults and ageing are more favourable in East Asian cultures. However, few observational

studies have looked at perceived age discrimination in older adults, with most focused on younger adults' perceptions of older people. Further there is some suggestion that these traditional attitudes may be changing in part due to ageing population and changing family structures (Lockenhoff et al., 2009). Future research should consider how ageing is viewed by older adults in other countries and comparative studies of perceived age discrimination would be useful in identifying country level indicators and aid our understanding of how age stereotypes can be addressed.

Finally, research on the relationship between self-perceived age and perceived age discrimination should be considered. For example, to investigate whether individuals who feel older than their actual age or who hold more negative views of ageing are more likely to perceive age discrimination in comparison with individuals who feel younger than their actual age or who hold more positive view of ageing. There is some indication that this maybe the case (Eibach et al., 2010; Stephan et al., 2015b). In an experimental study, Eibach et al (2010) demonstrated that individuals who were primed to feel older were more likely to be susceptible to or express negative attitudes to ageing or conform to ageist stereotypes. Whilst Stephan et al (2015) investigated the opposite association and showed that individuals who have experienced age discrimination are more likely to report older self-perceived ages over a two year period in comparison with those who have not reported age discrimination.

In addition, conducting qualitative or mixed methods research, such as, using semi-structured interviews or giving a more detailed questionnaire on perceptions of age discrimination and experiences of ageing to a smaller sample of older adults, would also be valuable in informing future quantitative analysis and may help to identify potential factors that have a role in shaping these perceptions at older ages. Conducting such research could also help to improve the measurement of age discrimination and self-perceived age in population surveys. Furthermore, as discussed

above in the limitations section it would be useful if the perceived discrimination measure could be amended or coded differently so that it is possible to tell in which situations respondents' perceived discrimination due to their age. A further possible refinement of the measure would be to qualify the time frame of the past year or the past month, as it could provide a reference point for respondents and help to gauge changes in the level of discrimination. Similarly, with the self-perceived age measure it might be useful to ask a follow-up question in order to ascertain the reasons for providing the answer they did. Perhaps by listing possible factors that they may have been taken into account.

8.6   Conclusion

One of the overriding themes of this thesis is how we ourselves view ageing and how this may inform our perceptions of discrimination and ultimately how we appraise our own ageing experience. The findings of my thesis indicate that there is scope to change this and that interventions may be possible. For example, through identifying older adults who feel older than their actual age or who have more negative perceptions of ageing may help us to target those most at risk, interventions could be applied that may help redress these perceptions and in turn could help to improve the health and wellbeing. Promoting more positive messages about ageing and increasing the opportunities for interaction with younger people may help to address some of these negative perceptions about older age and to reduce age discrimination. This would be beneficial for both older adults and younger generations. It would be just as important to address these issues as much for the current cohort of older adults those in the future.

References

Abrams, D., Crisp, R.J., Marques, S., Fagg, E., Bedford, L., & Provias, D. (2008). Threat inoculation: Experienced and imagined intergenerational contact prevents stereotype threat effects on older people's math performance. *Psychology and Aging,* 23, 934–939.

Abrams, D., Eilola, T., & Swift, H. (2009). *Attitudes to age in Britain 2004-2008* (No. Research Report No 599). Department for Work and Pensions, London.

Abrams, D., Eller, A., & Bryant, J. (2006). An age apart: The effects of intergenerational contact and stereotype threat on performance and intergroup bias. *Psychology and Aging*, 21, 691–702.

Abrams, D., Russell, P.S., Vauclair, C.-M., & Swift, H.J. (2011a). *Ageism in Europe: findings from the European Social Survey.* Age UK, London.

Abrams, D. & Swift, H.J. (2012). Ageism doesn't work. *Public Policy & Aging Report,* 22, 3–8.

Abrams, D., Swift, H.J., Lamont, R.A., & Drury, L. (2015). *The barriers to and enablers of positive attitudes to ageing and older people, at the societal and individual level.* Foresight Future of an Ageing Population. Government Office for Science, London.

Abrams, D., Vauclair, C.-M., & Swift, H.J. (2011b). *Predictors of attitudes to age across Europe* (No. Research Report No. 735). Department for Work and Pensions, London.

Adams, J., Stamp, E., Nettle, D., Milne, E.M., & Jagger, C. (2014). Socioeconomic position and the association between anticipated and actual survival in older English adults. *Journal of Epidemiology and Community Health*, 68, 818–825.

Aday, R.H., Sims, C.R., McDuffie, W., & Evans, E. (1996). Changing children's attitudes toward the elderly: The longitudinal effects of an Intergenerational Partners Program. *Journal of Research in Childhood Education*, 10, 143–151.

Alvarez-Galvez, J., & Salvador-Carulla, L. (2013). Perceived discrimination and self-rated health in Europe: Evidence from the European Social Survey. *PLoS ONE,* 8, e74252.

Arber, S., & Ginn, J. (1995). *Connecting gender and ageing: a sociological approach.* Open University Press, Buckingham ; Philadelphia.

Ayalon, L. (2014). Perceived age, gender, and racial/ethnic discrimination in Europe: Results from the European Social Survey. *Educational Gerontology,* 40, 499–517.

Ayalon, L., & Gum, A.M. (2011). The relationships between major lifetime discrimination, everyday discrimination, and mental health in three racial and ethnic groups of older adults. *Aging & Mental Health,* 15, 587–594.

Baltes, P.B., & Baltes, M.M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In: Baltes, P.B., & Baltes, M.M. (Eds.), *Successful aging: Perspectives from the behavioral sciences.* Cambridge University Press, New York, pp. 1–34.

Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (2006). *Retirement, health and relationships of the older population in England: the 2004 English Longitudinal Study of Ageing.* Institute for Fiscal Studies, London.

Banks, J., Karlsen, S., & Oldfield, Z. (2003). Socio-economic position. In: Marmot, M., Banks, J., Blundell, R., Lessof, C., & Nazroo, J. (Eds.), *Health, wealth and lifestyles of the older population in England.* Institute for Fiscal Studies, London.

Banks, J., Nazroo, J., Steptoe, A. (2012). The dynamics of ageing: Evidence from the English Longitudinal Study of Ageing 2002-10 (Wave 5). Institute of Fiscal Studies, London.

Barak, B., & Stern, B. (1986). Subjective age correlates: a research note. *The Gerontologist,* 26, 571–578.

Barnes, L.L., de Leon, C.F.M., Lewis, T.T., Bienias, J.L., Wilson, R.S., & Evans, D.A. (2008). Perceived discrimination and mortality in a population-based study of older adults. *American Journal of Public Health,* 98, 1241–1247.

Barnes, L.L., De Leon, C.F.M., Wilson, R.S., Bienias, J.L., Bennett, D.A., & Evans, D.A. (2004). Racial differences in perceived discrimination in a community population of older blacks and whites. *Journal of Aging and Health,* 16, 315–337.

Barnett, K., Mercer, S.W., Norbury, M., Watt, G., Wyke, S., & Guthrie, B. (2012). Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *The Lancet*, 380, 37–43.

Barrett, A.E. (2003). Socioeconomic status and age identity: The role of dimensions of health in the subjective construction of age. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 58, S101–S109.

Bayl-Smith, P.H., & Griffin, B. (2014). Age discrimination in the workplace: Identifying as a late-career worker and its relationship with engagement and intended retirement age. *Journal of Applied Social Psychology*, 44, 588-599.

Beyer, A.-K., Wolff, J.K., Warner, L.M., Schüz, B., & Wurm, S. (2015). The role of physical activity in the relationship between self-perceptions of ageing and self-rated health in older adults. *Psychology & Health,* 30, 671–685.

Bowling, A. (1999). Ageism in cardiology. *British Medical Journal*, 319, 1353–1355.

Braithwaite, V. (2002). Reducing ageism. In: Nelson, T.D. (Ed.), *Ageism: Stereotyping and prejudice against older persons*. MIT Press, Cambridge, Massachusetts, pp. 311–337.

Bugental, D.B., Hehman, J.A. (2007). Ageism: A Review of Research and Policy Implications. *Social Issues and Policy Review,* 1, 173–216.

Butler, R.N. (1980). Ageism - a foreword. *Journal of Social Issues*, 36, 8–11.

Butler, R.N. (1969). Ageism: Another form of bigotry. *The Gerontologis*t, 9, 243–246.

Carstensen, L.L. (2006). The influence of a sense of time on human development. *Science*, 312, 1913–1915.

Chan, K.S., Kasper, J.D., Brandt, J., & Pezzin, L.E. (2012). Measurement equivalence in ADL and IADL difficulty across international surveys of aging: findings from the HRS, SHARE, and ELSA. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 67, 121–32.

Cheshire, H., Hussey, D., Medina, J., Pickering, K., Wood, N., Ward, K., Taylor, K., & Lessof, C. (2012a). *Financial circumstances, health and well-being of the older*

population in England: The 2008 English Longitudinal Study of Ageing technical report. National Centre for Social Research, London.

Cheshire, H., Hussey, D., Phelps, A., & Wood, N. (2012b). Methodology. In: Banks, J., Nazroo, J., & Steptoe, A. (Eds.), *The dynamics of ageing: Evidence from the English Longitudinal Study of Ageing 2002-10 (Wave 5)*. Institute for Fiscal Studies, London, pp. 183–213.

Chipman, A., & Kielstra, P. (2012). *A new vision for old age: Rethinking health policy for Europe's ageing society*. Economist Intelligence Unit, London.

Choi, N.G., & DiNitto, D.M. (2014). Felt age and cognitive-affective depressive symptoms in late life. *Aging & Mental Health*, 18, 833–837.

Choi, N.G., DiNitto, D.M., & Kim, J. (2014). Discrepancy between chronological age and felt age age group difference in objective and subjective health as correlates. *Journal of Aging and Health*, 26, 458–473.

Christian, J., Turner, R., Holt, N., Larkin, M., & Cotler, J.H. (2014). Does intergenerational contact reduce ageism: When and how contact interventions actually work? *Journal of Arts and Humanities*, 3, 1–15.

Clegg, A., Young, J., Iliffe, S., Rikkert, M.O., & Rockwood, K. (2013). Frailty in elderly people. *The Lancet,* 381, 752–762.

Cole, M.G., & Dendukuri, N. (2003). Risk factors for depression among elderly community subjects: a systematic review and meta-analysis. *American Journal of Psychiatry*, 160, 1147–1156.

Cornwell EY, & Waite LJ. (2009). Measuring social isolation among older adults using multiple indicators from the NSHAP Study. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 64, 38-46.

Crawford, R., & Emmerson, C. (2012). *NHS and social care funding: the outlook to 2021/22*. Nuffield Trust, London.

Crosby, F. (1984). The denial of personal discrimination. *American Behavioral Scientist,* 27, 371–386.

Cuddy, A.J.C., Norton, M.I., & Fiske, S.T. (2005). This old stereotype: The pervasiveness and persistence of the elderly stereotype. *Journal of Social Issues*, 61, 267–285.

Cuijpers, P., Vogelzangs, N., Twisk, J., Kleiboer, A., Li, J., & Penninx, B.W. (2013). Differential mortality rates in major and subthreshold depression: meta-analysis of studies that measured both. *The British Journal of Psychiatry,* 202, 22–27.

Davis, K., Stremikis, K., Squires, D., & Schoen, C. (2014). *Mirror, mirror on the wall, 2014 update: How the U.S. health care system compares internationally*. The Commonwealth Fund, New York.

Demakakos, P., Biddulph, J.P., Bobak, M., & Marmot, M.G. (2016). Wealth and mortality at older ages: a prospective cohort study. *Journal of Epidemiology and Community Health*, 70, 346-353.

Demakakos, P., Gjonca, E., & Nazroo, J. (2007). Age identity, age perceptions, and health: Evidence from the English Longitudinal Study of Ageing*. Annals of the New York Academy of Sciences*, 1114, 279–287.

Demakakos, P., Hacker, E.,& Gjonca, E. (2006). Perceptions of ageing. In: Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (Eds.), *Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing (Wave 2).* Institute for Fiscal Studies, London.

Demos, & WRVS. (2012). *Ageing across Europe*. WRVS, Cardiff.

Diehl, M.K., & Wahl, H.W. (2010). Awareness of age-related change: Examination of a (mostly) unexplored concept. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 65, 340–350.

Diehl, M., Wahl, H.-W., Barrett, A.E., Brothers, A.F., Miche, M., Montepare, J.M., Westerhof, G.J., & Wurm, S. (2014). Awareness of aging: Theoretical considerations on an emerging concept. *Developmental Review,* 34, 93–113.

Djernes, J.K. (2006). Prevalence and predictors of depression in populations of elderly: a review. *Acta Psychiatrica Scandinavica,* 113, 372–387.

Eggermont, L.H.P., Leveille, S.G., Shi, L., Kiely, D.K., Shmerling, R.H., Jones, R.N., Guralnik, J.M., Bean, J.F. (2014). Pain characteristics associated with the onset

of disability in older adults: The maintenance of balance, independent living, intellect, and zest in the Elderly Boston Study. *Journal of the American Geriatrics Society*, 62, 1007–1016.

Eibach, R.P., Mock, S.E., & Courtney, E.A. (2010). Having a "senior moment": Induced aging phenomenology, subjective age, and susceptibility to ageist stereotypes. *Journal of Experimental Social Psychology,* 46, 643–649.

Eurobarometer (2012). *Discrimination in the EU in 2012: Special Eurobarometer report 393.* European Commission, Brussels.

Eurobarometer (2009). *Discrimination in the EU in 2009: Special Eurobarometer report 317.* European Commission, Brussels.

Fiske, S.T., Cuddy, A.J.C., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology*, 82, 878–902.

Fonda, S., & Herzog, A.R. (2004). *Documentation of physical functioning measured in the Health and Retirement Study and the Asset and Health Dynamics among the Oldest Old Study*. University of Michigan, Ann Arbor, Michigan.

Franklin, B., Beach, B., Bamford, S.-M., & Creighton, H. (2015*). The missing million: Illuminating the employment challenges of the over 50s.* ILC-UK, London.

Fried, L.P., Carlson, M.C., McGill, S., Seeman, T., Xue, Q.-L., Frick, K., Tan, E., Tanner, E.K., Barron, J., Frangakis, C., Piferi, R., Martinez, I., Gruenewald, T., Martin, B.K., Berry-Vaughn, L., Stewart, J., Dickersin, K., Willging, P.R., & Rebok, G.W. (2013). Experience Corps: A dual trial to promote the health of older adults and children's academic success. *Contemporary Clinical Trials,* 36, 1–13.

Garstka, T.A., Hummert, M.L., & Branscombe, N.R. (2005). Perceiving age discrimination in response to intergenerational inequity. *Journal of Social Issues*, 61, 321–342.

Garstka, T.A., Schmitt, M.T., Branscombe, N.R., & Hummert, M.L. (2004). How young and older adults differ in their responses to perceived age discrimination. *Psychology and Aging,* 19, 326–335.

Gee, G.C., Pavalko, E.K., & Long, J.S. (2007). Age, cohort and perceived age discrimination: Using the life course to assess self-reported age discrimination. *Social Forces*, 86, 265–290.

Glass, D.T.A., Freedman, M.M., Carlson, D.M.C., Hill, M.J., Frick, D.K.D., Ialongo, D.N., McGill, M.S., Rebok, D.G.W., Seeman, D.T., Tielsch, D.J.M., Wasik, D.B.A., Zeger, D.S., & Fried, D.L.P. (2004). Experience corps: Design of an intergenerational program to boost social capital and promote the health of an aging society. *Journal of Urban Health,* 81, 94–105.

Greene, M.G., Adelman, R., Charon, R., & Hoffman, S. (1986). Ageism in the medical encounter: an exploratory-study of the doctor elderly patient relationship. *Language & Communication*, 6, 113–124.

Greene, M.G., Adelman, R.D., Charon, R., & Friedmann, E. (1989). Concordance between physicians and their older and younger patients in the primary care medical encounter. *The Gerontologist*, 29, 808–813.

Gruenewald, T.L., Tanner, E.K., Fried, L.P., Carlson, M.C., Xue, Q.-L., Parisi, J.M., Rebok, G.W., Yarnell, L.M., & Seeman, T.E. (2015). The Baltimore Experience Corps Trial: Enhancing generativity via intergenerational activity engagement in later life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, gbv005

Guralnik, J.M., LaCroix, A.Z., Abbott, R.D., Berkman, L.F., Satterfield, S., Evans, D.A., & Wallace, R.B. (1993). *Maintaining mobility in late life I: Demographic characteristics and chronic conditions.* American Journal of Epidemiology. 137, 845–857.

Hagestad, G.O., & Uhlenberg, P. (2005). The social separation of old and young: A root of ageism. *Journal of Social Issues*, 61, 343–360.

Han, J., & Richardson, V.E. (2015). The relationships among perceived discrimination, self-perceptions of aging, and depressive symptoms: a longitudinal examination of age discrimination. *Aging & Mental Health*, 19, 747–755.

Hess, T.M., Hinson, J.T., & Statham, J.A. (2004). Explicit and implicit stereotype activation effects on memory: Do age and awareness moderate the impact of priming? *Psychology and Aging*, 19, 495–505.

Hnilica, K. (2011). Discrimination and subjective well-being: Protective influences of membership in a discriminated category. *Central European Journal of Public Health*, 19, 3–6.

Horton, S., Baker, J., Pearce, G.W., & Deakin, J.M. (2008). On the malleability of performance implications for seniors. *Journal of Applied Gerontology*, 27, 446–465.

Hughes, M.E., Waite, L.J., Hawkley, L.C., & Cacioppo, J.T. (2004). A short scale for measuring loneliness in large surveys results from two population-based studies. *Research on Aging*, 26, 655–672.

Hughes, M.L., Geraci, L., & De Forrest, R.L. (2013). Aging 5 years in 5 minutes: The effect of taking a memory test on older adults' subjective age. *Psychological Science*, 24, 2481–2488.

Hussey, D., Lessof, C., Ward, K., & Wood, N. (2010). Methodology. In: Banks, J., Lessof, C., Nazroo, J., Rogers, N., Stafford, M., & Steptoe, A. (Eds.), Financial circumstances, health and well-being of the older population in England the 2008 English Longitudinal Study Ageing (Wave 4). Institute for Fiscal Studies, London.

Idler, E.L., & Kasl, S.V. (1995). Self-ratings of health: Do they also predict change in functional ability? *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 50B, S344–S353.

ILC-USA Anti-Ageism Task Force. (2006). *Ageism in America.* International Longevity Center-USA, New York.

Infurna, F.J., Gerstorf, D., Robertson, S., Berg, S., & Zarit, S.H. (2010). The nature and cross-domain correlates of subjective age in the oldest old: Evidence from the OCTO Study. *Psychology and Aging*, 25, 470–476.

Ipsos Mori, & Macmillan Cancer Support. (2015). *Exploring the attitudes and behaviours of older people living with cancer.* Macmillan Cancer Support, London.

Jang, Y., Chiriboga, D.A., & Small, B.J. (2008). Perceived discrimination and psychological well-being: The mediating and moderating role of sense of control. *International Journal of Aging & Human Development*, 66, 213–227.

Jang, Y., Poon, L.W., Kim, S.-Y., & Shin, B.-K. (2004). Self-perception of aging and health among older adults in Korea. *Journal of Aging Studies,* 18, 485–496.

Kastenbaum, R., Derbin, V., Sabatini, P., & Artt, S. (1972). "The Ages of Me": Toward personal and interpersonal definitions of functional aging*. International Journal of Aging and Human Development*, 3, 197–211.

Katz, S., Ford, A.B., Moskowitz, R.W., Jackson, B.A., & Jaffe, M.W. (1963). Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. *JAMA: Journal of the American Medical Association*, 185, 914–919.

Kavirajan, H., Vahia, I.V., Thompson, W.K., Depp, C., Allison, M., & Jeste, D.V. (2011). Attitude toward own aging and mental health in post-menopausal women. *Asian Journal of Psychiatry*, 4, 26–30.

Kawachi, D.I., & Berkman, L.F., 2001. Social ties and mental health. *Journal of Urban Health*, 78, 458–467.

Kessler, E.-M., Rakoczy, K., & Staudinger, U.M. (2004). The portrayal of older people in prime time television series: the match with gerontological evidence. *Ageing & Society*, 24, 531–552.

Kessler, E.-M., Schwender, C., & Bowen, C.E. (2010). The portrayal of older people's social participation on German prime-time TV advertisements. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 65, 97–106.

Kessler, R.C., Mickelson, K.D., & Williams, D.R. (1999). The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *Journal of Health and Social Behavio*r, 40, 208–230.

Keyes, C.L.M., & Westerhof, G.J. (2012). Chronological and subjective age differences in flourishing mental health and major depressive episode. *Aging & Mental Health*, 16, 67–74.

Kim, G., Jang, Y., & Chiriboga, D.A. (2012). Personal views about aging among Korean American older adults: the role of physical health, social network, and acculturation. *Journal of Cross Cultural Gerontology*, 27, 139–148.

Kim, S.-S., & Williams, D.R. (2012). Perceived discrimination and self-rated health in South Korea: A nationally representative survey. PLoS ONE 7, e30501.

Kite, M.E., Stockdale, G.D., Whitley, B.E., & Johnson, B.T. (2005). Attitudes toward younger and older adults: An updated meta-analytic review. *Journal of Social Issues,* 61, 241–266.

Kleinspehn-Ammerlahn, A., Kotter-Gruhn, D., & Smith, J. (2008). Self-perceptions of aging: Do subjective age and satisfaction with aging change during old age? *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences,* 63, P377–P385.

Klusmann, V., Evers, A., Schwarzer, R., & Heuser, I. (2012). Views on aging and emotional benefits of physical activity: Effects of an exercise intervention in older women. *Psychology of Sport and Exercise*, 13, 236–242.

Kotter-Grühn, D. (2015). Changing Negative Views of Aging: Implications for Intervention and Translational Research. *Annual Review of Gerontology & Geriatrics*, 35, 167–IX.

Kotter-Gruhn, D., & Hess, T.M. (2012). The impact of age stereotypes on self-perceptions of aging across the adult lifespan. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences,* 67, 563–571.

Kotter-Grühn, D., Kleinspehn-Ammerlahn, A., Gerstorf, D., & Smith, J. (2009). Self-perceptions of aging predict mortality and change with approaching death: 16-year longitudinal results from the Berlin Aging Study. *Psychology and Aging*, 24, 654–667.

Krieger, N. (2000). Discrimination and health. In: Berkman, L.F., & Kawachi, I. (Eds.), *Social Epidemiology*. Oxford University Press, Oxford.

Krieger, N., Smith, K., Naishadham, D., Hartman, C., Barbeau, E.M. (2005). Experiences of discrimination: Validity and reliability of a self-report measure for

population health research on racism and health. *Social Science & Medicine*, 61, 1576–1596.

Lahey, J.N. (2010). International comparison of age discrimination laws. R*esearch on Aging*, 32, 679–697.

Lain, D. (2011). Helping the poorest help themselves? Encouraging employment past 65 in England and the USA. *Journal of Social Policy*, 40, 493–512.

Larzelere, M.M., Campbell, J., & Adu-Sarkodie, N.Y. (2011). Psychosocial factors in aging. *Clinics in Geriatric Medicine,* 27, 645–660.

Lawton, M.P. (1975). The Philadelphia Geriatric Center Morale Scale: a revision. *The Journals of Gerontology,* 30, 85–89.

Lee, H., & Turney, K. (2012). Investigating the relationship between perceived discrimination, social status, and mental health. *Society and Mental Health,* 2, 1–20.

Levy, B.R. (2009). Stereotype embodiment: a psychosocial approach to aging. *Current Directions in Psychological Science,* 18, 332–336.

Levy, B.R. (2003). Mind matters: Cognitive and physical effects of aging self-stereotypes. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 58, P203–P211.

Levy, B.R., & Banaji, M.R. (2002). Implicit ageism. In: Nelson, T.D. (Ed.), *Ageism: Stereotyping and prejudice against older persons*. MIT Press, Cambridge, Massachusetts, pp. 49–75.

Levy, B.R., Chung, P.H., Bedford, T., & Navrazhina, K. (2014a). Facebook as a site for negative age stereotypes. *The Gerontologist,* 54, 172–176.

Levy, B.R., Hausdorff, J.M., Hencke, R., & Wei, J.Y. (2000). Reducing cardiovascular stress with positive self-stereotypes of aging. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 55, P205–P213.

Levy, B.R., & Leifheit-Limson, E. (2009). The stereotype-matching effect: Greater influence on functioning when age stereotypes correspond to outcomes. *Psychology and Aging*, 24, 230–233.

Levy, B.R., & Myers, L.M. (2005). Relationship between respiratory mortality and self-perceptions of aging. *Psychology & Health*, 20, 553–564.

Levy, B.R., & Myers, L.M. (2004). Preventive health behaviors influenced by self-perceptions of aging. *Preventive Medicine: An International Journal Devoted to Practice and Theory* ,39, 625–629.

Levy, B.R., Pilver, C., Chung, P.H., & Slade, M.D. (2014b). Subliminal strengthening: improving older individuals' physical function over time with an implicit-age-stereotype intervention. Psychological Science, 25, 2127–2135.

Levy, B.R., Pilver, C.E., & Pietrzak, R.H. (2014c). Lower prevalence of psychiatric conditions when negative age stereotypes are resisted. *Social Science and Medicine*, 119, 170–174.

Levy, B.R., Slade, M.D., & Kasl, S.V. (2002a). Longitudinal benefit of positive self-perceptions of aging on functional health. *Journals of Gerontology: Series B: Psychological Sciences and Social Sciences,* 57, P409–P417.

Levy, B.R., Slade, M.D., Kunkel, S.R., & Kasl, S.V. (2002b). Longevity increased by positive self-perceptions of aging. *Journal of Personality and Social Psychology,* 83, 261–270.

Levy, B.R., Slade, M.D., May, J., & Caracciolo, E.A. (2006). Physical recovery after acute myocardial infarction: positive age self-stereotypes as a resource. *International Journal of Aging & Human Development*, 62, 285–301.

Levy, B.R., Slade, M.D., Murphy, T.E., & Gill, T.M. (2012). Association between positive age stereotypes and recovery from disability in older persons. *JAMA: The Journal Of The American Medical Association*, 308, 1972–3.

Levy, B.R., Zonderman, A.B., Slade, M.D., & Ferrucci, L. (2009). Age stereotypes held earlier in life predict cardiovascular events in later life. *Psychological Science*, 20, 296–8.

Liljas, A.E.M., Wannamethee, S.G., Whincup, P.H., Papacosta, O., Walters, K., Iliffe, S., Lennon, L.T., Carvalho, L.A., Ramsay, S.E. (2016). Socio-demographic characteristics, lifestyle factors and burden of morbidity associated with self-reported hearing and vision impairments in older British community-dwelling men: a cross-sectional study. *Journal of Public Health*. 38, e21–28.

Lim, M.Y., Stephens, E.K., Novotny, P., Price, K., Salayi, M., Roeker, L., Peethambaram, P., & Jatoi, A. (2013). Self-perceptions of age among 292 chemotherapy-treated cancer patients: Exploring associations with symptoms and survival. *Journal of Geriatric Oncology*, 4, 249–254.

Lockenhoff, C.E., De Fruyt, F., Terracciano, A., McCrae, R.R., De Bolle, M., Costa, P.T., Aguilar-Vafaie, M.E., Ahn, C., Ahn, H., Alcalay, L., Allik, J., Avdeyeva, T.V., Barbaranelli, C., Benet-Martinez, V., Blatný, M., Bratko, D., Cain, T.R., Crawford, J.T., Lima, M.P., Ficková, E., Gheorghiu, M., Halberstadt, J., Hrebícková, M., Jussim, L., Klinkosz, W., Knezević, G., de Figueroa, N.L., Martin, T.A., Marusić, I., Mastor, K.A., Miramontez, D.R., Nakazato, K., Nansubuga, F., Pramila, V.S., Realo, A., Rolland, J.-P., Rossier, J., Schmidt, V., Sekowski, A., Shakespeare-Finch, J., Shimonaka, Y., Simonetti, F., Siuta, J., Smith, P.B., Szmigielska, B., Wang, L., Yamaguchi, M., & Yik, M. (2009). Perceptions of aging across 26 cultures and their culture-level associates. *Psychology and Aging*, 24, 941–954.

Luo, Y., Xu, J., Granberg, E., & Wentworth, W.M. (2012). A longitudinal study of social status, perceived discrimination, and physical and emotional health among older adults. *Research on Aging*, 34, 275–301.

Macnicol, J. (2012). Action against age discrimination: U.S. and UK comparisons. *Public Policy & Aging Report*, 22, 21–24.

Macnicol, J. (2006). *Age discrimination: An historical and contemporary analysis*. Cambridge University, Cambridge.

Maier, H., & Smith, J. (1999). Psychological predictors of mortality in old age. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 54, P44–54.

Markides, K.S., & Pappas, C. (1982). Subjective age, health, and survivorship in old-age. *Research on Aging*, 4, 87–96.

Meisner, B.A. (2012). A meta-analysis of positive and negative age stereotype priming effects on behavior among older adults. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 67, 13–17.

Mindell, J., Biddulph, J.P., Hirani, V., Stamatakis, E., Craig, R., Nunn, S., & Shelton, N. (2012). Cohort profile: The Health Survey for England. *International Journal of Epidemiology*, 41, 1585–1593.

Minichiello, V., Browne, J., & Kendig, H. (2000). Perceptions and consequences of ageism: Views of older people. *Ageing & Society,* 20, 253–278.

Mock, S.E. & Eibach, R.P. (2011). Aging attitudes moderate the effect of subjective age on psychological well-being: Evidence from a 10-year longitudinal study. *Psychology and Aging*, 26, 979–986.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., & The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta- Analyses: The PRISMA Statement. *PLoS Medicine,* 6, e1000097.

Montepare, J.M. (2009). Subjective age: Toward a guiding lifespan framework. *International Journal of Behavioral Development*, 33, 42–46.

Moser, C., Spagnoli, J., & Santos-Eggimann, B. (2011). Self-perception of aging and vulnerability to adverse outcomes at the age of 65-70 years. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, 66, 675–680.

National Institute on Aging. (2007). *Growing old in America: The Heath and Retirement Study*. National Institute on Aging, Bethesda.

Nelson, T.D. (2005). Ageism: Prejudice against our feared future self. *Journal of Social Issues,* 61, 207–221.

North, M.S., & Fiske, S.T. (2012). *An inconvenienced youth? Ageism and its potential intergenerational roots*, Psychological Bulletin 138, 982–997.

Nussbaum, J.F., Pitts, M.J., Huber, F.N., Raup Krieger, J.L., & Ohs, J.E. (2005). Ageism and ageist language across the life span: Intimate relationships and non-intimate interactions. *Journal of Social Issues,* 61, 287–305.

Office for National Statistics. (2016). *Healthy life expectancy at birth and age 65 by upper tier local authority and area deprivation: England, 2012 to 2014.* Office for National Statistics, London.

Office for National Statistics. (2015). *Past and projected data from the period and cohort life tables, 2014-based, UK, 1981 to 2064 (Statistical Bulletin)*. Office for National Statistics, London.

Office for National Statistics. (2013a). *National population projections, 2012-based projections (Statistical Bulletin)*. Office for National Statistics London.

Office for National Statistics. (2013b). *Deaths registered in England and Wales, 2012 (Statistical Bulletin)*. Office for National Statistics, London.

O'Flaherty, M., Buchan, I., & Capewell, S. (2013). Contributions of treatment and lifestyle to declining CVD mortality: Why have CVD mortality rates declined so much since the 1960s? *Heart*, 99, 159–62.

Ory, M., Kinney Hoffman, M., Hawkins, M., Sanner, B., & Mockenhaupt, R. (2003). Challenging aging stereotypes: Strategies for creating a more active society. *American Journal of Preventive Medicine,* 25, 164–171.

Oxford English Dictionary (2013). *Ageism.* Oxford University Press, Oxford.

Palmore, E. (2001). The ageism survey: First findings. *The Gerontologist,* 41, 572–575.

Pascoe, E.A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin,* 135, 531–554.

Pasupathi, M., & Lockenhoff, C.E. (2002). Ageist behaviour. In: Nelson, T.D. (Ed.), *Agesim: Stereotyping and prejudice against older persons*. MIT Press, Cambridge, Massachusetts, pp. 201–246.

Pavalko, E.K., Mossakowski, K.N., & Hamilton, V.J. (2003). Does perceived discrimination affect health? Longitudinal relationships between work discrimination and women's physical and emotional health. *Journal of Health and Social Behavior*, 44, 18–33.

Pew Research Center. (2014). *Attitudes about aging: a global perspective*. Pew Research Center, Washington, DC.

Prince, M.J., Wu, F., Guo, Y., Gutierrez Robledo, L.M., O'Donnell, M., Sullivan, R., & Yusuf, S. (2015). The burden of disease in older people and implications for health policy and practice. *The Lancet,* 385, 549–562.

Rabl, T., & Kühlmann, T.M. (2009). Work-life balance and demographic change. *Zeitschrift für Personalpsychologie*, 8, 88–99.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement,* 1, 385–401.

Ray, S., Sharp, E., & Abrams, D. (2006). *Ageism: a benchmark of public attitudes in Britain.* Age Concern England, London.

Ready for Ageing Alliance (2015). *The myth of the baby boomer.* Ready for Ageing Alliance, London.

Richeson, J.A., Shelton, & J.N. (2006). A social psychological perspective on the stigmatization of older adults In: Carstensen, L.L., & Hartel, C.R. (Eds.), When *I'm 64: Committee on Aging Frontiers in Social Psychology, Personality and Adult Developmental Psychology.* National Academies Press, Washington, pp. 174–208.

Robineau, D. (2016). Ageing Britain: two-fifths of NHS budget is spent on over-65s. The Guardian. URL: http://www.theguardian.com/society/2016/feb/01/ageing-britain-two-fifths-nhs-budget-spent-over-65s (last accessed: April 2016).

Roscigno, V.J., Mong, S., Byron, R., & Tester, G. (2007). Age discrimination, social closure and employment. *Social Forces*, 86, 313–334.

Rubin, D.C., & Berntsen, D. (2006). People over forty feel 20% younger than their age: subjective age across the lifespan. *Psychonomic Bulletin & Review*, 13, 776–80.

Rudberg, M.A., Furner, S.E., Dunn, J.E., Cassel, C.K. (1993). The relationship of visual and hearing impairments to disability: an analysis using the longitudinal study of aging. *Journals of Gerontology Series A: Medical Sciences,* 48: M261–5.

Sargent-Cox, K.A., Anstey, K.J., & Luszcz, M.A. (2014). Longitudinal change of self-perceptions of aging and mortality. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 69, 168–73.

Sargent-Cox, K.A., Anstey, K.J., & Luszcz, M.A. (2012). The relationship between change in self-perceptions of aging and physical functioning in older adults. *Psychology and Aging,* 27, 750–760.

Sarkisian, C.A., Liu, H., Ensrud, K.E., Stone, K.L., & Mangione, C.M., for the study of Osteoporotic Fractures Research Group. (2001). Correlates of attributing new disability to old age. *Journal of the American Geriatrics Society,* 49, 134–141.

Sarkisian, C.A., Prohaska, T.R., Davis, C., & Weiner, B. (2007). Pilot test of an attribution retraining intervention to raise walking levels in sedentary older adults. *Journal of the American Geriatrics Society*, 55, 1842–6.

Sarkisian, C.A., Prohaska, T.R., Wong, M.D., Hirsch, S., & Mangione, C.M. (2005). The relationship between expectations for aging and physical activity among older adults. *Journal of General Internal Medicine*, 20, 911–915.

Saz, P., & Dewey, M.E. (2001). Depression, depressive symptoms and mortality in persons aged 65 and over living in the community: a systematic review of the literature. *International Journal of Geriatric Psychiatry*, 16, 622–630.

Schmitt, T.M., Postmes, T., Branscombe, R.N., & Garcia, A. (2014). The consequences of perceived discrimination for psychological well-being: A meta-analytic review. *Psychological Bulletin*, 140, 921–948.

Shankar A, McMunn A, Banks J, Steptoe A. (2011). Loneliness, social isolation and behavioral and biological health indicators and older adults. *Health Psychology*, 30, 377-385.

Smith, J., Fisher, G., Ryan, L., Clarke, P., House, J., & Weir, D.R. (2013). *Psychosocial and Lifestyle Questionnaire 2006 - 2010*. Institute for Social Research, University of Michigan, Ann Arbor.

Sonnega, A., Faul, J.D., Ofstedal, M.B., Langa, K.M., Phillips, J.W., & Weir, D.R. (2014). Cohort profile: The Health and Retirement Study (HRS). *International Journal of Epidemiology*, 43, 576–585.

Spuling, S.M., Miche, M., Wurm, S., & Wahl, H.-W. (2013). Exploring the causal interplay of subjective age and health dimensions in the second half of life: a cross-lagged panel analysis. *Zeitschrift für Gesundheitspsychologie,* 21, 5–15.

Steffick, D.E., 2000. Documentation of Affective Functioning Measures in the Health and Retirement Study. University of Michigan, Ann Arbor, Michigan.

Stenholm, S., Westerlund, H., Head, J., Hyde, M., Kawachi, I., Pentti, J., Kivimäki, M., & Vahtera, J. (2015). Comorbidity and functional trajectories from midlife to old age: The Health and Retirement Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 70, 332–338.

Stephan, Y., Caudroit, J., Jaconelli, A., & Terracciano, A. (2014). Subjective age and cognitive functioning: A 10-year prospective study. *American Journal of Geriatric Psychiatry,* 22, 1180–1187.

Stephan, Y., Chalabaev, A., Kotter-Gruhn, D., & Jaconelli, A. (2013). "Feeling younger, being stronger": An experimental study of subjective age and physical functioning among older adults. *Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 68, 1-7.*

Stephan, Y., Sutin, A.R., Caudroit, J., & Terracciano, A. (2015a). Subjective age and changes in memory in older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* gbv010, 1-9.

Stephan, Y., Sutin, A.R., Terracciano, A. (2015b). How old do you feel? The role of age discrimination and biological aging in subjective age. *PLoS ONE,* 10, e0119293.

Steptoe, A., Breeze, E., Banks, J., & Nazroo, J. (2013). Cohort profile: The English Longitudinal Study of Ageing. *International Journal of Epidemiology*, 42, 1640–8.

Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013b). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences of the United States of America*, 110, 5797–801.

Steverink, N., Westerhof, G.J., Bode, C., & Dittmann-Kohli, F. (2001). The personal experience of aging, individual resources, and subjective well-being. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 56, P364–P373.

Stuck, A.E., Walthert, J.M., Nikolaus, T., Büla, C.J., Hohmann, C., & Beck, J.C. (1999). Risk factors for functional status decline in community-living elderly people: a systematic literature review. *Social Science & Medicine,* 48, 445–469.

Studenski, S., Perera, S., Patel, K., Rosano, C., Faulkner, K., Inzitari, M., Brach, J., Chandler, J., Cawthon, P., Connor, E.B., Nevitt, M., Visser, M., Kritchevsky, S., Badinelli, S., Harris, T., Newman, A.B., Cauley, J., Ferrucci, L., & Guralnik, J. (2011). Gait speed and survival in older adults. *JAMA: Journal of the American Medical Association*, 305, 50–58.

Sutin, A.R., Stephan, Y., Carretta, H., & Terracciano, A. (2015). Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *American Journal of Geriatric Psychiatry*, 23, 171–179.

Sweiry, D., & Willitts, M. (2012). *Attitudes to age in Britain 2010/11, In-House Research*. Department for Work and Pensions, London.

Swift, H.J., Lamont, R.A., & Abrams, D. (2012). Are they half as strong as they used to be? An experiment testing whether age-related social comparisons impair older people's hand grip strength and persistence. *BMJ Open*, 2, e001064.

The House of Lords Select Committee on Public Service and Demographic Change. (2013). *Ready for Ageing?* (No. HL Paper 140). The Stationary Office Limited, London.

Tinker, A., Hussain, L., D'Cruz, J.L., Tai, W.Y.S., & Zaidman, S. (2016). Why should medical students study social gerontology? *Age and Ageing,* 45, 190–193.

Uotinen, V., Rantanen, T., & Suutama, T. (2005). Perceived age as a predictor of old age mortality: a 13-year prospective study. *Age and Ageing*, 34, 368–72.

Van Den Heuvel, W. (2012). Discrimination against older people. *Reviews in Clinical Gerontology*, 22, 293–300.

Van den Heuvel, W.J.A., & Van Santvoort, M.M. (2011). Experienced discrimination amongst European old citizens. *European Journal of Ageing,* 8, 291–299.

Van Den Heuvel, W.J., & Van Santvoort, M.M. (2013). Rectification article "Experienced discrimination amongst European old citizens." *European Journal of Ageing* (forthcoming).

Vauclair, C.-M., Marques, S., Lima, M.L., Abrams, D., Swift, H., & Bratt, C. (2015). Perceived age discrimination as a mediator of the association between income

inequality and older people's self-rated health in the European region. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 70, 901-912.

Vogt Yuan, A.S. (2007). Perceived age discrimination and mental health. *Social Forces*, 86, 292–311.

Wahrendorf, M., Reinhardt, J.D., & Siegrist, J. (2013). Relationships of disability with age among adults aged 50 to 85: Evidence from the United States, England and Continental Europe. *PLoS ONE,* 8, e71893.

Wait, S. (2005). *Promoting age equality in health care.* A report for the alliance for health and the future.

Wamala, S., Bostrom, G., & Nyqvist, K. (2007a). Perceived discrimination and psychological distress in Sweden. *The British Journal of Psychiatry*, 190, 75–6.

Wamala, S., Merlo, J., Bostrom, G., & Hogstedt, C. (2007b). Perceived discrimination, socioeconomic disadvantage and refraining from seeking medical treatment in Sweden. *Journal of Epidemiology and Community Health*, 61, 409–15.

Westerhof, G.J., & Barrett, A.E. (2005). Age identity and subjective well-being: a comparison of the United States and Germany. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 60, S129–S136

Westerhof, G.J., Barrett, A.E., & Steverink, N. (2003). Forever young? A comparison of age identities in the United States and Germany. *Research on Aging*, 25, 366–383.

Westerhof, G.J., Miche, M., Brothers, A.F., Barrett, A.E., Diehl, M., Montepare, J.M., Wahl, H.-W., & Wurm, S. (2014). The influence of subjective aging on health and longevity: A meta-analysis of longitudinal data. *Psychology and Aging*, 29, 793–802.

Westerhof, G.J., & Tulle, E. (2007). Meanings of ageing and old age: Discursive contexts, social attitudes and personal identities. In: Peace, S., Bond, J., Dittmann-Kohli, F., & Westerhof, G.J. (Eds.), *Ageing in Society*. Sage Publications, London, pp. 235–254.

Wiest, M., Schüz, B., Webster, N., & Wurm, S. (2011). Subjective well-being and mortality revisited: differential effects of cognitive and emotional facets of well-being on mortality. *Health Psychology*, 30, 728–735.

Wilkinson, J., & Ferraro, K. (2002). Thirty years of ageism research. In: Nelson, T.D. (Ed.), *Ageism: Stereotyping and prejudice against older people*. MIT press, Cambridge, Massachusetts, pp. 339–358.

Williams, D.R., Gonzalez, H.M., Williams, S., Mohammed, S.A., Moomal, H., & Stein, D.J. (2008a). Perceived discrimination, race and health in South Africa. *Social Science & Medicine,* 67, 441–452.

Williams, D.R., & Mohammed, S.A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine*, 32, 20.

Williams, D.R., Neighbors, H.W., & Jackson, J.S. (2008b). Racial/ethnic discrimination and health: Findings from community studies. *American Journal of Public Health*, 98, S29–S37.

Williams, D.R., Yan, Y., Jackson, J.S., & Anderson, N.B. (1997). Racial differences in physical and mental health: Socio-economic status, stress and discrimination. *Journal of Health Psychology,* 2, 335–51.

Wolff, J.K., Warner, L.M., Ziegelmann, J.P., Schwarzer, R., Romer, C.T., & Wurm, S. (2013). Changing self-perceptions of aging as part of an exercise intervention for older adults. *Psychology & Health*, 28, 55–55.

Wolff JL, Starfield B, & Anderson G. (2002). Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. *Archives of Internal Medicine*, 162, 2269–2276.

Wurm, S. (2008). The health-promoting effect of a positive view on aging: Longitudinal findings from the German Ageing Survey. *International Journal of Psychology*, 43, 201–201.

Wurm, S., & Benyamini, Y. (2014). Optimism buffers the detrimental effect of negative self-perceptions of ageing on physical and mental health. *Psychology & Health*, 29, 832–848.

Wurm, S., Tesch-Römer, C., & Tomasik, M.J. (2007). Longitudinal findings on aging-related cognitions, control beliefs, and health in later life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 62, P156–P164.

Wurm, S., Tomasik, M.J., & Tesch-Römer, C. (2010). On the importance of a positive view on ageing for physical exercise among middle-aged and older adults: Cross-sectional and longitudinal findings. *Psychology & Health*, 25, 25–42.

Wurm, S., Tomasik, M.J., & Tesch-Romer, C. (2008). Serious health events and their impact on changes in subjective health and life satisfaction: the role of age and a positive view on ageing. *European Journal of Ageing*, 5, 117–127.

Wurm, S., Warner, L.M., Ziegelmann, J.P., Wolff, J.K., & Schuz, B. (2013). How do negative self-perceptions of aging become a self-fulfilling prophecy? *Psychology and Aging,* 28, 1088–1097.

Zivin, K., Llewellyn, D.J., Lang, I.A., Vijan, S., Kabeto, M.U., Miller, E.M., & Langa, K.M. (2010). Depression among older adults in the United States and England. *The American Journal of Geriatric Psychiatry*, 18, 1036–44.