Published in final edited form as:
J Gerontol B Psychol Sci Soc Sci. 2008 November ; 63(6): P321–P327.

Is Positive Well-Being Protective of Mobility Limitations Among Older Adults?

Amy Love Collins[1], **Noreen Goldmán**[2], and **German Rodríguez**[3]

Amy Love Collins: alc@princeton.edu; Noreen Goldmán: ngoldman@princeton.edu; German Rodríguez: grodri@princeton.edu

[1]Research Associate, Office of Population Research, Princeton University, Princeton, New Jersey, 08544. Telephone: 609.258.1394

[2]Professor of Demography and Public Affairs, Office of Population Research, Princeton University, Princeton, New Jersey, 08544. Telephone: 609.258.5724

[3]Senior Research Demographer, Office of Population Research, Princeton University, Princeton, New Jersey, 08544. Telephone: 609.258.4872

Abstract

This study examined associations among life satisfaction, perceptions of future happiness and mobility limitations in a population based sample of 3,363 older persons from the Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan. Zero-inflated Poisson regression was used to determine if current life satisfaction and perceptions of future happiness were independently related to the number of mobility limitations that developed during an approximately eight-year period. We adjusted for sociodemographic characteristics, health status, social involvement and depressive symptoms at baseline. Life satisfaction and perceptions of future happiness were both associated with the development of fewer mobility limitations during follow-up, but only for those participants who had no mobility limitations at baseline. The results suggest a protective relationship between psychological well-being and physical decline in later life.

Introduction

Researchers are increasingly attentive to the role that positive mental health plays in physical health outcomes. The term positive mental well-being is often used to reflect frequent experiences of positive affect and the presence of self-esteem, mastery, life satisfaction and optimism. Positive mental well-being is not the absence of negative well-being, and has distinct physiological and neurobiological correlates (Cacioppo & Berntson, 1999; Cacioppo, Gardner & Berntson, 1999; Hamer, 1996; Ryff et al., 2006). Thus, the causes and consequences of positive well-being cannot necessarily be inferred from research on negative well-being (Ryff et al., 2006).

Positive well-being is recognized as a protective factor against poor health in young and older populations (Fredrickson & Levenson, 1998; Fredrickson, 2001; Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004; Lyyra Tormakangas, Read, Rantanen & Berg, 2006; Maier & Smith, 1999; Ostir, Markides, Black, & Goodwin, 2000; Ostir, Markides, Peek, & Goodwin, 2001; Ostir et al., 2002; Ostir, Berges, Markides, & Ottenbacher, 2006; Pitkala, Laakkonen, Strandberg & Tilvis, 2004; Pressman & Cohen, 2005; Salovey, Rothman,

Address correspondence to: Amy Love Collins, Office of Population Research, Princeton University, Princeton, New Jersey, 08544. alc@princeton.edu.

Detweiler & Steward, 2000; Scheier & Carver, 1992). In the present study, we examine the health consequences of positive well-being for a middle-aged and elderly population. Specifically, we investigate the relationship between two facets of positive well-being – current life satisfaction and perceptions of future happiness – and functional status over an eight-year follow-up period in Taiwan.

Appraisals of life satisfaction have been shown to be related to functional status in older Western populations (Pressman & Cohen, 2005). Life satisfaction typically refers to quality of life judgments that are based on individuals' own criteria for success and happiness (Pavot, Diener, Colvin, & Sandvik, 1991; Shin & Johnson, 1978). Life satisfaction measures vary in their composition, but generally, they tap trait levels of affect as well as cognitive assessments of the extent to which a person's life matches his or her perceptions (Okun & Stock, 1987). Two cross-sectional studies found that lower life satisfaction was associated with an increased likelihood of physical frailty and residence in a nursing home (Finlayson, 2002; Strawbridge, Shema, Balfour, Higby & Kaplan, 1998). Other studies of younger and middle-aged populations demonstrated a relationship between life satisfaction and fatal injury and work disability (Koivumaa-Honkanen et al. 2000; 2002; 2004).

Evidence suggests that affective judgments about the future also contribute to better functional status. In a study of recovery after coronary artery bypass surgery, optimists were faster to accomplish mobility tasks (e.g., sitting in bed, walking around the room), were rated by staff as demonstrating a better recovery six to eight days and six months after surgery, and showed better functional status up to five years later (Scheier & Carver, 1992; Scheier et al., 1989). A cross-sectional study of community-dwelling older adults with knee pain found that pessimism was significantly related to poorer performance on four daily activities (walking, lifting an object, climbing stairs, and getting into and out of a car) while optimism was related to performance only on the walking task. Another cross-sectional study demonstrated that pessimism was significantly related to increased mobility limitations in a sample of older women (Umstattd, McAuley, Motl & Rosengren, 2007). These studies suggest that perceptions of positive outcomes in the future may benefit physical functioning in both clinical and non-clinical populations.

There are several lines of research demonstrating the pathways through which positive well-being may be beneficial to health. For example, happier people tend to use active, problem-focused coping and are more accepting of stressful life events (Salovey et al., 2000). Similarly, life satisfaction may reveal how well one has adapted or learned to cope with one's health status and environment (Folkman, 1997; Fredrickson, 2001). Higher life satisfaction can also be an indication of how easily an individual disengages from unattainable goals and re-engages in new, more attainable goals (Rasmussen, Wrosch, Scheier & Carver, 2006). This strategy would be vital to coping with health conditions, such as restricted mobility or chronic disease, which may render valued life goals impossible.

Fredrickson (2001) and Salovey et al. (2000) have independently suggested that positive emotions and cognitive styles contribute to the building of resources that promote resilience. Positive feelings can broaden individuals' coping abilities by facilitating the gain of social, intellectual, and physical resources (Fredrickson, 2001). For example, positive affect increases engagement in social networks and activities, which have been shown to be negatively associated with illness and mortality (Pressman & Cohen, 2005). Positive affect is associated with confidence in and adherence to health practices (Bardwell, Berry, Ancoli-Israel, & Dimsdale, 1999; Cohen, Doyle, Turner, Alper, & Skoner, 2003; Luoto, Prattala, Uutela, & Puska, 1998; Ryff, Singer, & Dienberg Love, 2004; Salovey, Rothman, Detweiler, & Steward, 2000; Scheier & Carver, 1992), particularly focusing on and planning for future health outcomes (Salovey et al., 2000).

Another pathway through which frequent positive experiences may benefit health is based on research demonstrating that positive emotions are linked to physiologic reactions. Positive affect is associated with physiological functioning, including autonomic nervous system activation, hypothalamic-pituitary-adrenal (HPA) axis activation, and changes in cardiovascular response and immune function (Pressman & Cohen, 2005; Steptoe, Wardle & Marmot, 2005). At the other end of the spectrum, negative emotions and chronic stress may exacerbate illness through neuroimmune and neuroendocrine deficiencies that increase vulnerability to disease (Heim, Ehlert & Hellhammer, 2000; McEwen & Stellar, 1993; Segerstrom & Miller, 2004). Positive emotions can "undo" the immediate effects of negative emotions by reducing psychophysiological reactivity and enhancing coping when individuals are confronted with negative events (Fredrickson & Levenson, 1998; Pressman & Cohen, 2005; Shapiro, Jamner, Goldstein, & Delfino, 2001; Tugade, Fredrickson, & Barrett, 2004). In sum, frequent positive experiences may create more favorable physiological profiles.

In the present study, we extend the literature on positive well-being and functional status by examining whether the associations are manifest in a Chinese population. Few of the studies investigating positive well-being and functional status have used national samples, and none, to our knowledge, has been fielded in a non-Western population. Life satisfaction and other global measures of well-being generally have cross-cultural validity between Western and non-Western samples (Diener, Oishi, & Lucas, 2003). In particular, as in Western societies, older adults in China and Taiwan equate successful aging and life satisfaction with economic prosperity, physical health, and social involvement and support (Chen, 2001; Hsu, 2007; Lu & Shih, 1997). Undoubtedly, however, there are some important differences across populations. For example, comparisons between Western and non-Western samples reveal that relationship harmony and interpersonal evaluations are a more central component of life satisfaction in Eastern than in Western cultures (Diener, Oishi, & Lucas, 2003; Lu & Shih, 1997).

In this study, we use data from the Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan to test whether life satisfaction and perceptions of future happiness protect older adults from increased mobility limitations over an approximately eight-year period. We use an indicator of mobility to assess health status because measures of functional status and disability are likely to be reported more accurately by older respondents than the presence of chronic diseases, and because these measures are strong predictors of medical care use and survival in older populations. In particular, mobility difficulty is predictive of more severe forms of disability and institutionalization (Fried & Guralnik, 1997; Guralnik et al., 1994).

We included two aspects of positive well-being in our statistical analysis, because it is unclear from existing research to what extent different facets of positive well-being may overlap in their prediction of health. Our data allowed us to examine current life satisfaction and perceptions of future happiness separately. We adjusted for health status and social connectedness at baseline, both of which are related to the development of mobility limitations. We also included baseline depressive symptoms in order to examine the benefits of life satisfaction and perceptions of future happiness independent of negative affect. Few studies of the relationship between positive mental well-being and health include controls for baseline negative affect (Pressman & Cohen, 2005). Given the evidence from previous studies on life satisfaction, affective judgments about future events, and functional status in older adults, we anticipated that both current life satisfaction and perceptions of future happiness would independently contribute to the number of mobility limitations in our sample.

Method

Participants

The sample included participants from the longitudinal Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan. The first wave of data collection began in 1989 with a nationally representative sample of 4,049 persons aged 60 and older and an additional national sample of 2,642 near-elderly persons aged 50 to 66 in 1996. Respondents have been interviewed at approximate three-year intervals since the initial interview date. The current study relied primarily on data from the 1996 and 2003 interviews, which involved a follow-up period of 7.8 years. Of the 3,778 completed interviews in 1996 and 2003, 3,363 respondents (89%) had data on all of the variables included in our model. Approximately 321 of the 415 missing cases (77%) were due to the use of proxy respondents, who were not asked any subjective questions (e.g., self-assessed health or depressive symptoms).

Measures

Mobility limitations included the number of mobility activities for which the respondent had any difficulty (potential range was 0 to 8). These activities include standing for 15 minutes, squatting, reaching over one's head, grasping with fingers, lifting/carrying 11–12 kilograms, running 20–30 meters, walking 200–300 meters, and climbing 2–3 flights of stairs. A variable denoting mobility limitations in 1996 was included as a baseline health control.

Life satisfaction and perceptions of future happiness were measured using items adapted from the 20-item Life Satisfaction Index (LSIA) (Neugarten, Havighurst & Tobin, 1961) and modified for use with Taiwanese respondents (0 = Low life satisfaction and 8 = High life satisfaction) (Cronbach's alpha = .79). Subscales of the LSIA are comparable to other measures of life satisfaction that are typically used in the literature (Liang, 1985; Nezlek, Richardson, Green & Schatten-Jones, 2002; Stock, Okun, & Benin, 1986). The interviewers made the following statement to each respondent before asking ten questions about their life (in Mandarin): "I'd like to ask for your current views or feelings about your life. Please tell me whether you agree with the sentences I am about to read." We used the following eight items from the scale to represent life satisfaction, each of which required a Yes/No response:

1. Has your life been better than most people's lives?
2. Are you satisfied with your life?
3. Do you find what you do interesting?
4. Have these few years been the best in your life?
5. If it was possible (to do again or to do over), would you want to start over or live this life again?
6. Do you feel that most of what you do is monotonous and of no interest?
7. Do you feel old and tired?
8. Would you say your life has matched your hopes?

All eight items loaded highly on one factor (eigenvalue = 2.66). Similar items were used in a previous study of life satisfaction and aging in Taiwan (Chen, 2001).

Perceptions of future happiness were measured using the question, "Do you expect that in the future happy things will occur?" (1 = Yes; 0 = No).

Sociodemographic controls included age, respondent's sex (1 = Female; 0 = Male), marital status (1 = Spouse or companion; 0 = Neither), and years of schooling completed (from the

1989 interview for the elderly sample and from the 1996 interview for near elderly). We also included two variables measuring social connectedness and involvement that are known to be related to health outcomes and positive well-being, specifically (1) the total number of reported ties with children, close relatives, and close friends with which the respondent has monthly contact, and (2) the number of social activities in which the respondent participates (potential range of 0 to 11).

Baseline health controls included depressive symptoms (10 items from the Center for Epidemiological Studies Depression Scale (CES-D) with a possible range of 0 to 30; Cronbach's alpha = .82) and cognitive impairment (the number of cognitive tasks that the respondent answered incorrectly out of a possible 11). Cognitive impairment was based on items from the modified Rey Auditory Verbal Learning Test (Lezak, 1983) and a modification of the Digits Backward Test (Wechsler, 1981). We also included one question that asks respondents to rate their overall health in one of five categories (1 = Excellent; 5 = Poor), which we refer to as self-assessed health ("Regarding your current state of health, do you feel it is excellent, good, average, not so good, or poor?"). Finally, we included smoking status (1 = Yes; 0 = No) and the number of chronic conditions the participant reported among the following conditions: high blood pressure, diabetes, heart disease, cancer, respiratory ailments, arthritis, ulcers, liver or gall bladder disease, cataracts, kidney disease, gout, or spinal injury (potential range of 0 to 12).

Statistical Analysis

The outcome variable was the number of mobility limitations reported during the 2003 interview. The predictors of interest were life satisfaction and perceptions of future happiness, assessed in 1996. We included control variables that are related to health outcomes and positive mental well-being: age, sex, education, marital status, number of social ties, number of social activities, and baseline health status.

The data were analyzed using a form of Poisson regression because the outcome variable, mobility limitations, is a count variable. With mobility limitations, however, we observed many more zeroes than would be expected if the distribution was Poisson. At follow-up, the mean number of limitations was two but 45% of the respondents had zero limitations, which is well above the 14% expected in a Poisson distribution with that mean. Therefore, we estimated a zero-inflated Poisson regression model which uses two equations estimated simultaneously: one is a logit equation that predicts membership in a latent class that is at risk of experiencing mobility limitations (the "inflate" equation); and the other is a Poisson equation that predicts the number of mobility limitations for those at risk. Although the inflate equation is typically modeled by predicting those *not* at risk (Cheung, 2002), we have chosen to predict the complementary outcome to facilitate comparisons with the Poisson equation. In our models, variables that increase the probability of being at risk generally increase the expected number of limitations for those at risk, so the coefficients in the two equations tend to have the same signs. For a fuller treatment of zero-inflated Poisson regression, see Long and Freese (2006), and for a discussion of its application in medical studies, see Cheung (2002).

Several of the previously reviewed prospective studies found that positive emotional well-being influenced health outcomes in samples that were healthy at baseline (Koivumaa-Honkanen et al., 2000; Koivumaa-Honkanen et al., 2002; Ostir et al., 2000; Ostir, Ottenbacher, & Markides, 2004). Thus, in order to investigate whether the results vary with initial health status, we included an interaction term between life satisfaction and whether or not the respondent had mobility limitations at the baseline interview in 1996. For similar reasons, we included an interaction term between perceptions of future happiness and whether or not the respondent had zero mobility limitations in 1996. To facilitate

interpretation of the regression coefficients for life satisfaction and perceptions of future happiness, we estimated two zero-inflated Poisson regression models: model (a) includes only the main effects of the covariates and model (b) adds the two interaction terms described above to model (a). The data were analyzed using Stata 9.0 (StataCorp, 2005).

Results

The sociodemographic characteristics and health status of the study population are shown in Table 1 and a correlation matrix of the positive well-being and health variables is presented in Table 2. Respondents reported an average life satisfaction score of 5.2 ($SD = 2.0$) out of 8 and 79.3% of the sample reported having perceptions of future happiness. Consistent with an older sample, the average number of mobility limitations increased from 0.8 to 2.0 over the follow-up period. The bivariate correlations were in the predicted direction. Poorer baseline health was positively associated with number of mobility limitations in 2003, and social involvement and higher well-being were negatively associated with number of mobility limitations in 2003. The correlation between current life satisfaction and perceptions of future happiness was low ($r = .07$), suggesting tht they reflect different dimensions of positive well-being.

Table 3 presents the coefficients and standard errors for the zero-inflated Poisson models. As noted earlier, the inflate equation predicted the risk of experiencing mobility limitations, and the Poisson equation predicted the number of mobility limitations for those at risk. In model (a), which included only the main effects, the significant sociodemographic covariates have signs in the expected direction. For example, in the inflate part of the model, being older, female, and having lower education at baseline were significantly associated with being a member of the latent class at risk of mobility limitations; in the Poisson part of the model these same covariates were significantly associated with a larger number of mobility limitations among those at risk. Each of the baseline health variables was significant in at least one of the two equations and two of the health variables were significant in both. In particular, having poorer self-assessed health and additional mobility limitations at baseline were associated with being at risk and with more mobility limitations at follow-up. Life satisfaction was not significantly related to being at risk for mobility limitations, but higher life satisfaction was associated with fewer mobility limitations for those at risk. Perceptions of future happiness were not associated with either being at risk or the number of limitations.

Model (b) included interaction terms between the positive well-being variables and whether or not the respondent had mobility limitations at the baseline interview in 1996. The results were very similar to model (a) for the health and sociodemographic controls as well as the measures of social involvement. Model (b) provided additional insight into the effects of life satisfaction and perceptions of future happiness, which were allowed to vary depending on whether or not the respondent had mobility limitations at baseline. We found that for those who had one or more mobility limitations at baseline both measures of positive well-being had no effect on the probability of being at risk or on the number of limitations among those at risk. However, we found a different result among those who had zero mobility limitations at baseline: life satisfaction and perceptions of future happiness had no effect on the probability of being at risk but a significant protective effect on the expected number of mobility limitations among those at risk. The estimated coefficients in the Poisson equation indicate that for those at risk at follow-up but with no mobility limitations at baseline, an increase in life satisfaction from the first to the third quartile (4 to 7) is associated with 9% fewer mobility limitations at follow-up. Setting all other predictors to their means this represents a decline in expected mobility limitations from 2.58 to 2.35. Having perceptions of future happiness is also associated with a 9% reduction in expected mobility limitations

for this group, which is equivalent to a reduction from 2.84 to 2.59 limitations when all other variables are set to their means. The combined effect of changes in both life satisfaction (from 4 to 7) and perceptions of future happiness is a 17% reduction in mobility limitations, equivalent for average predictors to a change from 2.77 to 2.31 in expected limitations among those at risk. Note that even incremental changes in the number of mobility limitations—such as standing, walking or climbing stairs—could be substantial in terms of the ability to function in daily life. These results are consistent with the notion that positive well-being matters for individuals that are relatively healthy at baseline.

Discussion

In our initial model, we found that life satisfaction, but not perceptions of future happiness, was significantly related to the number of mobility limitations at the end of the approximately eight-year follow-up period. However, the relationships were more nuanced when we introduced interaction terms reflecting functional status at baseline. Both life satisfaction and perceptions of future happiness were predictive of the number of mobility limitations at follow-up for respondents who had zero mobility limitations at baseline. The relationships were significant in the presence of controls for sociodemographic characteristics, social involvement, and mental and physical health status.

Our findings are consistent with those from other prospective studies finding associations between positive well-being and physical functioning in healthy samples. For example, a study by Ostir et al. (2000) found that older adults with high positive affect were half as likely as adults with low positive affect to have died or to have acquired limitations in functional status two and seven years later in the presence of controls for baseline functional status, lifestyle indicators (e.g., smoking, drinking) and baseline negative affect scores. Ostir et al.'s (2000) sample included only respondents who could complete a walking task and had no difficulty with activities of daily living at baseline. In Koivumaa-Honkanen et al.'s (2004) study of life satisfaction and work disability, life dissatisfaction predicted psychiatric sources of work disability in the portion of their sample classified as "ill" at baseline, whereas life dissatisfaction predicted both non-psychiatric and psychiatric causes of work disability for those classified as "healthy" at baseline. Koivumaa-Honkanen et al. (2000) included only those who were free of chronic disease at baseline in their study demonstrating a relationship between life dissatisfaction and mortality.

Given the multiple pathways through which positive emotions may affect health, our findings raise the question of why life satisfaction and perceptions of future happiness would be associated with health in the longer-term only for those of high functional status. One possibility is that positive well-being is beneficial up to a certain threshold of health, at which point, other, stronger influences come into play. For example, positive affect states may improve adherence to medical regimens and behaviors for those with no mobility limitations (e.g., better sleep, diet, exercise), which would reduce the number of mobility limitations they develop, whereas the presence of mobility limitations at baseline may disrupt adherence to health practices. Similarly, if positive well-being improves one's physiological profile over the long-term, it would be difficult for these subtle changes to have much of an impact after other negative physiological events have accumulated to the point of disability or disease. Presumably, positive emotions can only prevent or "undo" so much of the cumulative damage that has already taken place. There is also some evidence that high positive affect is dysfunctional in populations with chronic illness, because having higher positive affect may lead individuals to not take their illnesses seriously (Brown et al., 2000; Derogatis, Abeloff, & Melisaratos, 1979; Devins et al., 1990). Reporting high life satisfaction and perceptions of future happiness in the face of a high number of mobility limitations may indicate denial or suppression of the seriousness of one's disability.

There are limitations in this study that should be noted. First, we must consider the possibility of reverse causation, where mobility limitations affect positive well-being. Our analytic strategy deals with this problem by using time lags. Specifically, we examined the effect of life satisfaction and perceptions of future happiness as of 1996 on mobility limitations in 2003, approximately eight years later, effectively ruling out a direct effect of the outcome on the predictor. It is still possible, of course, that the measures of positive well-being in 1996 were affected by mobility limitations at that time, but our models control for this potential confounder by including mobility limitations in 1996 as a covariate. We also estimated the effect of mobility restrictions in 1996 on life satisfaction and perceptions of future happiness in 2003, controlling for the same measures of positive affect in 1996 (not shown here), and found no significant effects at the conventional five percent level. We are therefore confident that our estimates reflect genuine effects of positive well-being on mobility limitations and not the other way around. Second, there may be a measurement issue, as researchers have established that affect influences self-reports of health (Diener et al., 1999); for example, levels of mental well-being may drive respondents to underestimate or overestimate their ability to complete specific tasks. But these effects are more likely to be contemporaneous; it is hard to see how mental well-being in 2003 would affect self reports eight years earlier, except via correlation with previous mental well-being, which is controlled at least in part by the lagged outcome. Finally, it is possible that, despite our careful inclusion of control variables there remain unobserved confounders that affect both positive well-being in 1996 and mobility limitations in 2003. To the extent that those confounders also determine mobility limitations in 1996, however, their biasing effect would be substantially reduced by our control for baseline limitations.

In conclusion, we found that current life satisfaction and perceptions of future happiness were determinants of the number of mobility limitations at an eight-year follow-up for those without mobility limitations at baseline, adjusting for sociodemographic factors, social involvement, baseline health and depressive symptoms in a Chinese sample of middle-aged and older adults. Higher life satisfaction and perceptions of future happiness may contribute to better coping, improved health practices and to better physiological functioning in the longer-term. Future research should aim to clarify the multiple pathways through which positive emotions are related to health.

Acknowledgments

Support for this project came from the Demography and Epidemiology Unit of the Behavioral and Social Research Program of the National Institute of Aging (grant R01AG16790) and the National Institute of Child Health and Human Development (grant 5P30HD32030).

We thank Dana Glei and Rachel Pruchno for helpful comments on the manuscript.

References

Bardwell WA, Berry CC, Ancoli-Israel S, Dimsdale JE. Psychological correlates of sleep apnea. Journal of Psychosomatic Research. 1999; 47(6):583–596. [PubMed: 10661605]

Brown JE, Butow PN, Culjak G, Coates AS, Dunn SM. Psychosocial predictors of outcome: Time to relapse and survival in patients with early stage melanoma. British Journal of Cancer. 2000; 83(11): 1448–1453. [PubMed: 11076652]

Cacioppo JT, Berntson GG. The affect system: architecture and operating characteristics. Current Directions in Psychological Science. 1999; 8(5):133–137.

Cacioppo JT, Gardner WL, Berntson GG. The affect system has parallel and integrative processing components: form follows function. Journal of Personality & Social Psychology. 1999; 76(5):839–855.

Carver, CS.; Scheier, M. Optimism. In: Lopez, SJ.; Snyder, CR., editors. Positive Psychological assessment: a handbook of models and measures. Washington, DC: American Psychological Association; 2003. p. 75-89.

Chen C. Aging and life satisfaction. Social Indicators Research. 2001; 54:57–79.

Cheung YB. Zero-inflated models for regression analysis of count data: A study of growth and development. Statistics in Medicine. 2002; 21(10):1461–1469. [PubMed: 12185896]

Cohen S, Doyle WJ, Turner RB, Alper CM, Skoner DP. Emotional style and susceptibility to the common cold. Psychosomatic Medicine. 2003; 65(4):652–657. [PubMed: 12883117]

Derogatis LR, Abeloff MD, Melisaratos N. Psychological coping mechanisms and survival time in metastatic breast cancer. Journal of the American Medical Association. 1979; 242(14):1504–1508. [PubMed: 470087]

Devins GM, Mann J, Mandin H, Paul LC, Hons RB, Burgess ED, Taub K, Schorr S, Letourneau PK, Buckle S. Psychosocial predictors of survival in end-stage renal disease. Journal of Nervous Mental Disorders. 1990; 178(2):127–133.

Diener E, Oishi S, Lucas RE. Personality, culture, and subjective well-being: emotional and cognitive evaluations of life. Annual Review of Psychology. 2003; 54:403–425.

Diener E, Suh E, Lucas R, Smith H. Subjective well-being: Three decades of progress. Psychological Bulletin. 1999; 125(2):276–302.

Finlayson M. Changes predicting long-term care use among the oldest-old. Gerontologist. 2002; 42:443–453. [PubMed: 12145372]

Folkman S. Positive psychological states and coping with severe stress. Social Science & Medicine. 1997; 45(8):1207–1221. [PubMed: 9381234]

Fredrickson BL. The role of positive emotions in positive psychology. the broaden and-build theory of positive emotions. The American Psychologist. 2001; 56(3):218–226. [PubMed: 11315248]

Fredrickson BL, Levenson RW. Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. Cognition and Emotion. 1998; 12(2):191–220. [PubMed: 21852890]

Fried LP, Guralnik JM. Disability in older adults: evidence regarding significance, etiology and risk. Journal of the American Geriatrics Society. 1997; 45:92–100. [PubMed: 8994496]

Giltay EJ, Geleijnse JM, Zitman FG, Hoekstra T, Schouten EG. Dispositional optimism and all-cause and cardiovascular mortality in a prospective cohort of elderly Dutch men and women. Archives of General Psychiatry. 2004; 61(11):1126–1135. [PubMed: 15520360]

Guralnik JM, Simonsick EM, Ferruci L, Glynn RJ, Berman LF, Blazer DG, Scherr PA, Wallace RB. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. Journal of Gerontology. 1994; 49:M85–M94. [PubMed: 8126356]

Hamer DH. The heritability of happiness. Nature genetics. 1996; 14(2):125–126. [PubMed: 8841176]

Heim C, Ehlert U, Hellhammer DH. The potential role of hypocortisolism in the pathophysiology of stress-related bodily disorders. Psychoneuroendocrinology. 2000; 25(1):1–35. [PubMed: 10633533]

Hsu H. Exploring elderly people's perspectives on successful ageing in Taiwan. Aging & Society. 2007; 27:87–102.

Koivumaa-Honkanen H, Honkanen R, Koskenvuo M, Viinamaki H, Kaprio J. Life dissatisfaction as a predictor of fatal injury in a 20-year follow-up. Acta Psychiatrica Scandinavica. 2002; 105(6):444–450. [PubMed: 12059849]

Koivumaa-Honkanen H, Honkanen R, Viinamaki H, Heikkila K, Kaprio J, Koskenvuo M. Self-reported life satisfaction and 20-year mortality in healthy Finnish adults. American Journal of Epidemiology. 2000; 152(10):983–991. [PubMed: 11092440]

Koivumaa-Honkanen H, Koskenvuo M, Honkanen RJ, Viinamaki H, Heikkila K, Kaprio J. Life dissatisfaction and subsequent work disability in an 11-year follow-up. Psychological Medicine. 2004; 34(2):221–228. [PubMed: 14982128]

Lezak, MD. Neuropsychological assessment. 2. New York: Oxford University Press; 1983.

Liang J. A structural integration of the Affect Balance Scale and the Life Satisfaction Index A. Journal of Gerontology. 1985; 40(5):552–561. [PubMed: 4031403]

Long, JS.; Freese, J. Regression models for categorical dependent variables using stata. College Station, TX: Stata Press; 2006.

Lu L, Shi JB. Sources of happiness: a qualitative approach. The Journal of Social Psychology. 1997; 137(2):181–187.

Luoto R, Prattala R, Uutela A, Puska P. Impact of unhealthy behaviors on cardiovascular mortality in Finland, 1978–1993. Preventive Medicine. 1998; 27(1):93–100. [PubMed: 9465359]

Lyyra TM, Törmäkangas TM, Read S, Rantanen T, Berg S. Satisfaction with present life predicts survival in octogenarians. Journal of Gerontology: Psychological Sciences. 2006; 61(6):319–326.

Maier H, Smith J. Psychological predictors of mortality in old age. Journal of Gerontology: Psychological Sciences. 1999; 54(1):44–54.

McEwen BS, Stellar E. Stress and the individual: mechanisms leading to disease. Archives of Internal Medicine. 1993; 153(18):2093–2101. [PubMed: 8379800]

Neugarten BL, Havighurst RJ, Tobin SS. The measurement of life satisfaction. Journal of Gerontology. 1961; 16:134–143. [PubMed: 13728508]

Nezlek JB, Richardson DS, Green LR, Schatten-Jones EC. Psychological well being and day-to-day social interaction among older adults. Personal Relationships. 2002; 9:57–71.

Okun MA, Stock WA. The construct validity of subjective well-being measures: An assessment via quantitative research syntheses. Journal of Community Psychology. 1987; 15(4):481–492.

Ostir GV, Berges IM, Markides KS, Ottenbacher KJ. Hypertension in older adults and the role of positive emotions. Psychosomatic Medicine. 2006; 68(5):727–733. [PubMed: 17012526]

Ostir GV, Goodwin JS, Markides KS, Ottenbacher KJ, Balfour J, Guralnik JM. Differential effects of premorbid physical and emotional health on recovery from acute events. Journal of the American Geriatrics Society. 2002; 50(4):713–718. [PubMed: 11982673]

Ostir GV, Markides KS, Black SA, Goodwin JS. Emotional well-being predicts subsequent functional independence and survival. Journal of the American Geriatrics Society. 2000; 48(5):473–478. [PubMed: 10811538]

Ostir GV, Markides KS, Peek MK, Goodwin JS. The association between emotional well-being and the incidence of stroke in older adults. Psychosomatic Medicine. 2001; 63(2):210–215. [PubMed: 11292267]

Ostir GV, Ottenbacher KJ, Markides KS. Onset of frailty in older adults and the protective role of positive affect. Psychology & Aging. 2004; 19(3):402–408. [PubMed: 15382991]

Pavot W, Diener E, Colvin CR, Sandvik E. Further validation of the satisfaction with life scale: Evidence for the cross-method convergence of well-being measures. Journal of Personality Assessment. 1991; 57(1):149–161. [PubMed: 1920028]

Pitkala KH, Laakkonen ML, Strandberg TE, Tilvis RS. Positive life orientation as a predictor of 10-year outcome in an aged population. Journal of Clinical Epidemiology. 2004; 57:409–414. [PubMed: 15135844]

Pressman SD, Cohen S. Does positive affect influence health? Psychological Bulletin. 2005; 131(6): 925–971. [PubMed: 16351329]

Rasmussen HN, Wrosch C, Scheier MF, Carver CS. Self-regulation processes and health: The importance of optimism and goal adjustment. Journal of Personality. 2006; 74(6):1721–1747. [PubMed: 17083664]

Ryff CD, Dienberg Love G, Urry HL, Muller D, Rosenkranz MA, Friedman EM, Davidson R, Singer B. Psychological well-being and ill-being: Do they have distinct or mirrored biological correlates? Psychotherapy and Psychosomatics. 2006; 75(2):85–95. [PubMed: 16508343]

Ryff CD, Singer BH, Dienberg Love G. Positive health: Connecting well-being with biology. Philosophical Transactions of the Royal Society of London Series B, Biological sciences. 2004; 359(1449):1383–1394.

Salovey P, Rothman AJ, Detweiler JB, Steward WT. Emotional states and physical health. The American Psychologist. 2000; 55(1):110–121. [PubMed: 11392855]

Scheier MF, Carver CS. Effects of optimism on psychological and physical well being: Theoretical overview and empirical update. Cognitive Therapy and Research. 1992; 16(2):201–228.

Scheier MF, Matthews KA, Owens JF, Magovern GJS, Lefebvre RC, Abbott RA, et al. Dispositional optimism and recovery from coronary artery bypass surgery: The beneficial effects on physical and psychological well-being. Journal of Personality and Social Psychology. 1989; 57(6):1024–1040. [PubMed: 2614656]

Segerstrom SC, Miller GE. Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. Psychological Bulletin. 2004; 130(4):601–630. [PubMed: 15250815]

Shapiro D, Jamner LD, Goldstein IB, Delfino RJ. Striking a chord: Moods, blood pressure, and heart rate in everyday life. Psychophysiology. 2001; 38(2):197–204. [PubMed: 11347865]

Shin DC, Johnson DM. Avowed happiness as an overall assessment of the quality of life. Social Indicators Research. 1978; 5:475–492.

StataCorp. Stata statistical software: Release 9. College Station, TX: 2005.

Steptoe A, Wardle J, Marmot M. Positive affect and health-related neuroendocrine, cardiovascular, and inflammatory processes. Proceedings of the National Academy of Sciences. 2005; 102(18): 6508–6512.

Stock WA, Okun MA, Benin M. Structure of subjective well-being among the elderly. Psychology & Aging. 1986; 1(2):91–102. [PubMed: 3267396]

Strawbridge WJ, Shema SJ, Balfour JL, Higby HR, Kaplan GA. Antecedents of frailty over three decades in an older cohort. Journal of Gerontology: Social Sciences. 1998; 53B:S9–S16.

Tugade MM, Fredrickson BL, Barrett LF. Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health. Journal of Personality. 2004; 72(6):1161–1190. [PubMed: 15509280]

Umstattd MR, McAuley E, Motl RW, Rosengren KS. Pessimism and physical functioning in older women: influence of self-efficacy. Journal of Behavioral Medicine. 2007; 30(2):107–114. [PubMed: 17268878]

Wechsler, D. WAIS-R manual: Wechsler adult intelligence scale-revised. Cleveland, OH: Psychological Corporation/Harcourt Brace Jovanovich; 1981.

Table 1

Descriptive Statistics (n = 3,363)

Variable	*Mean or %*	*SD*
Outcome		
Mobility Limitations in 2003 (0 – 8)	2.0	2.5
Health		
Mobility Limitations in 1996 (0 – 8)	.8	1.6
CES-D (0 – 30)	5.2	5.7
Smoking (1=Yes; 0=No)	26.4%	--
# of Chronic Conditions (0 – 12)	1.4	1.5
Cognitive Impairment (0 – 11)	6.5	2.4
Self-assessed Health (1= Excellent and 5 = Poor)	2.7	1.1
Sociodemographic Controls		
Age (54 – 91)	64.1	8.1
Female (1=Yes; 0=No)	48.1%	--
Education (Years)	4.9	4.6
Marital Status (1=Spouse or companion; 0=Neither)	75.4%	--
Social Involvement		
Social Activities (0 – 11)	1.6	1.3
Fewer than Eight Social Ties (1=Yes; 0=No)	10.8%	--
Positive Well-being		
Life Satisfaction (0 – 8)	5.2	2.0
Perceptions of Future Happiness (1=Yes; 0=No)	79.3%	

Note: All predictor variables were measured in 1996 except for education, which was measured in 1989 for those aged 60 and older in 1989 and in 1996 for those aged 50 – 66 in 1996.

J Gerontol B Psychol Sci Soc Sci. Author manuscript; available in PMC 2013 March 28.

Table 2

Correlation Matrix (n = 3,363)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Mobility Limitations in 2003	--										
2. Mobility Limitations in 1996	.48	--									
3. CES-D	.28	.39	--								
4. Smoking	−.11	−.13	−.07	--							
5. # of Chronic Conditions	.27	.35	.27	−.12	--						
6. Cognitive Impairment	.22	.20	.18	−.06	.06	--					
7. Self-assessed Health	.32	.41	.43	−.09	.42	.21	--				
8. Social Activities	−.10	−.14	−.16	.11	.00	−.13	−.16	--			
9. Fewer than Eight Social Ties	.10	.12	.18	.02	.06	.13	.11	−.14	--		
10. Life Satisfaction	−.20	−.27	−.57	.01	−.18	−.15	−.34	.18	−.15	--	
11. Perceptions of Future Happiness	−.07	−.03	−.06	−.05	−.00	−.12	−.02	.03	−.13	.07	--

Note. All predictor variables were measured in 1996.

J Gerontol B Psychol Sci Soc Sci. Author manuscript; available in PMC 2013 March 28.

Table 3

Zero-inflated Poisson Regressions of Number of Mobility Limitations in 2003 on Life Satisfaction and Perceptions of Future Happiness (n = 3,363)

Variables	Model (a)				Model (b)			
	Inflate		Poisson		Inflate		Poisson	
	b	***SE***	***b***	***SE***	***b***	***SE***	***b***	***SE***
Intercept	−6.431**	.529	−.443**	.162	−6.427**	.534	−.300†	.164
Health								
Mobility Limitations in 1996	.500**	.065	.074**	.007	.422**	.083	.052**	.008
CES-D	.031**	.011	.000	.003	.031**	.011	.000	.003
Smoking	−.064	.114	.127**	.038	−.062	.114	.124**	.038
# of Chronic Conditions	.131**	.039	.013	.008	.128**	.039	.008	.008
Cognitive Impairment	−.002	.019	.022**	.006	.000	.020	.022**	.006
Self-assessed Health	.195**	.051	.041**	.016	.194**	.051	.033*	.016
Sociodemographic Controls								
Age	.087**	.006	.019**	.002	.088**	.006	.018**	.002
Female	.809**	.117	.095**	.035	.811**	.118	.073*	.035
Education	−.027*	.011	−.010**	.004	−.027*	.011	−.010*	.004
Marital Status	−.146	.118	.037	.030	−.146	.119	.041	.030
Social Involvement								
Social Activities	−.033	.035	−.004	.011	−.033	.035	−.003	.011
Fewer than Eight Social Ties	.039	.160	−.016	.039	.031	.159	−.005	.039
Positive Well-being								
Life Satisfaction	.026	.029	−.018*	.008	.088†	.046	−.011	.009
Perceptions of Future Happiness	−.043	.114	−.027	.031	−.250	.247	.016	.038
Interactions								
Life Satisfaction x Zero Mobility Limitations in 1996					−.073†	.043	−.020*	.009
Perceptions of Future Happiness x Zero Mobility Limitations in 1996					.269	.261	−.105*	.053

Notes: All predictor variables were measured in 1996 except for education, which was measured in 1989 for those aged 60 and older in 1989 and in 1996 for those aged 50 – 66 in 1996. The inflate equation predicted those at risk of experiencing mobility limitations and the Poisson equation predicted the number of mobility limitations for those at risk.

J Gerontol B Psychol Sci Soc Sci. Author manuscript; available in PMC 2013 March 28.

† $p < .10$;

* $p < .05$;

** $p < .01$