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Psychological disposition and self-reported health among the 'oldest-old' in China

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ABSTRACT
This study contributes to our understanding of the ageing process by investigating whether particular psychological dispositions among older people are associated with healthy ageing. The study's objective is to further our knowledge about what constitutes 'health' for the 'oldest-old' (people aged 80 or more years) in China. It is recognised that apart from the absence of disease, good health is a subjective experience, and it is posited that self-reported health is associated with psychological disposition, or in other words, that an individual's personal attitudes, motivations, and beliefs condition their perception of health and illness. Using data from China's *Longitudinal Healthy Longevity Survey* (1998 and 2000 waves), we examine whether psychological disposition in 1998 had an independent effect on self-reported health in 2000. The study is based on a stratified random sample of 4,366 people aged 80 or more years. After introducing controls for health status and socio-demographic variables, the multivariate, longitudinal results demonstrate that a robust psychological disposition was indeed associated with good short-term, self-reported health. The findings also illustrate that the effect differed by age, for the relationship was significant for octogenarians and nonagenarians but insignificant for centenarians. Data limitations prevented an empirical investigation of the processes that underlie the relationship between psychological disposition and self-reported health.

KEY WORDS – Psychological wellbeing, self-reported health, oldest-old, octogenarians, nonagenarians, centenarians.

Introduction

Population ageing is a well-established and worldwide phenomenon with pervasive social and economic ramifications (United Nations Organisation 2002). In 2000, the global population aged 60 years and older totalled 205 million persons, and it is expected to reach 1.2 billion by 2025. Within the older population, those aged 80 or more years are increasing at a historically unprecedented rate; the 'oldest-old' numbered 70 million people in 2000 and are expected to be 153 million people by 2025. Rapid

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population ageing is most prevalent in developing world regions, which China exemplifies. According to United Nations (UN) figures, the Chinese aged 80 or more years numbered 1.6 million persons in 1950, 5.1 million in 1975, and 11.5 million in 2000; and UN projections indicate a total of 30.6 million persons by 2025, when they will constitute one-fifth of the world total. The fast transition towards a 'grey' age structure raises sobering issues for Chinese policy-makers, with one of the greatest challenges being to provide sufficient social and economic support for the oldest-old. In essence, low fertility and rapid population ageing translates into a diminishing support ratio, *i.e.* the average number of persons aged 15–64 years for each person aged 65 or more years. In China, the ratio was 13.8 in 1950, 12.8 in 1975 and 10 in 2000, and it is projected to be 5.2 in 2025. China, like most developing countries, will continue to depend on non-medical and preventive strategies for promoting the health of older people, because deficient public resources and budgetary constraints restrict *per capita* medical expenditure and access to formal health and social care services.

The population's health status and healthcare provision are a key concern in countries experiencing population ageing. In general, morbidity and functional limitations increase with age among older people, and the consumption of healthcare resources is very high among the oldest-old (Manton and Soldo 1992; Smith, Gerstorf and Li 2004; Zeng and Vaupel 2002). The widespread view that frailty and disability characterise old age is simplistic, however, and 'healthy ageing' or a healthy old age can be promoted in many ways (Suzman *et al.* 1992). While there is a high prevalence of disease and disorder at the oldest ages, it is inappropriate to define 'good health' simply as the absence of disease (Smith, Gerstorf and Li 2004), but rather we need to consider the components and factors of self-assessed health. How people in advanced old age confront and accommodate non-lethal disorders influences not only their perceived health but also their overall life satisfaction.

The literature suggests that an individual's psychological disposition accounts for much of the variation in how she or he experiences disease (Gecas 1989; Kobasa, Maddi and Kahn 1982). This study's objective is to further our knowledge about what constitutes 'health' for the oldest-old, and explicitly recognises that, apart from the absence of disease, good health is a subjective experience. This study uses data from the *Chinese Longitudinal Healthy Longevity Survey* (CLHLS) to analyse whether psychological disposition affects self-reported health among the oldest-old. The CLHLS offers an in-depth perspective into health patterns among the oldest-old, and has an exceptionally large sample.

In the less developed regions of the world, improved living standards and medical advances have raised life expectancies at birth by 56 per cent

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over the last five decades (United Nations Organisation 2002). But there are some concerns about whether life satisfaction – a subjective measure of quality of life and a cornerstone of 'successful ageing' – parallels these remarkable gains in longevity. A Taiwan study indicated that life satisfaction declines after 65 years of age, largely because of age-related effects, such as decreasing income, deteriorating health and changes in living arrangements (Chen 2001). Self-reported health, our dependent variable, is an integral component of life satisfaction in old age (Mannell and Dupuis 1996), and is a sensitive indicator of whether living better accompanies a longer life span. The following sections provide a summary of the analytical importance of self-reported health (SRH) and a definition of 'successful ageing'. We then expound the theoretical proposition that possessing a robust psychological disposition is an important factor in healthy ageing.

Self-reported health

A substantial literature details the meaning of self-reported or self-rated health, which is increasingly recognised as a sensitive and reliable indicator of current and future health status, including morbidity, disability and mortality. An individual's SRH is a short but holistic assessment of their overall health status. It is influenced by both objective and subjective assessments of personal health, and by a person's medical history, current physical symptoms and body sensations, health beliefs and behaviours, and mental and emotional wellbeing (Kaplan and Baron-Epel 2002). Among the valuable properties of SRH is its capacity to predict short- and long-term survival, the onset of functional limitations, and present and future health-care demands (Benyamini, Leventhal and Leventhal 2003; Idler, Hudson and Leventhal 1999). As a subjective assessment, SRH is a general indicator of 'successful ageing', and partially reflects an individual's ability to adapt effectively to their changing health status and life circumstances (Smith, Gerstorf and Li 2004). SRH is associated with psychological disposition, because an individual's personal attitudes, motivations and beliefs guide their perceptions of illness and disability. In other words, individual differences in SRH may be an independent effect of psychological disposition. For example, as psychological disposition represents an individual's ability and willingness to adapt to change (Kou and Tsai 1986), the subjective experience of a disease or illness event can range from being a minor annoyance to a highly disruptive ordeal (Smith, Gerstorf and Li 2004).

Successful ageing

'Successful ageing' implies maximising the life span while simultaneously reducing the number of health disorders and compressing the duration of

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ill health in old age (Baltes and Baltes 1990). A strictly medical approach to healthy ageing is expensive and inefficient, however, because it focuses overly on treating health disorders rather than supporting the preventive strategies that promote good health (Fries 1990). The following analysis adopts the perspective that 'healthy ageing' is a dynamic process that requires efficacious adaptations to health changes in old age (Baltes and Baltes 1990). We prefer this perspective because 'healthy ageing' is not simply a matter of being free from disease or disability in old age, for the relatively high prevalence of chronic conditions and functional limitations at advanced ages implies generally poor objective health status among the oldest-old, while SRH is robust among people in advanced old age. Among Chinese octogenarians, for instance, 60 per cent reported 'good health' (the best rating) another 31 per cent reported 'moderate health', and only eight per cent reported 'poor health' (Zeng and Vaupel 2002). Self-rated health is on average somewhat lower among nonagenarians and centenarians, but the percentage reporting poor health is similar to that reported by octogenarians.

Von Faber and colleagues (2001) indicated that many of the oldest people are satisfied with their lives despite having functional limitations. In effect, this *disability paradox* describes the individual's ability to adjust to and accept changing circumstances. Although being healthy and functionally independent are important criteria of 'successful ageing', the standard for health and functional independence varies by age and between individuals. For example, the optimal standard for health and independence for centenarians is presumably lower than for octogenarians, because personal health expectations and beliefs about good health change with age (Knight and Ricciardelli 2003), which explains why centenarians may report similar SRH to octogenarians with fewer health problems. Rather than characterising health among the oldest-old by the absence or presence of disease, then, this study adopts the multifaceted definition, based on assessments of health status relative to age and cohort norms, developed by Smith *et al.* (2002). According to this definition, SRH may constitute the single most effective instrument for gauging overall health among the oldest people because it captures what biomedical assessments cannot: how individuals interpret and cope with disease.

Psychological resources and health

Zeng and Vaupel (2002) speculated that psychological wellbeing might be the 'secret' of Chinese longevity, by protecting even individuals with less than optimal functional capacity, and examined the benefits of positive

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thinking for healthy ageing. Antonovsky's (1979, 1987) innovative concept, *salutogenesis*, is instructive for understanding the association between positive thinking and healthy ageing. It refers to 'health making' processes, and is the opposite of pathogenesis. The salutogenic hypothesis asserts that believing that 'life is comprehensible, manageable, and meaningful' – which Antonovsky terms a *sense of coherence* – is a benefit to health because it provides individuals with the psychological and emotional fortitude with which to confront and manage negative life experiences. An individual's sense of coherence is an important dimension of their personality structure, because it influences how they interpret their internal and external environments, and represents a 'dynamic feeling of confidence' that they have control over adverse situations. A strong sense of coherence produces the salutogenic effect, because it helps the individual mobilise resources to manage difficult circumstances, whereas the individual with a weak sense of coherence feels helpless under similar circumstances.

Many studies have shown that differences in psychological resources offer a plausible explanation of individual variations in health outcomes (*e.g.* Gecas 1989; Kobasa, Maddi and Kahn 1982; Thoits 1995). Having a firm sense of control is associated with numerous positive health practices and outcomes, including proactive help-seeking behaviour, preventive health-care, a lower overall incidence of illness, and high SRH (Schieman and Turner 1998). A positive attitude appears to be a particularly important salutogenic resource for older people, because a sense of control is very helpful when facing the biological changes of later life (Rodin 1986). For example, a positive sense of control is a sign of an individual's confidence in their ability to handle or accept adverse situations, and this may counterbalance the negative effect that a functional limitation has on SRH. A sense of control, moreover, is associated with an orientation toward good health behaviour, and this attitude, as expressed in a balanced diet, getting regular exercise and not smoking, may prevent or postpone the onset of age-related health problems (Grembowski *et al.* 1993).

A recent study by Smith, Gerstorf and Li (2004) confirmed that psychological resources predicted mortality among the oldest-old in China, and demonstrated that these resources generally shaped individual responses to social losses (*e.g.* widowhood), health problems and functional limitations. The authors found that psychological disposition had two dimensions: a positive or salutogenic element defined by personality qualities such as optimism, conscientiousness, control and happiness; and a negative or pathogenic component defined by problems such as neuroticism, loneliness and low self-esteem. The negative dimension contributes

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to passivity, avoidance, denial and helplessness, which foster an inability to manage changing life circumstances (Kobasa, Maddi and Kahn 1982). Smith, Gerstorf and Li (2004) found that a robust psychological disposition is characterised by the specified salutogenic resources that promote coping and that it minimises the pathogenic traits.

Hypotheses

The analysis is grounded in the notion that psychological disposition is a major indicator of an individual's health experience. It examines five hypotheses.

1. That psychological disposition will predict self-rated health (SRH) among the oldest-old, and specifically that a more robust disposition at Time 1 (1998) will increase SRH at Time 2 (2000).
2. That the correlation between psychological disposition and SRH could be accounted for by intervening variables or is spurious, *e.g.* differences in physical health status at Time 1 could explain differences in SRH at Time 2.
3. That differences in health behaviour may mediate the relationship between psychological disposition and SRH.
4. That gender may mediate the relationship between psychological disposition and SRH.
5. That an age effect may modify the relationship between psychological disposition and SRH.

Hypothesis 2 was formulated because a previous study found that disease history lowers SRH by reminding people of the *potential* for serious illness (Benyamini, Leventhal and Leventhal 1999). To test the hypothesis, controls for health status were entered into the model. Hypothesis 3 reflects the finding of a recent study that there is a strong correlation between health behaviours and SRH among the oldest-old in China, and to test this proposition, further controls were introduced for health behaviours at Time 1 (Li, Zhang and Wang 2004). Hypothesis 4 reflects the fact that among the oldest-old, women heavily outnumber men and have more health problems (Zeng and Vaupel 2002). To examine Hypothesis 5, that the effect of psychological disposition differs by age group, an analysis disaggregated the oldest-old into octogenarians, nonagenarians and centenarians. The analyses also introduced controls for socio-demographic variables, including education, age, marital status, living arrangements, children and siblings, ethnic status and rural residence, as all have well-established effects on health.

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Data and methods

The empirical analysis uses data from the 1998 baseline and 2000 follow-up surveys of the *Chinese Longitudinal Healthy Longevity Survey* (CLHLS).[1] The CLHLS was developed specifically to glean information about morbidity risks, mortality risks and healthy ageing among the 'oldest-old' (those aged 80 or more years). The survey covered a random selection of one-half of the counties and cities ($N = 631$) in 22 provinces of China, using a multi-stage, clustered, sampling design, and it represented about 85 per cent of the Chinese population. The baseline survey tried to interview all centenarians in the included areas. For each centenarian respondent, an octogenarian and a nonagenarian living in the same or in a neighbouring area, with pre-determined age and sex characteristics, were interviewed. The survey aimed for equal numbers of men and women octogenarians and also for male and female nonagenarians, so therefore over-sampled extremely old individuals and men.

The questionnaire included various items on formal and informal support, physical health status, health-risk behaviours, activities of daily living, self-reported health, mental health, health attitudes, and medical care services, and the questions minimised those that people in advanced old age could not reliably answer because of limited education, visual or auditory impairments, or frail health (Gu 2005). The survey also included supplementary demographic, socio-economic and environmental questions. A doctor, nurse or medical student gave each respondent a basic medical examination. To reduce non-response among those with serious functional or cognitive impairments, and to prevent a bias towards healthy individuals, data were collected through proxies (close relatives or caregivers).[2] In both the baseline and 2000 waves, around 38 per cent of octogenarians, 60 per cent of nonagenarians, and 80 per cent of centenarians were surveyed with both independent and proxy responses. Only a very small percentage (around 1 % overall) of the sample were surveyed entirely through proxy interview (Gu 2005).

The overall response rate for the baseline wave was 88 per cent, but this figure increased to 98 per cent when the deceased, recent migrants, and individuals too infirm to participate were excluded. The achieved baseline sample in 1998 (Time 1) was 9,093 respondents. A summary of their socio-demographic characteristics is presented in Table 1. Sixty per cent of the respondents were resident in rural areas, and the share was positively related to age. Other very marked age-cohort effects characterised the level of schooling (54 per cent of octogenarians, 66 per cent of nonagenarians, and 84 per cent of centenarians reported having no formal education) and the respondents' reliance on children or grandchildren as

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TABLE 1. *Principal socio-demographic characteristics of the sample*

Characteristic	Age group (years)			
	80–89	90–99	100–122	77–122
	Percentages			
Women	49.4	56.9	80.1	60.0
Widowed	66.4	86.1	95.3	80.5
Living with children or grandchildren	64.6	79.3	86.0	74.8
No formal education	54.7	68.1	83.5	66.2
Children or grandchildren the primary source of financial support	60.5	77.8	85.2	72.4
Rural residents	55.0	63.2	71.8	61.9
Sample sizes	*Number*			
Men	1,787	1,298	481	3,638
Women	1,741	1,715	1,937	5,455
All	3,528	3,013	2,418	9,093

Note: Weighted mean percentages, unweighted *N*.

the primary source of financial support. The follow-up survey in 2000 (Time 2) included 4,831 respondents from the original sample but 3,368 respondents had died since 1998. Information on the ages and causes of death among the deceased were collected. In addition, 894 of the original respondents (9.8%) were lost to the 2000 follow-up. Hence, excluding the deceased respondents, the attrition rate was 15.6 per cent. After removing cases where key variables were missing, the sample for the analyses reported in this paper contained 4,366 individuals.

Measures

The dependent self-reported health (SRH) measure was derived from the responses to a five-level ordinal variable, with a range from 'excellent' (5) to 'poor' (1). The main or base independent variable was a measure of psychological disposition compiled from the responses to the following question sequence: 'People have their own disposition (personality). Here are some statements of people's description of their disposition. How similar are you to these people?' Seven psychological disposition statements were given: 'I always look on the bright side of things'; 'I like to keep my belongings neat and clean'; 'I often feel fearful or anxious'; 'I often feel lonely and isolated'; 'I can make my own decisions concerning my personal affairs'; 'The older I get, the more useless I feel'; and 'I am as happy now as when I was younger'. There were five possible responses to each statement, including 'very similar', 'similar', 'so-so', 'not similar', and 'not similar at all'. The overall index was derived from the aggregate score on these items, and so had a possible range of

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TABLE 2. *Definitions and codes of the control variables, and the comparative characteristics of the sample and of non-respondents at Time 2 (2000)*

Variable	Variable definition and codes	Time 2 sample	Non-respondents
Psychological disposition	Seven item scale[1]	25.48*	25.06
Health status			
Chronic conditions			
Serious	D (1 = yes, 0 = no)	11.1 %*	15.9 %
Any	D (1 = yes, 0 = no)	40.8 %*	40.3 %
None	Reference category	48.1 %*	43.9 %
ADLs[2]	Number (maximum 6)	0.28*	0.77
Health behaviour			
Vegetable consumption	Four item scale[3]	3.60*	3.51
Fruit consumption	Four item scale[3]	2.04*	2.14
Exercise	D (1 = yes, 0 = no)[4]	88.8 %*	84.2 %
Socio-demographic			
Age	Age in years	83.6*	85.2
Female	D (1 = female, 0 = male)	63.8 %*	60.6 %
Education	Completed years of schooling	1.91*	2.52
Children	Number of living children	2.67*	2.50
Siblings	Number of living siblings	0.86*	0.68
Minority	D (1 = ethnic minority, 0 = Han)	8.0 %	7.1 %
Marital status:			
Widowed	D (1 = yes, 0 = no)	69.5 %*	73.3 %
Separated/divorced/n-md[5]	D (1 = yes, 0 = no)	3.8 %*	4.1 %
Married	Reference category	26.7 %*	22.6 %
Living arrangements			
Spouse only	D (1 = yes, 0 = no)	13.1 %*	10.4 %
Children/great/grandchildren	D (1 = yes, 0 = no)	64.7 %*	67.7 %
Siblings/parents/others	D (1 = yes, 0 = no)	2.3 %*	1.9 %
Nursing home	D (1 = yes, 0 = no)	6.9 %*	6.6 %
Living alone	Reference category	13.0 %*	13.4 %
Rural residence	D (1 = yes, 0 = no)	64.4 %*	57.0 %
Sample sizes		4,366	4,727

Notes: Weighted mean percentages, unweighted *N*. * Significantly different between the two samples at $p < 0.05$. D Dummy variable. 1. Cronbach's alpha 0.63 (see text). 2. (Limitations in) activities of daily living. 3. Frequency of consumption ('1' rarely/never to … 4 'almost everyday'). 4. 1 = regular exercise or physical labour. 5. Never married.

'8' to '35' (Cronbach's alpha = 0.63). These questions measured psychological disposition by tapping levels of optimism, conscientiousness, personal control, happiness, neuroticism, loneliness and self-esteem (Smith, Gerstorf and Li 2004). Table 2 shows the variable definitions and descriptive statistics for all explanatory variables, with comparative statistics for those who died or were lost in the follow-up.

Physical health status was measured with two variables. A three-category variable indicated: the presence of a serious (life-threatening) chronic disease (*e.g.* cancers, heart disease, stroke); or the presence of

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any chronic disease (hypertension, diabetes, stroke, various respiratory problems, various vision problems, cancers, ulcers, Parkinson's disease, and others not specified); or the absence of chronic disease. Over one-half (52 %) of the target population reported a chronic disease, and 11 per cent reported a serious chronic condition. A six-point ordinal scale was used to measure the activities of daily living (ADL), which covered bathing, dressing, toileting, transferring, continence and feeding. The prevalence of ADL limitations was generally low and the average number of impairments was less than one per person. Health behaviour was measured, first by the frequency of vegetable and fruit consumption with a four-level ordinal scale, from 'rare/never' to 'almost everyday', and secondly, with a dummy variable for 'regular exercise or performing physical labour'.

Gender was indicated by a dichotomy, educational attainment as measured by years of completed schooling, and age was measured in years (the mean age was 84 years). A three-level categorical variable measured marital status; the 'separated' and 'divorced' were combined with 'never-married' respondents because these statuses are uncommon among the present cohort of the oldest-old. The living arrangement was measured with a five-level categorical variable: with a spouse only (13 %); with children and/or grandchildren (65 %); with siblings, parents and/or others (2 %); in a nursing home (7 %); and living alone (13 %). Continuous variables indicated the numbers of living children (mean 2.7) and of living siblings (mean $<$ 1.0). Dummy variables indicated membership of a minority ethnic group (8 %) and rural residence (64 %).

There were some notable differences at Time 1 between the survivors (or recaptured respondents) and the deceased at Time 2 (Table 2). At Time 1, the deceased were older and had significantly lower psychological disposition, significantly more serious chronic conditions and ADL limitations, and less healthy behaviours. Not surprisingly, therefore, a multivariate logistic analysis confirmed that Time 1 psychological disposition, self-reported health, serious chronic diseases, and some health behaviours predicted mortality by Time 2 (results not shown). It was reasoned that the decision to exclude the deceased from the analysis did not bias the results because it was confirmed that psychological disposition predicted short-term mortality, for this is consistent with its prediction of self-reported health.

The statistical model

The analysis used random effects models to adjust for the cluster effects in the survey and to obtain valid estimates of parameters and standard

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errors (Laird and Ware 1982). A simplified random effects model was specified:

$$y_{ij} = \mu_N + \sum_{k=1}^{m} x_{ijk}\beta_k + \alpha_i + \varepsilon_{ij}, \quad (1)$$

where: $i = 1, 2, \ldots c$ and $j = 1, 2, \ldots n_i$

y_{ij} is the observed value of the dependent variable for the jth respondent in the ith county/city,
μ_N is the intercept (the overall mean of the response measure),
x_{ijk} represents the kth explanatory variable (psychological disposition and covariates in Table 2),
β_k is the corresponding unknown fixed-effects parameter,
$\alpha_i \sim$ iid N(0, δ^2_N) and $\varepsilon_{ij} \sim$ iid N(0, δ^2_ε).

The first two terms on the right-side of Equation 1 comprise the fixed effects part of the model, whereas $(\alpha_i + \varepsilon_{ij})$ are random effects terms. The variance components δ^2_N and δ^2_ε measure the variations of the response measure for, respectively, counties/cities of residence and respondents. Because the respondents are nested within a city or county, Equation 1 is also a two-level hierarchical linear model (Bryk and Raudenbush 1992).[3]

Results

Table 3 presents the random effects models of psychological disposition at Time 1 (T1) on self-reported health (SRH) at Time 2 (T2). All explanatory variables are T1 variables and all models include SRH at T1 to control for the floor effect. The analysis began with a simple model (Model 1), which includes only psychological disposition at T1. Confirming Hypothesis 1, the results indicate that psychological disposition is associated with SRH at T2. Model 2 tested Hypothesis 2, that physical health differences at T1 confound the effect of psychological disposition on SRH at T2. The results indicate that the effect of psychological disposition at T1 was independent of physical health status, but also that poor health status significantly lowers SRH, even though health status did not change the magnitude of the psychological disposition effect ($p > 0.05$).

Model 3 tested Hypothesis 3, that the connection between psychological disposition at T1 and SRH at T2 was confounded by differences in health behaviour. The results, however, found no support for this hypothesis, even though good health behaviours did indeed improve SRH. This result provided additional support for Hypothesis 1. Model 4 tested Hypothesis 4, that gender accounts for the connection between psychological

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TABLE 3. *Random effects models of the effects of psychological disposition on self-reported health: China 1998–2000*

Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5
Psychological disposition	0.027***	0.025***	0.024***	0.026***	0.022***
Self-reported health at T1	0.197***	0.168***	0.190***	0.195***	0.158***
Health status					
Chronic condition:					
Serious	–	−0.227***	–	–	−0.220***
Any	–	−0.126	–	–	−0.128***
ADLs	–	−0.030*	–	–	−0.035*
Health behaviour					
Vegetable consumption	–	–	0.042*	–	0.035*
Fruit consumption	–	–	0.040*	–	0.043**
Exercise	–	–	0.088*	–	0.056
Socio-demographic					
Age	–	–	–	–	0.097*
Age-squared	–	–	–	–	−0.001*
Female	–	–	–	−0.057*	−0.025
Education	–	–	–	–	0.005
Children	–	–	–	–	0.020**
Siblings	–	–	–	–	0.014
Minority	–	–	–	–	−0.004
Marital status:					
Widowed	–	–	–	–	−0.009
Separated/divorced/n-md	–	–	–	–	−0.045
Rural residence	–	–	–	–	0.039
Living arrangements					
With spouse only	–	–	–	–	0.072
With children/great/grandch'n	–	–	–	–	0.147**
With siblings/parents/others	–	–	–	–	0.128
Nursing home	–	–	–	–	0.030
Model statistics					
Intercept	2.126***	2.368***	1.918***	2.190***	−2.509
Covariance parameter $\hat{\sigma}^2_N$	0.051***	0.051***	0.053***	0.051***	0.051***
Covariance parameter $\hat{\sigma}^2_e$	0.766***	0.759***	0.762***	0.766***	0.751***
−2 REML log likelihood	10526	10503	10526	10527	10550

Note: N=4,366. *Significance levels:* * $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed tests).

disposition at T1 and SRH at T2, but again the results provided no support. Although women had lower SRH than men, the difference did not significantly alter the effect of psychological disposition on SRH. Model 5 combined the explanatory variables from the previous models with socio-demographic controls, and provided overall confirmation that psychological disposition at T1 had an independent effect on SRH at T2. In comparison with the previous models, the psychological disposition effect was reduced slightly in Model 5, but the decline was statistically insignificant ($p>0.05$).

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TABLE 4. *Random effects models of psychological disposition on self-reported health by age group, China, 1998–2000*

Independent variable	Age group (years)		
	80–89	90–99	100+
Psychological disposition	0.021***	0.028**	0.007
Self-reported health at T1	0.171***	0.163***	0.091†
Health status			
Chronic condition:			
Serious	−0.156*	−0.380***	−0.132
Any	−0.152***	−0.067	−0.154†
ADLs	−0.061*	−0.011	−0.023
Health behaviour			
Vegetable consumption	0.013	0.025	0.099*
Fruit consumption	0.035†	0.050†	0.067
Exercise	0.094	−0.025	0.030
Socio-demographic			
Age	0.008	−0.010	−0.015
Education	0.012*	−0.010	−0.015
Female	0.012	−0.087	−0.181†
Children	0.024**	0.031*	−0.015
Siblings	0.015	0.012	−0.015
Minority	0.026	−0.141	0.010
Rural residence	0.081†	−0.050	0.089
Marital status:			
Widowed	−0.027	0.043	−0.016
Separated/divorced/n-md	−0.097	0.087	−0.125
Living arrangements			
Spouse only	0.088	−0.032	0.138
Children/great/grandchildren	0.146*	0.235**	−0.030
Siblings/parents/others	0.174	0.177	−0.189
Nursing home	0.059	0.031	−0.157
Model statistics			
Intercept	1.302*	2.909**	4.311**
Covariance parameter $\hat{\sigma}^2_N$	0.012***	0.068***	0.125***
Covariance parameter $\hat{\sigma}^2_e$	0.792***	0.695***	0.715***
−2 REML log likelihood	6044	2817	1806
Sample sizes	2,376	1,193	797

Significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed tests). † $p<0.05$ (one-tailed test).

Overall it was found that poor health status, health behaviour and being female all lowered SRH, and that both variance components (δ^2_N and δ^2_ε) were highly significant in all models, indicating that factors associated with the county or city of residences, and those specific to individuals, were significant components of the variation in SRH at T2. Table 4 presents the random effects models of psychological disposition on SRH by selected age groups. The results confirm Hypothesis 5, that the effect of psychological disposition varied by age group. To be more specific, the findings show that the effect weakened with increasing age,

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as the relationship between psychological disposition and SRH was insignificant for centenarians. Again, the effects of the other covariates were generally consistent with expectations, and the variance components were significant in all models.

Discussion and conclusions

This study has examined the relationship between psychological disposition and self-reported health among a large representative sample of the 'oldest-old' in China. Previous research indicated that psychological resources constituted a major health variable, and this study has confirmed that psychological disposition predicts self-reported health in this population. The most likely explanation is that a robust psychological disposition raises health status through positive thinking and satisfaction with the individual's coping ability; these are crucial personal assets for accepting and adapting to life changes, and for avoiding behaviours that trigger or exacerbate disease and functional limitations (Grembowski *et al.* 1993; Kobasa, Maddi and Kahn 1982; Smith, Gerstorf and Li 2004). A robust disposition also implies the minimisation of dysfunctional thoughts and behaviour (*e.g.* neuroticism, low self-esteem, helplessness) that suppress coping ability or induce illness.

The study's findings show that psychological disposition has an independent effect on self-reported health among people in advanced old age in China. Drawing from previous research evidence, the study hypothesised that health status, health behaviours and gender might account for this relationship, *i.e.* that there was no independent effect. The controlled results, however, show this not to be the case and that the relationship is not spurious. The insignificant change in the psychological disposition effect between the baseline and the full models found no support for the hypothesis that health status, health behaviour, gender and major socio-demographic variables explain away the connection between disposition and SRH. In addition, introducing other controls for poor health status and other confounding factors at Time 1 did not remove the relationship. Nonetheless, the findings are no more than suggestive and need to be interpreted with caution – there could be a reciprocal effect between psychological disposition and SHR that was not controlled in the analyses.

The findings also indicate that the relationship was not uniform across the constituent age groups of the oldest-old. When the models were calibrated separately by decennial age groups, it was found that psychological disposition at T1 predicted SRH at T2 among octogenarians

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and nonagenarians, but that the effect was insignificant among centenarians. Prior research showed that centenarians coped with their (on average) many functional limitations through having ample social support (Dello Buono, Urciuoli and De Leo 1998); this factor may override the influence of psychological resources. Moreover, having far outlasted average life expectancy, it may be that psychological state or disposition among centenarians is more independent of health and functional status than at earlier ages, even though having a robust disposition likely helped many of them achieve their advanced age.

Rodin (1986) remarked that conventional health-care and social service systems tend to ignore or oppose patient-directed health management. This is a deeply misguided principle for service delivery to older people, because to apply strictly biomedical and clinical criteria to their health-care is inefficient and expensive (Fries 1990). Healthy ageing is dependent upon patient-directed strategies that aim to reduce the amount and duration of morbidity in old age. Such strategies are crucial for promoting longer, active life expectancy, and for minimising the impact of rapid population ageing on health-care demand, utilisation and expenditure. This study contributes to the literature by providing further evidence that among older people, the non-medical resource of psychological disposition is an important factor in self-reported health. It is recognised, however, that insufficient data were available to explain the relationship between psychological disposition and self-reported health. Are individuals with robust dispositions particularly good at coping with and accepting changing life circumstances? Further research is required to answer this question.

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NOTES

1 The CLHLS was funded primarily by the United States *National Institutes of Health* and conducted by the *Centre for Healthy Aging and Family Studies* at Beijing University and the *China National Research Centre on Aging* in 1998. There was another follow-up wave of data collection in 2002. For detailed information on the sample design, see Zeng *et al.* (2001). Following best international practice (*e.g.* Folstein, Folsein and McHugh 1975;

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Katz *et al.* 1963), the CLHLS was pilot-tested and carefully adapted to the Chinese socio-cultural and linguistic contexts.

2 Further information about the necessity and validity of proxy reporting in the CLHLS is available in Gu (2005).

3 The parameters and variance components in the random effects models were all estimated using the 'restricted maximum likelihood' (REML) method available in the SAS mixed-models procedure (Littell *et al.* 1996).

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