

Attributes of age-identity

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ABSTRACT

Chronological age can be an unsatisfactory method of discriminating between older people. The lay concept of how old people actually feel may be more useful. The aim of the analyses reported in this paper was to investigate indicators of age-identity (or subjective age) among a national random sample of people aged 65 or more years living at home in Britain. Information was initially collected by home interview and a follow-up postal questionnaire 12–18 months later. The age that respondents felt was a more sensitive indicator than chronological age of many indicators of the respondents' health, psychological and social characteristics. Multiple regression analysis showed that baseline health and functional status, and reported changes in these at follow-up, explained 20.4 per cent of the variance in self-perceived age. Adding baseline mental health (anxiety/depression), feelings and fears about ageing at follow-up explained a further 0.8 per cent of the variance, making the total variance explained 21.2 per cent. It is concluded that measures of physical health and functional status and their interactions influenced age-identity. Mental health status and psychological perceptions made a small but significant additional contribution.

KEY WORDS – age-identity, subjective age, self-perceived age, attitudes to ageing, ageing

Introduction

What is old age? Researchers and policy makers commonly use 65 years as a convenient threshold to denote 'old age', partly because of its customary use for the state pension age. Retirement ages now vary greatly, however, and *de facto* the age of retirement in advanced capitalist countries shows considerable flexibility. Any categorisation of chronological age obscures the physiological, psychological and social diversity of older people. The age group 65 or more years spans up to 40 years of future life, and

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comprises both the delights of the 'third age' and the vulnerability of the 'oldest old', including those at the limits of their functional capacity (Baltes and Smith 2003).

Functional ageing

Biologically, ageing can be considered as the progressive constriction of each organ's capacity to maintain homeostasis when challenged, leading to reduced physiological adaptability, increased susceptibility and vulnerability to disease, and eventually to death (Resnick 1997; Troen 2003). One indicator of this process is the almost exponential increase in probability of death from late adolescence to old age. At the oldest ages, the rate of increase of mortality intriguingly flattens out and approximates to almost a constant hazard (Grundy 1997). Certainly in very old people, accidents and injuries become a greater cause of morbidity and death than at younger ages. At the population level, chronological age is a sensitive indicator of health status, whether measured by mortality, disability or self-rated health.

Research findings, however, also indicate that there is some plasticity of the ageing processes, not least in late old age, and it has therefore been suggested that theories of homeostasis require modification (Grundy 2002). For example, evidence on ageing and the risk of cognitive impairment shows that, despite strong relationships with chronological age, the impairment is not inevitable and most people do not develop Alzheimer's disease (Grundy 2002). Furthermore, experimental studies have demonstrated that the deterioration in muscle strength associated with ageing is reversible (Greig 2002; Malbut, Dinan and Young 2002; McMurdo 2000). A review of United States longitudinal data also concluded that it is likely that health behaviour at 50 years of age will influence health status in the ninth decade of life (Hartman-Stein and Potkanowicz 2003). Indeed, Vaillant and Mukamal (2001) demonstrated, on the basis of a longitudinal survey that followed almost 600 youths, students and adolescent boys for 60 years (or until they died), that functioning at ages 70-80 years could be predicted by seven variables before age 50 years (not smoking or stopping when young, having an adaptive coping style, not abusing alcohol, maintaining healthy weight, having a stable marriage, and engaging in exercise). A valuable measure of functional age would therefore tap into the cumulative gains and losses in capacity amassed throughout a life. For example, biomarkers of functional age might include lean muscle mass, muscle strength, basal metabolic rate, the ratio of body fat to muscle, aerobic capacity, blood-sugar tolerance, cholesterol/high-density

lipoprotein ratio, blood pressure, bone density, and internal temperature regulation.

Ageing, disability and morbidity

While greater chronological age is associated with a higher prevalence of longstanding illness and disability (Brayne *et al.* 2001), and with disorders of the musculo-skeletal, heart, circulatory and respiratory systems (Bridgwood 2000), such associations hide the consequences of disability or disease states in the face of increasing functional age. A person with reduced functional reserve capacity will have much more difficulty in maintaining independence in the face of a disease than another of the same chronological age but with much greater functional reserve capacity. Secular trends suggest that levels of serious ill health and disability are declining, resulting in increased life expectancy free of severe disability, although less severe ill-health and disability appear to be increasing (Suzman, Willis and Manton 1992; Manton, Corder and Stallard 1993; Manton Stallard and Corder 1995; Kelly and Baker 2000; Dunnell and Dix 2000; Wanless 2002). These observations suggest that the rate of functional ageing may be decreasing.

Simply focusing on physiological measures in the quest for a marker of functional ageing is however insufficient. The longitudinal data for people aged 70–79 years collected by the MacArthur studies of successful ageing showed that belief in one's self-efficacy had a significant impact on perceptions of functional disability, and are independent of actual underlying physical abilities (Seeman *et al.* 1999). Furthermore, large numbers of very old people have reported that they feel relatively healthy (Nybo *et al.* 2001). The 'oldest old' (aged 85 or more years) have also frequently been reported to have higher psychological wellbeing and satisfaction with life than younger old people (Bowling, Farquhar and Browne 1991; Bowling *et al.* 1999).

The concept of 'successful ageing' has been developed alongside that of functional age (Bowling 1993). Definitions of successful ageing include the achievement of wellbeing, life satisfaction and high life expectancy; the capacity for self-care, autonomy, productivity and achievement; and a positive psychological outlook (Baltes and Baltes 1990; Rowe and Kahn 1987; Valliant 1990; Day 1991; Fisher 1995). Definitions also encompass the ability to adapt one's values to meet the challenges of later life (Baltes and Baltes 1990), and having the physiological and psychological abilities of younger people (Rowe and Kahn 1987). The concept of 'successful ageing', with its implicit embodiment of American norms of 'success', has not however escaped criticism (Torres 1999).

Subjective age

Survey research on age-identity among the general British public has shown that the older the respondent, the later the age at which he or she states that old age begins (Age Concern England 1992). Most research on age-identity, or self-perceived age, has been conducted in North America. Sherman and Schiffman (1991) referred to self-perceived age as 'cognitive age'. Barak and Schiffman (1981) argued that the 'age concepts' that people use are based on personal 'age indicators', expressed in such phrases as 'feel an age', 'look an age', 'do age' and 'have the interests of an age', and that when these concepts are used, many older people reported themselves to be 10–15 years younger than their chronological age. When comparing themselves to others, moreover, the respondents perceived themselves as healthier, more financially secure, more satisfied with their lives, and less likely to want to live their lives differently. These findings are consistent with those from research on subjective age and health, satisfaction with life, and quality of life (Mutran and Burke 1979; Barak and Schiffman 1981; Steitz and McClary 1988; Logan, Ward and Spitze 1992; Grundy and Bowling 1999; Michalos *et al.* 2000; 2001). Staats *et al.* (1993) found that older people who identified their social activities with those of a younger age group than their own were also more likely to report a higher quality of life. Age-identity merits further exploration as a more sensitive indicator than chronological age, for it has been reported to be a better predictor of mortality than chronological age or health status (Carp and Carp 1981; Markides and Pappas 1982).

Aim and methods

The aim of the study reported in this paper was to investigate the predictors of age-identity, defined as the age that people feel in relation to their actual age.

Baseline interview survey and response

The baseline data came from four successive quarterly *Omnibus Surveys* in Great Britain of private (non-institutional) households that were carried out between Spring 2000 and Winter 2001-2 by the Office for National Statistics (ONS).¹ The samples were based on random samples of postcodes, drawn from postcode directories for small users (private households), and stratified by the socio-economic and urban/rural characteristics of the areas. Because only one member of a household is sampled for

interview, those in small households have a better chance of selection than members of large households. Correction weights were applied (thus totals in the analyses do not always equal 100%). The sampling procedure and the measures have been described in detail elsewhere (Bowling *et al.* 2002). Sample respondents aged 65 or more years were asked at the end of the *Omnibus Survey* interview whether they would be willing to be interviewed again about their quality of life: 999 (77%) agreed and were successfully interviewed for the *Quality of Life Survey*, part of a wider study of the quality of life funded by the UK Economic and Social Research Council (ESRC) and through the UK Medical Research Council's 'Health Services Research Collaboration' (MRC HSRC).

Follow-up postal survey and response

Of the 999 respondents who were interviewed for the baseline *Quality of Life Survey*, 786 consented to be followed-up in a postal survey 12–18 months later. The follow-up questionnaire aimed primarily to investigate their subjective age, their feelings about ageing, and whether their quality of life and health had changed since the baseline interview. Of the 786 people followed up, 16 had died and 533 (68% of the survivors) responded. It is acknowledged that the respondents are likely to be selective of 'successful survivors'.

Baseline measures

The perceived quality of life, physical health and functioning, psychological, social, socio-economic and socio-demographic characteristics and circumstances were measured in the baseline survey using several validated scales and sub-scales, in addition to single item and open-ended questions. The open-ended questions requested the respondents' perceptions of their quality of life (QoL) ('good', 'bad', 'most important', and 'how QoL could be improved'). A seven-point rating scale for overall quality of life was used, with the categories ranging from 'So good, it could not be better' to 'So bad, it could not be worse' (after Browne *et al.* 1994; Bowling 1995; Bowling *et al.* 2002, 2003). The questions on QoL were followed by structured items and summed scales that measured: (i) psychological attitudes and self-constructs,² (ii) physical health and functioning,³ (iii) psychological morbidity,⁴ (iv) social capital,⁵ and (v) standard *Omnibus Survey* measures of socio-demographic and socio-economic characteristics (both new and old classifications of socio-economic status were used to facilitate comparisons between studies).

Follow-up measures

The follow-up self-administered postal questionnaire needed to be concise. To estimate changes in status between baseline and follow-up surveys, it duplicated the key baseline questions on self-rated quality of life, difficulties with activities of daily living, long-standing illness, and health status.⁶ The opportunity was also taken to enquire about the following new topics: smoking status and amount smoked, height and weight (to enable calculation of the body mass index);⁷ type and frequency of health services use; informal help; indices of longevity in the family; and perceptions of ageing ('At what age do you consider someone to be old?'). There were also new open-ended questions on the best and worst things about ageing and old age, the respondent's greatest fears about ageing, and on age-identity (Do you feel younger, older, or about the same as your actual age? If you feel younger or older, about what age do you feel you are?) The age that respondents subjectively *felt* was compared with the actual or chronological age, and the difference computed in years. Questions were also asked about major changes in life during the previous six months (too few reported additional changes during the period six to 12 months before the interview to justify analysis). Finally, the respondents were asked for their consent to be flagged in public registers so that future personal events (including death) could be linked to their record at the *National Health Service Central Registry*: 446 (84 %) of the respondents consented.

Statistical methods

The dependent variable of interest was the subject's age-identity: the number of years older or younger than their actual chronological age that they felt. This was expressed as an ordered categorical variable (the categories are specified in Table 2), and recoded into feels 'younger', 'the same age' or 'older' for cross-tabulations and chi-squared tests. Bivariate tests were conducted of the association between age identity and both actual age at follow-up and the following independent variables that were collected during the baseline (indicated by 'b') and follow-up (indicated by 'f') interviews: perceptions of old age ('how old is old?') (f), family longevity (f), self-rated quality of life (b, f), social circumstances (b, f), health and functional status (b, f), behavioural (b), social activity (b), psychological characteristics, including morbidity (b) and socio-demographic characteristics (b, changes in at f). Actual chronological age was also analysed in relation to these variables for comparison.

Multiple regression modelling was used to analyse the independent effects of relevant predictor variables on the dependent age-identity variable. Most of the examined covariates were statistically significant in

the univariate analyses, and all were theoretically relevant. Age and sex were entered irrespective of their (initially insignificant) results because much previous research supported *a priori* hypotheses of their influence. Hierarchical regression was selected as it is theory driven, not data driven, and enables theory-relevant hypotheses to be tested (Scafia and Games 1987).

Multi-collinearity occurs when two or more variables are closely associated with each other, with the implication that the model may not be able to assess reliably the independent contribution of each variable (Katz 1999). A matrix of correlation coefficients can indicate the inter-correlations of the independent variables (a correlation of ± 0.8 or stronger will lead to problems in the analysis), although the limitation of this method is that it assesses the relationship between two variables without adjustment for others. The correlation matrix produced by the multivariate analysis for the parameter estimates is a better measure of whether two variables will create problems of multi-collinearity as the estimates are adjusted for each other.⁸

As mentioned before, the analyses presented here are based on responses to the postal follow-up survey items on age-identity (dependent variable), and analysed in relation to both baseline and follow-up survey data. Questions on age-identity were not asked at baseline interview. Missing responses to the survey questions were treated as missing values in the analyses (the sub-totals in the tables show the range of complete responses).

Results

Table 1 shows the characteristics of the respondents to both baseline and follow-up surveys, and their similarity to the respondents who refused consent on the same occasion. There were no differences in the socio-demographic or health characteristics of the responders and the non-responders at baseline or follow-up, or between the baseline sample of consenters and the non-consenters to the follow-up interview. They were also broadly representative of people aged 65 or more years in Great Britain (when compared with the ONS mid-term population estimates and other national survey data) (Bridgwood *et al.* 2000).

Attitudes to ageing

The follow-up respondents were asked at what age they considered someone to be old, and how old they felt. Fifty-five (10%) of the

TABLE I. *Characteristics of the respondents to the postal follow-up*

Baseline characteristic	Responders to both b and f		Responders to b but not to f ¹		Total	
	%	(n)	%	(n)	%	(n)
Age:						
65-74	65	(348)	60	(275)	63	(623)
75-84	29	(157)	34	(157)	31	(314)
85+	6	(34)	6	(27)	6	(61)
Sex:						
Male	54	(291)	50	(228)	52	(519)
Female	46	(249)	50	(231)	48	(480)
Social class: old coding						
I (professional)	7	(38)	2	(10)	5	(48)
II (semi-professional)	31	(167)	21	(98)	26	(265)
III _m (skilled non-manual)	20	(106)	18	(82)	19	(188)
III _m (skilled manual)	22	(118)	25	(112)	23	(230)
IV (semi-skilled)	11	(59)	21	(98)	16	(155)
V (unskilled)	4	(24)	8	(37)	6	(61)
Other	5	(27)	5	(22)	5	(49)
New coding:						
1 Employers and managers ¹	10	(54)	7	(32)	9	(86)
2 Higher professionals ²	14	(73)	6	(25)	10	(98)
3 Lower managers/prof's ³	17	(91)	12	(53)	15	(144)
4 Intermediate ⁴	15	(77)	11	(49)	13	(126)
5 Small employer/own oam ⁵	7	(38)	7	(33)	7	(71)
6 Lower sup./craft ⁶	13	(70)	13	(58)	13	(128)
7 Semi-routine	17	(88)	31	(137)	23	(225)
8 Routine	7	(34)	13	(59)	10	(93)
Education highest:						
Degree or higher	7	(39)	5	(25)	6	(64)
Higher education below degree	9	(46)	4	(17)	6	(63)
'A' levels/highers	5	(24)	3	(14)	4	(38)
ONC/BTEC	2	(10)	2	(10)	2	(20)
'O' level or GCSE	11	(61)	4	(17)	8	(78)
CSE grade 2-5	1	(5)	2	(9)	1	(14)
Other quals	9	(53)	7	(32)	9	(85)
None	56	(301)	23	(235)	64	(636)
Total ADL score:						
0 no difficulty	35	(184)	30	(132)	32	(316)
1 1-4	35	(184)	31	(139)	33	(323)
2 5-9	12	(66)	15	(68)	13	(134)
3 10-18	11	(61)	14	(64)	13	(125)
4 19-45: severe difficulties	7	(40)	10	(45)	9	(85)
ADL score:						
0 No difficulty	41	(222)	35	(156)	38	(378)
1 1-2	22	(115)	21	(94)	21	(209)
2 3-7	20	(107)	19	(87)	20	(194)
3 8-21 Severe difficulties	17	(92)	25	(113)	21	(205)
Difficulty walking:²						
No difficulty	76	(409)	68	(308)	72	(717)
Some difficulty	11	(63)	16	(74)	14	(137)

TABLE 1 (Cont.)

Baseline characteristic	Responders to both b and f		Responders to b but not to f ¹		Total	
	%	(n)	%	(n)	%	(n)
With help of aid	6	(33)	7	(30)	6	(63)
Unable to do	7	(36)	9	(43)	8	(79)
Health status:						
Excellent	11	(58)	10	(45)	10	(103)
Very good	30	(162)	28	(127)	29	(289)
Good	33	(179)	34	(157)	34	(336)
Fair	21	(112)	21	(93)	32	(205)
Poor	5	(27)	7	(32)	6	(59)
GHQ case:						
Depressed	20	(109)	20	(90)	20	(199)
Not depressed	80	(429)	80	(361)	80	(790)
Number of respondents:	(526-540)		(446-459)		(892-996)	

Notes: 1. Large organisations. 2. Organisations. 3. Lower managers and professionals. 4. Intermediate occupations. 5. Own account managers. 6. Including craft and related occupations.

Notes: b baseline postal survey. f follow-up postal survey questions. 1. Non-consenters and non-respondents. 2. Level of difficulty walking 400 yards. For further definitions of the variables, see text.

respondents considered 'old age' to be between ages 50-69 years, 38 per cent (195) said 70-79 years, 31 per cent (157) said 80-84 years, and 21 per cent (111) said 85 or more years. Table 2 shows that just over one-half of all respondents felt younger than their actual age, indeed about one-third felt over 10 years younger. Most of the remainder felt their age and a few (5 or 6%) felt older. There were no consistent or significant relationships between the actual age of the respondents and the age that they felt, indicating that self-perceived age is independent of chronological age. Nor was whether the respondents felt younger, the same or older than their actual age associated with familial ages (ages of parents and siblings, ages of death of parents). There was no association between a respondent's sex and the age that they felt.

Tables 3, 4 and 5 present both the chronological and subjective ages and selected socio-demographic characteristics of the respondents at baseline and at the follow-up interviews. They show clearly that there were no differences in the respondents' social characteristics and circumstances, psychological attitudes (except health expectations), or reported health status by their actual chronological age. Those aged 75 or more years did report worse physical functioning (Activities of Daily Living (ADL) score) at baseline and follow-up, than younger respondents (Table 3), and engaged in fewer social activities (Table 4), but that they were no less likely

TABLE 2. *How much older or younger than actual age the respondent felt*

Felt at follow-up:	Per cent	Number
Up to 5 years younger	1	5
5 < 10 years younger	12	67
10 < 15 years younger	16	83
15 < 25 years younger	15	80
25+ years younger	6	32
Younger unspecified	6	32
Younger mentally/older physically	—	1
About the same	38	204
Up to 10 years older	3	16
10+ years older	2	6
Older unspecified	1	7
Number of respondents		533

than the younger respondents to have experienced a deterioration in their physical functioning between the two surveys.

The age that the respondents actually *felt* was a more sensitive indicator than chronological age of several of the socio-demographic variables. In particular, respondents who felt younger than their actual years were more likely than those who felt older, or those who felt their chronological age, to have better baseline physical and psychological health and functioning (ADL and GHQ scores), and to be less likely to have experienced a deterioration in their physical functioning (Table 3). Further analyses showed that those who felt younger were less likely than those who felt the same age or older to have reported at baseline that they suffered from narrowing or hardening of the arteries ($p < 0.01$) and chronic bronchitis/emphysema ($p < 0.001$). This is consistent with the data in Table 4 showing that those who felt younger than their age or the same age were more likely to have reported that they were former smokers.

Table 4 also shows that those who felt younger than their age were also more likely to have participated in social activities at baseline, to report at follow-up that the best things about growing older were their greater independence, freedom, time and enjoyment, and less likely to report that the worst thing about ageing was declining health and functioning and dependency. It also shows that, at follow-up, respondents who felt younger than their age were more likely to consider people older than themselves as 'old', to feel a sense of mastery and control over their life (self-efficacy), to have rated their quality of life at baseline more positively, and at follow-up to have reported unchanged (as opposed to deteriorated) quality of life. Table 5 shows that they were more likely to be in the higher socio-economic groups, to be more educated, and to be home owners. It confirms that few of the socio-demographic and psychological status

TABLE 3. How much older or younger than actual age the respondent felt by health and quality of life variables

Variables and categories	Actual age ¹				Age-identity ²					
	65–74		75 +		Younger		Same		Older	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Self-assessed health status at baseline (compared to others same age)										
Excellent	10	(62)	11	(41)	16	(48)	4	(9)	–	(–)***
Very good	29	(178)	30	(110)	33	(99)	30	(60)	3	(1)
Good	34	(210)	34	(126)	35	(103)	33	(66)	23	(7)
Fair	21	(134)	19	(72)	14	(41)	27	(65)	48	(15)
Poor	6	(38)	6	(21)	2	(6)	6	(13)	26	(8)
ADL score at baseline										
0: no difficulty	40	(246)	19	(70)***	44	(132)	25	(49)	–	(–)***
1–4	33	(204)	33	(120)	34	(102)	37	(74)	13	(4)
5–9	12	(73)	17	(61)	9	(28)	14	(29)	30	(9)
10–18	8	(49)	21	(76)	9	(23)	14	(29)	30	(9)
19–45: severe difficulties	7	(46)	10	(39)	4	(12)	10	(20)	27	(8)
ADL score at follow-up (7 items)										
0: no difficulty	42	(136)	22	(34)***	52	(153)	31	(63)	3	(1)***
1–2	24	(77)	23	(36)	22	(64)	23	(47)	3	(1)
3–7	21	(68)	27	(41)	17	(50)	21	(42)	47	(14)
8–21: most difficulties	13	(41)	28	(44)	9	(28)	25	(49)	47	(14)
ADL change between baseline and follow-up										
Deteriorated	27	(87)	24	(37)	19	(51)	35	(62)	36	(8)***
Same-unchanged	63	(202)	64	(99)	71	(191)	54	(94)	64	(14)
Improved	10	(32)	12	(19)	10	(28)	11	(20)	–	(–)
GHQ score at baseline										
Depressed (case)	19	(116)	23	(84)	15	(45)	26	(52)	40	(12)***
Not depressed (non-case)	81	(503)	77	(287)	85	(253)	74	(151)	60	(18)
Reported happiness at baseline (GHQ item)										
No	9	(55)	9	(33)	6	(19)	10	(20)	27	(8)***
Yes	91	(564)	91	(339)	94	(279)	90	(183)	73	(22)
QoL rating at baseline										
Could not be better	5	(31)	6	(23)	4	(11)	4	(8)	20	(8)***
Very good	47	(292)	42	(157)	60	(179)	37	(77)	25	(10)
Good	31	(198)	32	(119)	26	(78)	42	(86)	25	(10)
Alright	14	(88)	16	(61)	9	(28)	13	(26)	25	(10)
Bad	1	(7)	4	(13)	1	(2)	2	(5)	3	(1)
Very bad	1	(4)	–	(1)	–	(1)	1	(1)	–	(–)
Could not be worse	1	(4)	–	(1)	–	(–)	1	(1)	2	(1)
QoL change between baseline and follow-up										
Deteriorated	30	(106)	36	(68)	26	(76)	38	(78)	65	(20)***
Unchanged	54	(186)	51	(94)	61	(180)	45	(92)	19	(6)
Improved	16	(54)	13	(25)	13	(40)	17	(35)	16	(5)

Notes: 1. Actual age at baseline (the increase in follow-up age was 12–18 months). 2. Feels younger, same or older than actual age at follow-up (follow-up question only); caution in interpretation of statistical significance is needed as some cells had expected values of <5. Effect size: change in health status: 0.038; change in ADL: 0.18; change in quality of life: 0.25. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 4. *How much older or younger than actual age the respondent felt by psychological and behaviour variables*

Variables and categories	Actual age				Age-identity					
	65-74		75+		Younger		Same		Older	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Self-efficacy score at baseline										
5-10 (most positive)	27	(167)	23	(85)	30	(90)	21	(43)	23	(7)***
11-12	36	(222)	35	(127)	39	(114)	33	(66)	17	(5)
13-14	23	(137)	24	(90)	22	(66)	25	(51)	27	(8)
15-25 (most negative)	14	(87)	18	(65)	9	(26)	21	(43)	33	(10)
Social comparisons and expectations (health) at baseline										
Better	26	(158)	38	(139)**	43	(124)	24	(48)	7	(2)***
Same	45	(269)	38	(139)	38	(108)	46	(91)	17	(5)
Worse than expected	29	(177)	24	(90)	19	(56)	30	(59)	76	(23)
Number of social activities at baseline										
0 (low)	5	(30)	10	(37)***	2	(7)	5	(11)	13	(4)***
1-2	22	(139)	34	(126)	13	(38)	27	(54)	45	(14)
3-4	33	(205)	35	(131)	31	(93)	37	(76)	32	(10)
5-12 (high)	40	(247)	21	(79)	54	(158)	31	(63)	10	(3)
Smoking status at follow-up										
Never smoked	33	(113)	37	(69)	34	(101)	34	(68)	34	(10)**
Ex-smoker	573	(195)	58	(109)	59	(172)	58	(114)	47	(14)
Current smoker: cigarettes smoked per day										
< 10 per day	3	(10)	2	(3)	1	(4)	4	(8)	3	(1)
10 < 20 per day	4	(15)	2	(4)	4	(12)	3	(6)	3	(1)
20+ per day	3	(9)	1	(2)	2	(5)	1	(2)	13	(4)
Smokes, no. unspecified	-	(-)	-	(1)	-	(1)	-	(-)	-	(-)
Body-mass index (Quetelet index) at follow-up										
< 18 severely underweight	2	(6)	2	(3)	1	(3)	1	(2)	14	(4)***
18 < 20 underweight	4	(12)	6	(11)	2	(6)	6	(12)	17	(5)
20 < 25 normal	37	(122)	48	(85)	45	(123)	35	(69)	35	(10)
25 < 27 normal	18	(62)	19	(34)	18	(51)	20	(40)	3	(1)
27 < 30 overweight	21	(71)	13	(24)	20	(54)	19	(37)	10	(3)
30+ severely overweight	18	(60)	12	(22)	14	(39)	19	(37)	21	(6)
Best things about growing older at follow-up										
Independence/slower pace ¹	84	(278)	78	(135)	87	(250)	77	(144)	67	(18)**
Nothing good	16	(52)	22	(39)	13	(39)	23	(43)	33	(9)
Worst things about growing older at follow-up										
Worsening functioning ²	36	(116)	49	(87)	78	(220)	83	(161)	85	(23)*
Other/nothing mentioned	64	(209)	51	(92)	22	(60)	17	(32)	15	(4)
At what age considers someone to be old at follow-up										
< 65 years	3	(10)	2	(3)	-	(1)	4	(8)	10	(3)***
65-69 years	10	(34)	5	(9)	4	(12)	12	(24)	21	(6)
70-74 years	17	(58)	15	(27)	13	(36)	21	(42)	24	(7)
75-79 years	19	(64)	25	(46)	18	(53)	25	(49)	21	(6)
80-84 years	31	(105)	29	(52)	34	(97)	28	(54)	14	(4)
85+	20	(87)	24	(44)	31	(88)	10	(20)	10	(3)

Notes: 1. Independence/slower pace/more time/other people/enjoyment/ knowledge 2. And/or dependency.

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 5. *How much older or younger than actual age the respondent felt by socio-demographic characteristics*

Variables and categories	Actual age				Age-identity					
	65–74		75 +		Younger		Same		Older	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Social class of respondents (baseline): old coding										
I (professional)	4	(27)	6	(22)	7	(22)	6	(13)	–	(–)**
II (semi-professional)	26	(165)	27	(100)	38	(113)	21	(43)	30	(9)
III _{nm} (skilled non-manual)	19	(117)	19	(72)	19	(56)	21	(43)	17	(5)
III _m (skilled manual)	23	(146)	22	(83)	19	(56)	27	(55)	23	(7)
IV (semi-skilled)	17	(106)	14	(51)	7	(21)	16	(32)	17	(5)
V (unskilled)	6	(36)	6	(26)	4	(13)	5	(10)	3	(1)
Other	5	(28)	5	(22)	6	(17)	4	(9)	10	(3)
Social class of respondents (baseline): new coding										
1 Employers and mngrs ¹	8	(51)	10	(36)	11	(33)	9	(19)	11	(3)*
2 Higher professionals ²	10	(58)	11	(41)	16	(48)	10	(20)	7	(2)
3 Lower mngrs and prof ³	16	(100)	12	(44)	20	(57)	12	(24)	18	(5)
4 Intermediate occ'tns	13	(77)	14	(49)	14	(39)	18	(35)	11	(3)
5 Small employers, oam ⁴	7	(43)	8	(28)	9	(25)	6	(12)	3	(1)
6 Lower supervisory ⁵	11	(69)	16	(58)	11	(33)	17	(33)	11	(3)
7 Semi-routine occ'tns ⁶	26	(156)	19	(70)	14	(42)	20	(39)	28	(8)
8 Routine occupations	9	(56)	10	(37)	5	(15)	8	(15)	22	(3)
Housing tenure (baseline)										
Owens outright	70	(437)	68	(255)***	79	(234)	70	(143)	54	(16)**
Owens mortgage	9	(57)	3	(12)	9	(27)	6	(12)	13	(4)
Rents LA/HA ⁷	18	(112)	23	(87)	10	(29)	21	(43)	30	(9)
Rents privately	3	(18)	6	(21)	3	(8)	3	(5)	3	(1)
Educational attainment										
Degree or higher	7	(43)	6	(21)	9	(27)	5	(10)	–	(–)**
Higher below degree	6	(40)	6	(23)	9	(26)	6	(11)	20	(6)
'A' levels or highers	4	(26)	3	(12)	4	(13)	5	(10)	3	(1)
ONC/BTEC	3	(16)	1	(5)	2	(6)	2	(4)	–	(–)
'O' level or GCSE	9	(56)	6	(22)	14	(38)	9	(19)	3	(1)
CSE grade 2–5	2	(11)	1	(3)	1	(3)	1	(2)	–	(–)
Other qualifications	9	(55)	8	(29)	10	(31)	10	(20)	7	(2)
No qualifications	60	(377)	69	(259)	51	(152)	62	(128)	67	(20)
Number of respondents										
At baseline	604–625		367–374							
At follow-up	325–358		155–188		270–299		197–205		28–31	

Notes: 1. Large organisations. 2. Organisations. 3. Lower managers and professionals. 4. Intermediate occupations. 5. Own account managers. 6. Including craft and related occupations. 7. Local authority and housing association (or social) housing.

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

variables were associated significantly with actual age, indicating that this measure is less efficient than 'felt age' in differentiating among the respondents.

Hierarchical multiple linear regression was used to explore the independent predictive ability of the covariates on age-identity (the dependent

variable). Age-identity was a ranked variable that measured how many years older or younger than their actual age the respondents felt (a score of '0' indicates feeling the same as one's actual age). The variables that were significantly associated ($p < 0.05$) with age-identity and had theoretical meaning were entered as independent variables, including health status, physical functioning (ADL), psychological morbidity, psychological self-constructs and attitudes, perceptions of ageing, personal social capital, and socio-economic status. Age, sex and socio-economic group (social class, housing tenure, highest level of education, gross annual income category) were entered in the initial model.

Multi-collinearity was high (> 15) among several of the independent variables, and this led to their exclusion from the final model. The following variables were excluded: perceived quality of life (quality of life rating, changes in quality of life between baseline and follow-up surveys); psychological self-constructs and attitudes (self-efficacy, social comparisons and expectations (health, finances), optimism-pessimism); personal social capital (number of social contacts, perceived loneliness, frequency of contact with relatives and friends, number of social activities), age and sex. Their process of entry and exclusion is outlined next.

The health variables in the initial model were self-reported health status compared with others of same age at baseline (adjusted $R^2 = 0.09$), ADL at baseline (adjusted $R^2 = 0.12$), changes in health status between baseline and follow-up (adjusted $R^2 = 0.19$), changes in functional ability (ADL) between baseline and follow-up (adjusted $R^2 = 0.20$). Body-mass index and amount of health service use were then introduced but were insignificant and therefore excluded from further models. The next group of variables to be entered related to psychology and perceptions: psychological morbidity (GHQ score for anxiety/depression) (adjusted $R^2 = 0.20$), reported worsening functioning, dependency and deterioration in health as the worst things about growing older (as against not mentioned) (adjusted $R^2 = 0.20$), reported worsening health, functioning, senses and dependency as their biggest fears about growing older (as against not mentioned) (adjusted $R^2 = 0.21$). The remaining variables were then tested: quality of life rating at baseline, change in quality of life rating between baseline and follow-up, scores for self-efficacy, social comparisons and expectations of health, and then of finances, optimism-pessimism bias, social contacts (number, perceived loneliness, frequency of contact with relatives, friends, number of social activities), and socio-economic status (social class, housing tenure, highest educational qualification, gross income categorised) and demographic variables (age, sex). Only two of these variables retained statistical significance (frequency of contact with friends, number of social activities) and one previously insignificant variable, sex, achieved

TABLE 6. Regression of age-identity on health, mental health and perceptions

	Model 1				Model 2			
	β	stand. β	95% CI	t	β	stand. β	95% CI	t
1. Health								
Health compared with others of same age	0.43	0.31	(0.28–0.59)	5.36***	0.41	0.30	(0.25–0.58)	4.87***
ADL total score	0.23	0.20	(0.10–0.35)	3.66***	0.21	0.18	(0.08–0.33)	3.28**
Change in health status	-0.57	-0.26	(-0.79–0.36)	-5.21***	-0.56	-0.25	(-0.78–0.34)	-5.06***
Change in ADL	-0.36	-0.14	(-0.58–0.13)	-3.07**	-0.34	-0.13	(-0.56–0.11)	-2.89**
2. Mental health and perceptions								
GHQ score					0.02	0.04	(-0.03–0.08)	0.864
Worst things about growing older					-0.00	-0.04	(-0.01–0.00)	-1.02
Biggest fears about growing older					-0.01	0.00	(-0.01–0.00)	-2.21*
Constant	2.87				3.03			
R ²	0.21				0.22			
Adjusted R ²	0.20				0.21			
F	29.15***				17.85***			

Notes: stand. β is standardised beta. t refers to a two-tailed test. CI confidence interval.

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

significance. They made little improvement to the model. Moreover, these variables showed multi-collinearity and were excluded from further models.

In summary, the initial modelling showed that baseline physical health and functional status, changes in these at follow-up, baseline psychological morbidity and feelings about ageing at follow-up, were the strongest independent predictors of self-perceived age. Adding the other variables, which were statistically significant in the initial analysis, made no improvement to the model, and most demonstrated multi-collinearity. The associations were in the direction expected, *e.g.* better health and functioning, lack of psychological morbidity and positive feelings about ageing associated with feeling younger than one's age.

Table 6 shows the results of the final multiple regression model of the effects of physical health status and functioning, and mental health (psychological morbidity), including perceptions of ageing, on self-perceived age (dependent variable). This showed that baseline physical health and functional status, and reported changes in these at follow-up, explained 20.4 per cent of the variance in self-perceived age ratings. Adding baseline psychological morbidity (anxiety/depression), feelings

and fears about ageing at follow-up explained a further 0.8 per cent of the variance, making the total variance explained 21.2 per cent. The implication is that good health and functioning were the principal predictors of feeling younger than one's years, followed by lack of psychological morbidity and positive attitudes towards ageing.

Discussion

The analyses presented here described the agreement between self-perceived age ('age-identity') and chronological age, and examined predictors of age-identity in a sample of people aged 65 and over. It has been shown that age-identity was independent of chronological age, and the bivariate analyses found that while chronological age was significantly associated with physical functioning (ADL), there were no significant differences between chronological age and respondents' social characteristics and circumstances, psychological attitudes, or reported health status. In contrast, there were significant associations between age-identity, the difference in years between felt and actual age, and social and psychological characteristics, although physical health and functional status were the main predictors of subjective age. This evidence supports the use of a measure of subjective age (as well as chronological age) to enhance sensitivity in studies of ageing.

The findings indicated, then, that age-identity was a better discriminator of social groups than actual age. Good health and functioning were the main independent predictors of feeling younger than one's years, followed by lack of psychological morbidity and positive attitudes towards ageing. Nonetheless, most of the variance (almost 80%) between subjective age groups remained unexplained, reflecting the complexity of subjective variables, and indicating the need for further investigation.

A strength of the study design was that the baseline respondents were a national random sample of people aged 65 or more years. They were interviewed at home, and a high percentage consented to be followed-up, and returned the follow-up postal questionnaires. Of course a substantial minority did not respond, although analysis of the characteristics of responders and non-responders revealed no major differences between them. A potential weakness of the study was that the sample did not include people living in institutions, or those with any evidence of mental confusion. Caution in generalising the results is therefore necessary, as the responders to the study may be selective of 'successful survivors'. Another problem was that because perceived age was asked only at the follow-up survey, it was not possible to control for the effects of perceived age at

baseline. It is possible that age-identity at baseline might have had a prior influence on perceived health and functional status.

The findings of the bivariate analyses corroborate other research which has reported that people who felt younger than their years reported better physical and mental health status on a range of indicators, and rated their satisfaction with aspects of their lives, or quality of life, as higher (Mutran and Burke 1979; Barak and Schiffman 1981; Steitz and McClary 1988; Logan, Ward and Spitze 1992; Grundy and Bowling 1999; Michalos, Zumbo and Hubley 2000; Michalos *et al.* 2001). It is possible that the future cohorts of those aged in the sixties and older will be even more reluctant to perceive themselves as 'old'. Indeed, there is some evidence from Britain that people aged in the fifties share more of the attributes and behaviour of those aged in the thirties and forties than of those who are older than themselves (Scales and Scase 2000).

Perceived age may, of course, be a function of perceived years left to live (or of time to death). At any age, the higher socio-economic groups have the greatest average remaining life expectancy, which might influence their judgements of perceived age, although socio-economic variables made no contribution to the regression model. Socio-economic status also confounds the associations between health and functional status with self-perceived age. The principal conclusion is that the subjective perception of one's age is influenced partly by inter-related measures of physical health and functional status. Mental health (psychological morbidity) and psychological perceptions made a small but significant contribution. Whether or not each of these variables are directly related to variations in longevity, rather than simply being the main factors influencing how old one feels, remains to be seen. Future research should also aim to identify other factors that influence age-identity, *e.g.* expectations of older age and how these are conditioned. The study reported here indicates that a measure of non-chronological age, such as age-identity, is worthy of further exploration.

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NOTES

- 1 For details of the ONS *Omnibus Surveys*, visit <http://www.statistics.gov.uk/services/SurveyOmnibus.asp>
- 2 Perceptions of self-efficacy: control and mastery over life including: self-ratings of perceived control over ‘the important things in life’; perceived ability to make successful plans, and action in the face of failure (Schwarzer 1993); perceived risks of negative life and negative health events events in comparison with other men/women their age in Britain (men were asked to compare themselves with men, and women were asked to compare themselves with women) (Sutton 1998); optimism-pessimism bias which included attitude statements on outlook in ‘uncertain times’, expecting things ‘to go wrong’, looking on the ‘bright side’, things ‘working out the way wanted’) (Sheier and Carver 1985); health values, which included attitude statements on caring about other things ‘more than one’s health’ and whether there were things ‘more important than one’s health’ (Lau, Hartman and Ware 1986); social comparisons and expectations, including self-ratings of living conditions, finances, achievements and health in comparison with relevant others or in comparison with their past circumstances and expectations.
- 3 Functional status, including performance of ADL and IADL, were measured using the Bond and Carstairs (1982) version of Townsend’s (1979) scale, the ONS disability scale items (Martin, Meltzer and Elliott 1988), the SF-36 item on health perceptions (*viz.* In general, compared with other people’s age, would you say that your current health is ‘excellent’, ‘very good’, ‘good’, ‘fair’ or ‘poor’?) (Ware *et al.* 1993); self-reported long-standing illness, disability or infirmity; and self-reported, diagnosed medical conditions using a check list of conditions.
- 4 The *General Health Questionnaire* (GHQ-12) detects mainly anxiety and depression by rating feelings over the past week (Goldberg and Williams 1988).
- 5 Personal social capital (type, availability, frequency and proximity of help and support (Sherbourne and Stewart 1991); number and type of social activities; number of social contacts; frequency of loneliness); and external social capital (enjoyment of living in the area and ratings of the quality of facilities in the area; rating of problems in the area; feelings of safety; reported neighbourliness of area) (Cooper *et al.* 1999).
- 6 Change scores (in ADL, quality of life rating, longstanding illness and health status) were calculated and effect sizes estimated.

- 7 Given that obese individuals tend to under-estimate their weight, the body-mass index needs to be interpreted with caution (Lawlor *et al.* 2002).
- 8 These two techniques do not deal with the problem of a combination of independent variables being highly associated with another independent variable (Katz 1999). The following indicators, produced by the multivariate analysis, were used to assess multicollinearity (MC) between the variables before deciding to enter them into the model: the tolerance factor (high MC when close to 0), the variable inflation factor (VIF) (problematic VIF if > 2), the eigenvalue (E) (predictors likely to be highly inter-related when E is close to 0, thus small changes in the data may lead to large changes in the estimates of the coefficients), the condition index (CI) which is the square root of the largest eigenvalue to each successive eigenvalue (possible problems with MC if CI value > 15 ; serious problem with MC if CI value > 30). The predictor variables were entered first one-by-one, to assess the effect on the overall adjusted R^2 and their impact on multi-collinearity. Where MC was at an acceptable (minimal) level, the variables were entered into the final model.

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