

19. Giallauria F, De Lorenzo A, Pileri F *et al.* Reduction of NT-pro-BNP levels with exercise-based cardiac rehabilitation in patients with left ventricular dysfunction after myocardial infarction. *Eur J Cardiovasc Prev Rehabil* 2006; 13: 625–32.
20. Giannuzzi P, Tavazzi L, Temporelli PL *et al.* Long-term physical training and LV remodeling after myocardial infarction: results of the exercise in anterior myocardial infarction (EAMI) trial. *J Am Coll Cardiol* 1993; 22: 1821–9.
21. Giannuzzi P, Temporelli PL, Corrà U *et al.* Antiremodeling effect of long-term exercise training in patients with stable chronic heart failure. *Circulation* 2003; 108: 554–9.
22. Dubach P, Myers J, Dziekan G *et al.* Effect of exercise training on myocardial remodeling in patients with reduced LV function after myocardial infarction. Application of magnetic resonance imaging. *Circulation* 1997; 95: 2060–7.
23. Giannuzzi P, Temporelli PL, Corrà U *et al.* Attenuation of unfavourable remodeling by exercise training in postinfarction patients with LV dysfunction. *Circulation* 1997; 96: 1790–7.
24. Nagaya N, Goto Y, Nishikimi T *et al.* Sustained elevation of plasma brain natriuretic peptide levels associated with progressive ventricular remodeling after acute myocardial infarction. *Clin Sci* 1999; 96: 129–36.
25. Nilsson JC, Groenning BA, Nielsen G *et al.* Left ventricular remodeling in the first year after acute myocardial infarction and the predictive value of N-terminal pro brain natriuretic peptide. *Am Heart J* 2002; 143: 696–702.
26. Takagi S, Sakuragi S, Baba T *et al.* Predictors of left ventricular remodeling in patients with acute myocardial infarction participating in cardiac rehabilitation. *Circ J* 2004; 68: 214–9.
27. Wallmeyer K, Wann LS, Sagar KB, Czakanski P, Kalbfleish J, Klopfenstein HS. The effect of changes in afterload on Doppler echocardiographic indexes of left ventricular performance. *J Am Soc Echocardiogr* 1988; 1: 135–40.
28. Voutilainen S, Kupari M, Hippelainen M, Karppinen K, Ventil M, Heikkilä J. Factors influencing Doppler indexes of left ventricular filling in healthy persons. *Am J Cardiol* 1991; 68: 653–9.
29. Walther C, Gielen S, Hambrecht R. The effect of exercise training on endothelial function in cardiovascular disease in humans. *Exerc Sport Sci Rev* 2004; 32: 129–34.
30. Hambrecht R, Adams V, Erbs S *et al.* Regular physical activity improves endothelial function in patients with coronary artery disease by increasing phosphorylation of endothelial nitric oxide synthase. *Circulation* 2003; 107: 3152–8.

Received 21 January 2006; accepted in revised form 7 July 2006

Age and Ageing 2006; **35**: 607–614 © The Author 2006. Published by Oxford University Press on behalf of the British Geriatrics Society. doi:10.1093/ageing/af1100 All rights reserved. For Permissions, please email: journals.permissions@oxfordjournals.org
Published electronically 2 September 2006

Which model of successful ageing should be used? Baseline findings from a British longitudinal survey of ageing

ANN BOWLING, STEVE ILIFFE

Department of Primary Care and Population Sciences, University College London, Hampstead Campus, London NW3 2PF, UK

Address correspondence to: A. Bowling. Tel: (+44) 0207 830 2239. Email: a.bowling@ucl.ac.uk

Abstract

Background: there is increasing interest in how to age ‘successfully’ and in reaching consensus over its definition.

Objective: to assess different models of successful ageing, using a British longitudinal survey of ageing in 2000–1.

Setting: community settings in Britain.

Methods: five models of successful ageing were tested on a British cross-sectional population survey of 999 people aged 65+. The models were biomedical, broader biomedical, social, psychological and lay based.

Results: the lay model emerged as the strongest. Respondents who were classified as successfully aged with this model, compared with those not successfully aged, had over five times the odds of rating their quality of life (QoL) as good rather than not good [odds ratio (OR) = 5.493, 95% confidence interval (95% CI) = 2.655–11.364].

Conclusion: the lay-based, more multidimensional, model of successful ageing predicted perceived QoL more powerfully than unidimensional models and should be used to evaluate the outcomes of health promotion in older populations.

Keywords: successful ageing, physical functioning, mental functioning, social functioning, health status, well-being, quality of life, elderly

Background

With population ageing, there is increasing interest in how to age ‘successfully’ and in reaching consensus over the definition and measurement of this concept. Calls for a broad, public health approach to promote successful ageing [1] have been answered by the promotion of older people’s health in the National Service Framework for Older People [2] and the proposal for ‘Life Checks’ at retirement [3].

Health promotion in older people can alter behaviour, particularly exercise and diet, with a demonstrable benefit on cardiac morbidity and falls [4, 5]. Targeting several health behaviours improves general health perception and self-efficacy in older people [6, 7]. There is, therefore, a rationale for promoting successful ageing, and clinicians are exploring ways of assessing health risks and engaging in health promotion with older people [8], although sometimes with limited success [9]. We need to understand the components of successful ageing to devise health promotion interventions and measure their outcomes.

The MacArthur studies of successful ageing are the most well-known epidemiological surveys and were grounded in Rowe and Kahn’s [10] model of successful ageing, defined not simply as longevity, but as (i) absence, or avoidance, of disease and risk factors, (ii) maintenance of physical and cognitive functioning and (iii) active engagement with life. They examined onset, and predictors, of poor physical and mental functioning [11, 12], predictors of mortality [13] and biological markers [14]. Many investigators have used similar models [15, 16], sometimes including psychosocial variables [17].

There are many psychosocial approaches to successful ageing, focusing on high social functioning (e.g. social activity and participation, social interactions) [18], and life satisfaction [19]. Early studies equated these concepts with successful ageing, but they are now often used as outcomes [20]. Psychological models view successful ageing as possessing: a sense of control over life or self-efficacy; effective strategies for coping, adaptation and self-worth; and goals [20]. With these competences, a person can age successfully despite deteriorating health and functioning [21].

Models of successful ageing are contentious, because no agreement exists across disciplines about definitions, and there is debate about appropriate cut-off points in measures used [15]. Constituents of successful ageing in some studies are used as precursors or outcomes in others. Some investigators do not define the concept at all or only implicitly by choice of measures. And, unlike lay perspectives, few models are truly multidimensional [22].

Aim

These analyses aimed to assess models of successful ageing, using baseline data from a British longitudinal survey of ageing.

Methods

The sample was derived from four quarterly Office for National Statistics (ONS) Omnibus Surveys (OS) in Britain

during 2000–1, sampled from a small user postcode sampling frame, with geographic and socio-economic stratification. OS respondents aged 65+ were asked whether they would be willing to be re-interviewed by ONS interviewers for our module on quality of life (QoL). Those who consented were re-interviewed two months later. Of the sample of 1,299 eligible respondents sifted by ONS from the OS, the overall response rate was 77% (999), 19% refused and 4% were not contactable. The characteristics of the sample were broadly similar to those from mid-year census population estimates for Great Britain. Full details have been published elsewhere [23].

Measures

Open-ended questions were asked at the beginning of the interview to elicit respondents’ descriptions of their QoL, followed by a self-rating of QoL overall on a 7-point Likert scale, ranging from ‘So good, could not be better’ to ‘So bad, could not be worse’. Structured questions were used next: Sherbourne and Stewart’s [24] and Cooper *et al.*’s [25] scales of social support and perceived neighbourhood environment; Schwarzer’s [26] self-efficacy scale; Scheier and Carver’s [27] optimism–pessimism scale; Lau *et al.*’s [28] health values scale; the General Health Questionnaire-12 (GHQ-12) for psychological morbidity [29]; Townsend’s [30] physical functioning [activities of daily living (ADL)] scale; self-rated health; and social activities, loneliness, life expectations, perceived risks and diagnosed medical conditions. Standard socio-demographic and socio-economic items and classifications were also included, as well as the NS socio-economic classification (NS SEC).

Models of successful ageing, and the indicators used for their construction, were selected after examination of the literature [22] (Box 1). Consistent with the methods of other investigators, maximum scores were used to represent successful ageing for the different models [10, 15]. More people would be classified as successfully aged if thresholds were lowered, and this remains an issue for further exploration.

Statistical analysis

The variables selected for the construction of the alternate models of successful ageing (Box 1) were dichotomised to permit their summing for the models based on numbers of good scores achieved on each. Univariate analyses included frequency distributions, means, *t*-tests for independent samples and chi-square tests.

Logistic regression analysis [odds ratios (ORs), 95% confidence intervals (95% CIs)] was used for model comparison (after checks for multicollinearity). The ability of theoretically relevant, socio-demographic variables to independently predict successful ageing classifications was tested. A hierarchical approach was used, with entry of independent variables in theoretical order of importance. Socio-economic status, marital status and age have been reported to be associated with health, social and psychological resources; gender has more inconsistent associations [23]. They were expected to have explanatory power in relation to overlapping models of successful ageing. As life satisfaction,

Box 1. Construction of models of successful ageing, based on the literature [22]

Biomedical model: Comprised summing of variables, recoded as 1 good/best versus 0 rest, number of diagnosed, chronic medical conditions (score: none), activities of daily living (ADL) (no/little difficulty score: <10), no psychiatric morbidity [General Health Questionnaire-12 (GHQ-12): 5+]

Broader biomedical model: Comprised summing of the above plus number of different social activities engaged in during past month (3+), as an index of social engagement

Social functioning model: Comprised summing of number of different social activities engaged in during past month (as above 3+), frequency of social contacts score (1–8), helped/supported in all 5 areas of life asked about

Psychological resources model: Comprised summing of self-efficacy score (best <11), best optimism score (<6), plus single GHQ items (3, 6, 8, 10, 11) on sense of purpose: playing useful part; coping: facing up to problems, overcoming difficulties; self-esteem: feels has self-confidence and has self-worth

Lay model: Comprised summing of the above (minus separate GHQ items as they were already included in GHQ score in biomedical models and singularity would be violated by their inclusion) plus gross annual income (>£7,280) and perceived social capital [rating of area facilities (e.g. transport, closeness to shops, services), area problems (e.g. crime, vandalism, graffiti, speed and volume of traffic, air quality), somewhere nice to go for a walk, feels safe walking alone during the day or night]

well-being or QoL has been used as an outcome indicator of successful ageing by many investigators, self-rated QoL was selected as the outcome indicator against which to test the independent predictive ability of the successful ageing models. The level for statistical significance was set at 0.05.

Item non-response was small, although cumulative. Imputations for missing data were not used. An analytic weight was used for analyses to allow for the unequal probability of people in households containing few adults having a better chance of sample selection than those in households with many.

Results

Characteristics of respondents

Thirty-four per cent (341) of respondents were aged 65–70, 28% (283) were 70–75, 21% (207) were 75–80 and 17% (168) were 80+. Forty-eight per cent (480) of respondents were female, most [98% (983)] were white and 62% (619) were married or cohabiting.

Few, 16% (165), had educational qualifications at A level or above, 20% (196) had lower qualifications and 64% (637) had none. Nineteen per cent (185) were in the higher socio-economic groups (NS SEC 1–3: employers, managers and professionals and intermediate occupations), and the rest were in lower groupings.

Comparison of models

Table 1 summarises the distributions of respondents on the variables selected for the inclusion in the alternate models of successful ageing [22]. The variables selected for the construction of the biomedical model were number of diagnosed chronic conditions, physical functioning (ADL score) and psychological morbidity (GHQ-12 score). Number of areas of different social activities in the past month was added for the broader biomedical model. The social functioning model included the number of social activities, areas of life supported/helped with and frequency of face-to-face social contacts with relatives and friends. The psychological resources model included self-efficacy, level of optimism and sense of purpose, coping, self-confidence and self-worth. The lay model included all these indicators plus annual

gross income and perceived neighbourhood environment [ratings of area facilities (e.g. shops, services, transport), somewhere nice to walk, safety and problems (e.g. graffiti, vandalism, litter, rubbish, volume and noise of traffic)].

The table summarises that, although just 21–37% had good levels of health and physical functioning, most people were in good psychological health. Although 33% had undertaken more than three different social activities in the past month, and 41% had a high frequency of social contact score, almost three-quarters reported they had help available in all areas enquired about. Although 26% had the best self-efficacy scores, most had good scores on the optimism scales, had a sense of purpose, were coping, were self-confident and had a sense of worth. Less than half had an income of £7,280 or more; smaller proportions (13–28%) reported neighbourhood problems.

The number of good scores achieved with each model are displayed in Table 2, along with the means by respondents' characteristics. On the whole, the distributions are skewed towards having higher numbers of good scores, but the lay model shows a normal distribution. With each model, except the lay model, the criteria used for scoring as successfully aged were 100% good scores [15]. As few respondents scored all good scores with the lay model, this necessitated reducing the threshold for successful ageing to 10–13 good scores to ensure enough numbers for analysis. Between 16 and 34% had successfully aged using these criteria.

Respondents who were married or cohabiting, compared with those who were not, and those who were aged 65–80, compared with those aged 80+, had significantly higher mean scores for each model (except with age for the psychological model). Gender and socio-economic groups were significant for the biological, broader biological and lay models, but not for the social and psychological models, with men having higher mean scores than women, and those in higher socio-economic groups having higher scores than those in lower groups in the former models (Table 2).

Respondents' basic socio-economic and socio-demographic characteristics were entered into logistic regression analyses for each model of successful ageing to examine their independent predictive ability, given their theoretical relevance. The variables entered were highest

Table 1. Frequency distributions of dichotomised variables included in the models of successful ageing

Variables within the models	% (n)
Biomedical model	
Diagnosed chronic conditions: none ^a	37 (374)
1–6	63 (625)
ADL score <10 (good functioning) ^a	21 (210)
10–45	79 (774)
GHQ non-case (5–12) ^a	80 (790)
Cases 1–4	20 (200)
Broader biomedical model (all the above plus)	
Socially active: three ^b or more different social activities in past month ^a	33 (332)
0–2 activities	67 (662)
Social functioning model (social activities above plus)	
Support/help available in all five areas enquired about ^a	72 (706)
0–4 areas	28 (279)
High-frequency social contacts (1–8) ^a	41 (406)
9–16 lower frequency	59 (585)
Psychological resources model	
Best self-efficacy score (<11) ^a	26 (253)
10–23 lower scores	74 (728)
Best optimism score (<6) ^a	66 (648)
7–10 lower scores	35 (341)
Has sense of purpose/playing useful part ^a	80 (789)
Has not	20 (200)
Can face up to problems (coping) ^a	91 (897)
Cannot	9 (93)
Can overcome difficulties (coping) ^a	88 (871)
Cannot	12 (119)
Has self-confidence ^a	85 (845)
Has not	15 (145)
Has self-worth ^a	93 (925)
Has not (feels worthless)	7 (65)
Lay model (each of the above plus income and perceived social capital)^b	
Annual gross income >£7,280 ^a	43 (407)
£7,280 or less	57 (545)
Very good/good rating of area facilities (<25) ^a	87 (867)
Less good (25–42)	13 (128)
Very good/good rating for has somewhere nice to go for walk (1–2) ^a	72 (713)
Not good (3–6)	28 (281)
Feels very safe walking alone am/pm (<5) ^a	85 (787)
Does not (3–8)	15 (142)
Few reported problems in area (24–30) ^a	84 (831)
Problems reported (<24)	16 (163)
N	981–999 ^c

N, number of respondents.

All variables recoded and dichotomised as 1/0 with 1 ‘good scores’.

^aCriterion of successful ageing.

^bCounted once only in lay model, i.e. social activities (represented in broader biomedical model and the social functioning model), was only counted once in the lay model; the five General Health Questionnaire-12 (GHQ-12) items represented in the psychological model were not included in the lay model as they were already counted in biomedical models (GHQ score of case/non-case) and would violate assumption of singularity if both items and scale were included in statistical manipulations.

^cIf respondents had any missing values on any one of the items comprising a model, then they were excluded from the scoring for that model as complete cases were required.

education qualification, socio-economic status, marital status, age and sex. Table 3 summarises that the lay model was the strongest overall.

Only age was significant in the biomedical model, with younger respondents aged 65–80 having 1.665 the odds of scoring as successfully aged than older respondents. Neither gender nor level of educational qualification retained significance in the broader biological model. With this model, those in the higher socio-economic grouping had 1.667 the odds of scoring significantly as successfully aged than those in lower groups, those who were married or cohabiting had 1.635 the odds of scoring as successfully aged than others and younger respondents had over twice the odds of scoring as successfully aged than older respondents.

Marital status and age were significant in the social model, again with married or cohabiting respondents having 1.398 the odds of scoring successfully aged than those who were not; younger respondents had almost three times the odds of scoring as successfully aged than older respondents. The psychological resources model performed worst, with none of the variables attaining significance. By contrast, all variables except marital status were statistically significant with the lay model. Respondents with higher education qualifications had twice the odds of scoring as successfully aged than those with fewer or none, those in the higher socio-economic groups had almost twice the odds of scoring as successfully aged than those in lower groups, respondents aged <80 had over twice the odds of scoring successfully aged than older respondents and males had 1.659 the odds scoring as successfully aged than females.

The ability of the alternate successful ageing models to independently predict self-rated QoL was tested in separate logistic regression models, adjusted for socio-economic and demographic variables. QoL ratings were dichotomised as ‘good’ (1, ‘So good, could not be better’ to ‘Good’) or ‘not good’ (0, ‘Alright’ to ‘So bad, could not be worse’) before entry.

Each model was able to independently predict QoL. The lay model was the strongest. With this model, respondents who were classified as successfully aged, compared with those classified as not, had over five times the odds of rating their QoL as good rather than not good (OR = 5.493, 95% CI = 2.655–11.364, *P* = 0.001). The next strongest model was the broader biomedical model: respondents who were classified as successfully aged, compared with those who were not, had over three times the odds of good versus not good QoL (OR = 3.252, 95% CI = 1.855–5.700, *P* = 0.001). With the biomedical model, respondents classified as successfully aged had over twice the odds of rating their QoL as good rather than not good (OR = 2.598, 95% CI = 1.668–4.047, *P* = 0.001). The odds of having good versus not good QoL were also higher for respondents classified as successfully aged with the psychological and social models, although the odds were less strong (OR = 2.413, 95% CI = 1.324–4.398, *P* = 0.004 and OR = 1.998, 95% CI = 1.334–2.991, *P* = 0.001, respectively).

Marital status [married or cohabiting (1) versus not] contributed positively to QoL in all models. The ORs and CIs for marital status in each of the models were as follows—biomedical: OR = 1.564 (95% CI = 1.084–2.257), *P* = 0.017; broader biomedical: OR = 1.510 (95% CI = 1.047–2.176), *P* = 0.027; social: OR = 1.502 (95% CI = 1.045–2.158),

Table 2. Comparison of model scores and mean scores by respondents' characteristics

Model scores	Biomedical model [% (n)]	Broader biomedical model [% (n)]	Social functioning model [% (n)]	Psychological resources model [% (n)]	Lay model [% (n)]
Comparison of number of good scores, and their means, of alternate models of successful ageing					
Number of good scores					
0	8 (76)	5 (51)	7 (74)	1 (7)	—
1	19 (186)	11 (111)	21 (203)	1 (14)	—
2	42 (415)	22 (210)	38 (373)	3 (29)	— (3)
3	31 (302)	39 (379)	34 (332)	6 (61)	1 (10)
4		23 (227)		10 (96)	3 (21)
5				26 (252)	6 (54)
6				37 (365)	11 (90)
7				16 (155)	18 (152)
8					19 (159)
9					19 (163)
10					15 (128)
11					6 (55)
12					2 (18)
13					— (1)
Dichotomised scores					
High scores—successfully aged ^a	31 (302)	23 (227)	34 (332)	16 (155)	24 (202) ^b
Fewer scores	69 (677)	77 (751)	66 (650)	84 (824)	76 (652)
N	979	978	982	979	854
Mean scores for alternate models of successful ageing by respondents' characteristics [mean (SD)]					
	1.963 (0.898)	2.634 (1.112)	1.981 (0.921)	5.283 (1.399)	8.022 (1.9227)
Age					
65–80 (1)	2.027 (0.867)	2.741 (1.066)	2.078 (0.883)	5.313 (1.384)	8.140 (1.899)
80+ (0)	1.637 (0.981)	2.087 (1.182)	1.486 (0.953)	5.124 (1.470)	7.296 (1.908)
t value	−4.685***	−6.505***	−7.300***	−1.557	−4.488***
Gender					
Male (1)	2.051 (0.868)	2.757 (1.071)	1.994 (0.911)	5.347 (1.373)	8.308 (1.910)
Female (0)	1.869 (0.921)	2.503 (1.141)	1.963 (0.931)	5.213 (1.424)	7.698 (1.880)
t value	−3.176**	−3.584***	0.533	−1.498	−4.627***
Marital status					
Married or cohabiting (1)	2.044 (0.872)	2.785 (1.075)	2.081 (0.885)	5.357 (1.370)	8.255 (1.841)
Widowed, single, divorced, separated (0)	1.830 (0.924)	2.389 (1.129)	1.813 (0.954)	5.161 (1.438)	7.619 (1.994)
t value	−3.596***	−5.438***	−4.384***	−2.135*	−4.624***
NS SEC					
Higher socio-economic groups 1–3 (1)	2.179 (0.768)	3.032 (0.906)	2.080 (0.871)	5.431 (1.311)	8.633 (1.935)
Lower (0)	1.914 (0.920)	2.547 (1.134)	1.960 (0.930)	5.250 (1.427)	7.877 (1.882)
t value	−3.605***	−6.169***	−1.517	−1.637	−4.532***

N, number of respondents; NS SEC, National Statistics socio-economic classification; SD, standard deviation.

t-tests for independent samples used (two-tailed levels of significance).

^aSuccessfully aged dichotomous models: Biomedical model 3/3 good scores; broader biomedical model 4/4 good scores; social functioning model 3/3 good scores; psychological resources model 7/7 good scores; lay model 10–13 good scores.

^bThe low number of total good scores in the lay model necessitated lowering the threshold for successful ageing in the lay model to ensure sufficient numbers for analysis (compared with the other models).

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

$P = 0.028$; psychological: OR = 1.573 (95% CI = 1.093–2.265), $P = 0.015$; and lay: OR = 1.487 (95% CI = 1.000–2.210), $P = 0.050$. Age (65–80 versus 80+) was only significant in the psychological model: OR = 1.601 (95% CI = 1.042–2.460), $P = 0.032$. Education, socio-economic status or sex did not achieve statistical significance in the models.

Discussion

This article examined models of successful ageing, using data from a British survey of ageing. It was restricted to people living in their own homes and did not reflect frailer populations living in care homes. Given the increases in the

numbers of the oldest old (a group at the limits of functional capacity), new, broader theoretical approaches are required to deal with the challenges this poses.

Successful ageing has been variously treated as an outcome indicator or as a precursor to other outcomes (e.g. life satisfaction, QoL). It might also be questioned whether QoL should have been used here as an outcome, rather than constituent, of successful ageing. Although debatable, the use of a concept as a predictor and outcome variable is not necessarily illogical [e.g. in epidemiological research, health status is sometimes treated as an outcome variable as well as a predictor of other outcomes (e.g. longevity)]. However, investigators need clearer definitions and measurements of

Table 3. Logistic regression showing independent associations [odds ratio (OR), 95% confidence interval (95% CI)] with predictors on alternate successful ageing models

Independent variables	Biomedical model		Broader biomedical model		Social functioning model		Psychological resources model		Lay model	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Highest education qualification										
Degree/higher than A levels (1) versus lower	1.023 (0.644–1.625)	0.925	1.324 (0.817–2.146)	0.254	1.088 (0.687–1.722)	0.720	1.706 (0.987–2.948)	0.056	2.098 (1.267–3.475)	0.004
Socio-economic status NS SEC										
Highest 1–3 groups (1) versus lower	1.423 (0.955–2.120)	0.083	1.667 (1.090–2.549)	0.018	1.165 (0.778–1.743)	0.458	0.972 (0.597–1.644)	0.991	1.966 (1.257–3.075)	0.003
Marital status										
Married or cohabiting (1) versus not	1.257 (0.923–1.711)	0.146	1.635 (1.150–2.325)	0.006	1.398 (1.033–1.891)	0.030	1.213 (0.818–1.798)	0.336	1.247 (0.857–1.814)	0.249
Socio-demographic characteristics										
Age [65–80 (1) versus 80+]	1.665 (1.089–2.546)	0.019	2.469 (1.435–4.249)	0.001	2.759 (1.746–4.361)	0.001	1.023 (0.619–1.693)	0.928	2.444 (1.319–4.528)	0.005
Sex [male (1) versus female]	1.229 (0.915–1.651)	0.170	1.140 (0.822–1.580)	0.433	0.867 (0.650–1.157)	0.332	1.165 (0.802–1.693)	0.422	1.659 (1.158–2.375)	0.006
N	947		945		951		948		826 ^a	

N, number of respondents; NS SEC, National Statistics socio-economic classification.

All variables recorded and dichotomised as 1/0 with 1 'good scores'. Referent value = 0.

^aSome independent variables had missing items.

successful ageing, particularly if health promotion for older people is incorporated into health policy and practice.

This study was unique in its construction and empirical testing of alternate models of successful ageing. Consistent with research on biomedical models, between 16 and 34% of respondents had successfully aged using maximum/optimum scores for the models [15]. There is a case in an ageing population for relaxing definitions and classifications of successful ageing to include those with some loss of physical, psychological and social functioning. The level to aim for requires further investigation and could change the distribution of those who had successfully aged from a minority to at least half [15].

The strong performance of the lay model was not unexpected, given its multidimensionality, and it was further tested against a multidimensional outcome indicator—QoL [23]. Multidimensional perspectives and interventions ensure the relevance of health promotion to people, and multidimensional, lay-based, outcome measures are needed to evaluate any intervention designed to promote healthy, successful ageing. Clinicians will not be surprised at these findings. Multidisciplinary, multidimensional assessment is a hallmark of the clinical care of older people, but these results support a generalist approach to health maintenance in later life rather than a narrower focus, be it medical, social or psychological. Although the models created here are not without contention, the aim was to stimulate critical debate and ultimately improve understanding and measurement of successful ageing.

Key points

- There is increasing interest in how to age ‘successfully’ and in reaching consensus over its definition.
- Five models of successful ageing were tested on a British cross-sectional population survey; the more multidimensional lay model emerged as the strongest.
- A multidimensional, lay-based model should be used to evaluate the outcomes of health promotion in older populations.

Acknowledgements

We are grateful to the ONS OS staff and ONS Qualitative Research Unit for overseeing the QoL interview and processing the data. Those who carried out the original analysis and collection of the data hold no responsibility for the further analysis and interpretation of them. Material from the ONS OS, made available through ONS, has been used with the permission of the Controller of The Stationery Office. The data set is held on the Data Archive at the University of Essex. The survey was funded by the Economic and Social Research Council [award no. L480254003 (QoL)]. The QoL Questionnaire was also partly funded by grants and held collaboratively by Professors Christina Victor and John Bond (L480254042; Loneliness and Social Isolation, also part of the ESRC Growing Older Research Programme) and by Professor Shah Ebrahim [Medical Research Council

Health Services Research Collaboration (Health and Disability)]. We thank Drs Julie Barber and Salma Ayis for their helpful statistical advice.

Conflicts of interest

None.

References

1. Kane RA. Connecting the dots: public health, health care, health policy, and successful ageing. *Gerontologist* 2005; 45: 274–9.
2. Department of Health. National Service Framework for Older People. London: The Stationery Office, 2001.
3. Department of Health. Our Health, Our Care, Our Say: A New Direction for Community Services. London: The Stationery Office, 2006.
4. Christmas C, Anderson RA. Exercise and older patients. Guidelines for the clinician. *J Am Geriatr Soc* 2000; 48: 318–24.
5. Taylor-Davies S, Smiciklas-Wright H, Warland R *et al*. Responses of older adults to theory-based nutrition newsletters. *J Am Diet Assoc* 2000; 100: 656–64.
6. Fries JF, Fries ST, Parcell CL, Harrington H. Health risk changes with a low-cost individualised health promotion program: effects at up to 30 months. *Am J Health Promot* 1992; 6: 364–71.
7. Mayer JA, Jermanovich A, Wright BL *et al*. Changes in health behaviours of older adults: The San Diego Medicare Preventive Health Project. *Prev Med* 1994; 23: 127–33.
8. Stuck AE, Elkuch P, Dapp U *et al*. Feasibility and yield of a self-administered questionnaire for health risk appraisal in older people in three European countries. *Age Ageing* 2002; 31: 463–7.
9. Harari D, Iliffe S, Kharicha K *et al*. Multi-domain health promotion for older people: randomised controlled study of health risk appraisal in primary care. *British Geriatrics Society Spring Meeting, Gateshead, 6/7 April 2006*.
10. Rowe JW, Kahn RL. *Successful Aging*. New York: Pantheon Books, 1998.
11. Berkman LF, Seeman TE, Albert M *et al*. High, usual and impaired functioning in community-dwelling older men and women: findings from the MacArthur Foundation Network on Successful Ageing. *J Clin Epidemiol* 1993; 40: 1129–40.
12. Tabbarah M, Crimmins EM, Seeman TE. The relationship between cognitive and physical performance: MacArthur studies of successful aging. *J Gerontol A Biol Sci Med Sci* 2002; 57: M228–M235.
13. Schoenfeld DE, Malmrose LC, Blazer DG, Gold DT, Seeman TE. Self-rated health and mortality in the high-functioning elderly—a closer look at healthy individuals: MacArthur field study of successful aging. *J Gerontol* 1994; 49: M109–M115.
14. Reuben DB, Judd-Hamilton L, Harris TB, Seeman TE. The associations between physical activity and inflammatory markers in high-functioning older persons: MacArthur studies of successful aging. *J Am Geriatr Soc* 2003; 51: 1125–30.
15. Strawbridge WJ, Wallhagen MI, Cohen RD. Successful aging and well-being. Self-rated compared with Rowe and Kahn. *Gerontologist* 2002; 42: 727–33.
16. Roos NP, Havens B. Predictors of successful aging: a twelve year study of Manitoba elderly. *Am J Public Health* 1991; 81: 63–8.
17. Vaillant GE, Mukamal K. Successful aging. *Am J Psychiatry* 2001; 158: 839–47.

18. Silverstein M, Parker MG. Leisure activities and quality of life among the oldest old in Sweden. *Res Aging* 2002; 24: 528–47.
19. Leonard WM. Successful aging: an elaboration of social and psychological factors. *Int J Aging Hum Dev* 1981–2; 14: 223–32.
20. Baltes PB, Baltes MM. *Successful Aging: Perspectives from the Behavioral Sciences*. New York: Cambridge University Press, 1990.
21. Kane RL. The contribution of geriatric health services research to successful ageing. *Ann Intern Med* 2003; 139: 460–2.
22. Bowling A, Dieppe P. What is successful ageing and who should define it? *BMJ* 2005; 331: 1548–51.
23. Bowling A. *Ageing Well. Quality of Life in Old Age*. Maidenhead: Open University Press, 2005.
24. Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991; 32: 705–14.
25. Cooper K, Arber S, Fee L, Ginn J. *The Influence of Social Support and Social Capital on Health: A Review and Analysis of British Data*. London: Health Education Authority, 1999.
26. Schwarzer R. *Measurement of Perceived Self-Efficacy: Psychometric Scales for Cross-Cultural Research*. Berlin: Institute for Psychology, Free University of Berlin, 1993.
27. Scheier MF, Carver CS. Optimism, coping and health: assessment and implications of generalised outcome expectancies. *Health Psychol* 1985; 4: 219–47.
28. Lau RR, Hartman KA, Ware JE. Health as a value: methodological and theoretical considerations. *Health Psychol* 1986; 5: 25–43.
29. Goldberg DP, Williams P. *A User's Guide to the General Health Questionnaire*. Windsor: NFER-Nelson, 1988.
30. Townsend P. *Poverty in the United Kingdom*. Harmondsworth: Pelican, 1979.

Received 21 March 2006; accepted in revised form 7 July 2006

Age and Ageing 2006; 35: 614–618 © The Author 2006. Published by Oxford University Press on behalf of the British Geriatrics Society. doi:10.1093/ageing/af1105 All rights reserved. For Permissions, please email: journals.permissions@oxfordjournals.org

Hard to swallow: dysphagia in Parkinson's disease

NICK MILLER¹, EMMA NOBLE¹, DIANA JONES², DAVID BURN³

¹Speech language sciences, George VI Building, University of Newcastle, Newcastle-upon-Tyne NE1 7RU, UK

²School of Health, Community and Education Studies, Northumbria University, Newcastle, UK

³Regional Neurosciences Centre, Newcastle General Hospital, Newcastle, UK

Address correspondence to: N. Miller. Tel: (+44) 191 2 22 56 03; Fax: (+44) 191 2 22 65 18. Email: nicholas.miller@ncl.ac.uk

Abstract

Background: swallowing changes occur from the earliest stages of Parkinson's disease (PD), even in cases asymptomatic for dysphagia. Little empirical evidence exists concerning the individual's own perception of changes, the impact these have on their life and coping strategies to deal with them.

Objective: to establish if and how changes in swallowing impact on the lives of people with PD.

Design: in-depth interviews with qualitative analysis of content.

Setting: community.

Subjects: a total of 23 men and 14 women and their carers.

Methods: participants were purposively sampled to give a mix of men, women, family circumstances, stage and duration of PD and severity of swallowing symptoms. Individuals were interviewed at home. Interviews were transcribed. Emergent themes were identified and fed back to participants for confirmation and clarification.

Results: two broad themes emerged: (i) effects on swallowing of underlying physical changes, with subthemes of oral-pharyngeal-laryngeal changes, manual changes, effects of fatigue and (ii) psychosocial impact, with subthemes of alterations to eating habits, feelings of stigma, need for social adjustment and carers' issues. Coping strategies could aid swallowing problems but often to the detriment of others in the family through altered demands on preparation and organisation. Presence of significant impact was not necessarily associated with abnormal range scores on objective swallowing assessments.

Conclusions: the psychosocial consequences of the physical changes concerned people most. The importance of the early detection of changes for health and quality of life is underlined.

Keywords: *dysphagia, Parkinson's disease, impact, quality of life, elderly*