RESEARCH PAPER

Daily Functioning, Health Status, and Happiness in Older Adults

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Abstract The hypothesis that the degree to which disease disrupts daily functioning is inversely associated with happiness is widely accepted, yet existing literature offers little direct evidence in its support. This paper explores the hypothesized association in a community-based sample of 383 older adults. To assess the degree to which disease disrupts daily functioning we developed a measure—called the *freedom-from-debility* score—based on four Short Form-12 (SF-12) Health Survey questions explicitly designed to represent "limitations in physical activities because of health problems" and "limitations in usual role activities because of physical health problems." The results were consistent with the hypothesis. When participants were divided into categories based on their freedom-from-debility score, median happiness scores were monotonically increasing across categories. Controlling for demographic and socio-economic factors as well as health status (measured both subjectively and objectively), a one-point increase in freedom-from-debility score (on a scale from 0 to 100) was associated with a three-percent reduction in the odds of lower-quartile happiness. The results support the contention that health status is one of the most influential predictors of happiness, that the association between health status and happiness depends greatly on the manner in which health status is measured, and that the degree to which disease disrupts daily functioning is inversely associated with happiness.

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1 Introduction

Health status has long been described as one of the most influential predictors of subjective well-being, understood as some positive or desirable cognitive or affective mental state like happiness or satisfaction (Larson 1978; Okun and George 1984). Yet the relationship between health status and subjective well-being is complex. While research has found a robust correlation between self-reported health status and subjective well-being, so-called objective measures of health status—including comorbidity counts and physicians' health ratings—have been found to be at best weakly correlated with subjective well-being (Angner et al. 2009; Chuang et al. 1989; Diener and Seligman 2004; Friedsam and Martin 1963; Lebo 1953; Michalos et al. 2000; Okun et al. 1984; Zautra and Hempel 1984). In one summary: "The relative impact of one's objective health status on one's subjective well-being is more modest than one might expect even in the presence of the most catastrophic circumstances" (Michalos et al. 2000, 255).

This phenomenon, which has been labeled "well-being within illness" (Carel 2009), is supported by a multitude of studies. Indeed, in a variety of populations, researchers have found no significant association between medical conditions and subjective well-being (Diener and Seligman 2004; Frederick and Loewenstein 1999; Michalos et al. 2000). In a review article about the quality of life (QL) of cancer patients, deHaes and van Knippenberg (1985) conclude: "It is remarkable that comparisons between cancer patients and others do not seem to support the assumption that the QL of cancer patients in general is poorer than the QL of other groups" (p. 811). Tyc (1992) found no difference with respect to quality of life among pediatric cancer patients who had lost limbs as a result of their illness as compared to those who had not. Johnson et al. (1982) found that patients with end-stage renal disease who had either successfully undergone a kidney transplant or were on dialysis reported quality-of-life levels similar to those of the general population. In a comparison between spinal-cord-injured, "other handicapped," and "nonhandicapped" subjects, Chwalisz et al. (1988) found "no differences in subjective well-being between the handicapped and nonhandicapped groups" (p. 826). When researchers have established an association, it has frequently turned out to be weaker than anticipated. Brickman et al. (1978), for example, found that quadriplegic and paraplegic accident victims, though significantly less happy than healthy controls and lottery winners, were above the midpoint of the happiness scale and therefore "not … nearly as unhappy as might have been expected" (p. 921).

The literature offers multiple—not mutually exclusive—explanations for the limited association between medical conditions and subjective well-being (Angner et al. 2009; deHaes and van Knippenberg 1985). According to one explanation, people adapt to illness over time. This explanation is based on *hedonic adaptation theory*, which says that over time people experience a reduction in the intensity of their affective reaction to both favorable and unfavorable stimuli (Frederick and Loewenstein 1999; Lucas 2007). According to another explanation, those who suffer illness compensate by deriving more happiness or satisfaction from life domains other than health—including work, family life, etc. —by experiencing improvements in other domains and/or by assigning greater weight to those other domains. It follows from both of these hypotheses that, insofar as a medical

condition affects subjective well-being at all, it will only do so for a relatively short period of time after the diagnosis or the onset of the symptoms.

Not all studies fail to find a correlation between medical conditions and subjective well-being, however; in fact, there are some medical conditions that have been found to be associated with reduced happiness or satisfaction. Examples include closed-head injury (Klonoff et al. 1986; Wood and Rutterford 2006); facial disfigurement (Goldberg 1974); fibromyalgia and rheumatoid arthritis (Çeliker and Borman 2001; Smith and Wallston 1992); hearing loss (Magilvy 1985), multiple sclerosis and other neuromuscular disorders (Antonak and Livneh 1995; Livneh and Antonak 1994); and urinary incontinence (Angner et al. 2009).

It is often suggested that one difference between medical conditions that do, and those that do not, affect subjective well-being is related to whether they disrupt daily functioning. Conditions that disrupt daily functioning are thought to have a lasting impact because they interfere with the process of adaptation and/or the ability to compensate by deriving more happiness or satisfaction from other life domains (Angner et al. 2009; Diener and Seligman 2004; Michalos et al. 2000). It has also been suggested that progressive or degenerative diseases like multiple sclerosis may have a lasting impact on subjective well-being, because adaptive processes do not occur fast enough to keep up with the progression of the disease (Frederick and Loewenstein 1999, 312). Finally, Angner et al. (2009) have suggested that the social stigma associated with conditions such as urinary incontinence may have an effect on subjective well-being. We note that these hypotheses are not mutually exclusive.

Another approach to the relationship between health status, happiness, and daily functioning is suggested by the biopsychosocial model. According to this model, mechanisms at the cellular, tissue, organism, interpersonal, and environmental level all play significant roles in human functioning (Fava and Sonino 2008). While a disruption in daily functioning (social factor) in the presence of a disease (biological factor) might have effect on happiness (psychological factor), all three factors interact in deep and important ways. Similarly, the International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization postulates that environmental factors (such as neighborhood security) and personal factors (such as psychological coping ability) affect one's functioning and degree of disability, which then has an effect on one's health status (Clarke et al. 2011). The causality can also go in reverse direction, with a person's health status affecting his or her functioning, which would have an effect on environmental and personal factors. In the ICF model, the relationship between contextual factors (environmental and personal) and health status is influenced by the degree of disability or functioning. Both the biopsychosocial and ICF models suggest that several factors beyond objective health status affect a person's subjective well-being. Impairment in daily functioning is one such factor.

The purpose of this paper was to test the hypothesis that the degree to which disease disrupts daily functioning is inversely associated with happiness. Although the hypothesis is widely accepted, existing literature offers little direct evidence in its support. Using happiness as the outcome measure, we examined independent associations with health status and the degree to which disease disrupts daily functioning (after adjusting for relevant covariates) in a community-based sample of 383 older adults. As our measure of the degree to which disease disrupts daily functioning we developed a measure—called the *freedom-from-debility score*—based on four Short Form-12 (SF-12) Health Survey questions originally designed to represent "limitations in physical activities because of health problems" and "limitations in usual role activities because of physical health problems."

2 Methods

2.1 Respondents

Participants were recruited from the practices of 39 Alabama primary care physicians who responded to a statewide solicitation. Patients presenting to the practices for routine visits were given the opportunity to complete a study screening form. The form ascertained age, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) use, interest in completing a telephone survey, and contact information. Screening forms were collected by physician office personnel and mailed to the coordinating center. Patients deemed eligible from the screening form were contacted by telephone and offered participation in this study. Eligible participants met the following criteria: (1) established patients of a participating primary care physician; (2) at least 50 years of age; (3) currently taking prescription NSAIDs; and (4) willing to provide contact information, give informed consent, and complete a telephone interview. The overall response rate—computed as the fraction of participants deemed eligible who completed the interview—was 73.7 %.

2.2 Measures

Demographic and socioeconomic data were coded as binary variables. Race/ethnicity was defined as African-American or White; a participant who did not fit either category was excluded from analyses involving race/ethnicity. Age was entered as a variable indicating whether the participant was 65 years or older, or less than 65 years old, at the time of the interview; this is a commonly used cutoff point because historically it represents the transition from working age to retirement age. We coded participants as married if they said they were married, and as not married if they said they were divorced, widowed, separated, or never married. We separated participants into two groups with respect to their education level: those who had at most a high school education, and those with some college education or a graduate/professional degree. Participants were classified as poor if they reported an annual family income of $10,000 or less, which guaranteed that all those categorized as poor met federal standards for poverty. Since refusals are common in the case of income data, participants who failed to report their income were assumed to have the median income.

We used one subjective and one objective measure of health status. Subjective health status was assessed with the first question from the SF-12: "In general, would you say your health is: *excellent*, *very good*, *good*, *fair*, or *poor*?" Because of previously established non-linearities in the relationship between self-reported health status and happiness, for purposes of regression analysis we dichotomized the subjective measure of health status: participants were classified as having favorable health status (i.e., "excellent," "very good," or "good") or unfavorable health status (i.e., "poor" or "fair"). Our objective measure of health status was a comorbidity count, computed as the number of affirmative answers in response to the question "Do you have, or have you had, any of the following medical conditions?" followed by a list of nine comorbidities: high cholesterol, arthritis, osteoporosis, asthma or other lung disease, urinary incontinence, menopause, high blood pressure, diabetes, and history of cancer. Theoretically, then, the comorbidity count could range from 0 to 9, where a higher number corresponds to more compromised health status.

In order to assess the degree to which disease disrupted daily functioning, a summary score was created based on a subset of questions from the SF-12. The SF-12 consists of eight components. Two of them—the physical-functioning component (SF-2 and SF-3) and

the role-physical component (SF-4 and SF-5)—were explicitly created to assess "limitations in physical activities because of health problems" and "limitations in usual role activities because of physical health problems" respectively (Ware and Sherbourne 1992). The four questions concern the extent to which the respondent's health status affects activities such as work (inside and outside the home) and other daily activities (Appendix 1). Based on these four questions, we created an aggregate score representing the extent to which disease disrupts daily functioning. Previous research has shown no differences in responses to SF-12 physical status items between phone and mail surveys (Lungenhausen et al. 2007).

The first two questions (SF-2 and SF-3) are answered on a 3-point scale; the answer alternatives are 1 = "Yes, limited a lot"; 2 = "Yes, limited a little"; and 3 = "No, not limited at all." For these questions, a response of 1 was recorded as 0, 2 recorded as 50, and a response of 3 was recorded as 100. A physical-functioning score was derived by adding the two answers; when one answer was missing, the physical-functioning score was set to equal two times the non-missing answer. The last two questions (SF-4 and SF-5) are answered on a 5-point scale; the answer alternatives are 1 = "All of the time"; 2 = "Most of the time"; 3 = "Some of the time"; 4 = "A little of the time"; and 5 = "None of the time." For these questions, a response of 1 was recorded as 0, 2 as 25, 3 as 50, 4 as 75 and 5 as 100. A role-physical score was derived by adding the two answers; when one answer was missing, the role-physical score was set to equal two times the non-missing answer. An aggregate score was constructed as the weighted average of the physical-functioning and role-physical scores, with weights derived from the SF-12 scoring procedure. The result was normalized so that the aggregate score could range from 0 to 100. Our scale, like the SF-12, is scored so that a higher score indicates better health status; hence, the scale is best thought of as a *freedom-from-debility* scale.

Happiness was measured using the Subjective Happiness Scale of Lyubomirsky and Lepper (1999). This well-validated scale has been widely used (Angner et al. 2009; Lyubomirsky 2001; Lyubomirsky et al. 2005; Lyubomirsky et al. 2006). Because this measure is based on four items, it avoids many of the problems that plague single-item measures (Diener and Seligman 2004). The four items, which were originally formulated for administration as a written questionnaire, were modified for telephone administration. In addition, we adapted the reading level by eliminating the word "peer" in the second item (Appendix 2). As in the original design, the four answers were coded using numbers from 1 to 7 inclusive, and a happiness score was computed as the average of the four answers (with the last question reverse scored). When an answer to one of the four happiness questions was missing, the score was computed from the remaining three answers.

2.3 Procedure

Participants completed a 30-min telephone survey, which ascertained demographic and socioeconomic variables, health status indicators, and happiness scores. Data were obtained using computer-assisted telephone interview protocols and entered directly into the computer by the interviewers. Interviewers underwent formal training with certification of competency before beginning data collection. The computer software checked for logical and out-of-range errors. Participants completing the interview received a $20 gift card.

2.4 Analyses

Reliability was assessed using Cronbach's alpha (α). Correlations were assessed using Spearman's rho (ρ). To test for trend across ordered groups we relied on the test developed by Cuzick, and to test for equality of variances we relied on Levene's test based on the median. Happiness was the dependent variable. To examine bivariate and multivariable associations between independent variables and happiness, we used binary logistic regression analysis. For purposes of these analyses only, we divided participants into two classes with respect to happiness: those with lower-quartile happiness scores were said to be unhappy, with the remainder considered to be happy (Lyubomirsky 2001). To test the linearity of the relationship between the logit and continuous predictor variables, we used the Tukey-Pregibon link test. Model fit was quantified by the Nagelkerke Pseudo-R^2 and discrimination was quantified by the c-statistic. Data were analyzed using Stata/SE 12.1 for Mac.

3 Results

Of all participants in the analytic sample ($n = 383$), 38.7 % were African-American, 27.9 % were male, and 61.8 % were younger than 65 years of age (Table 1). The median age at the time of the interview was 61 (range: 49–99). Among the 327 participants who answered the income question, the median annual family income was $15,000–20,000; 56 participants who failed to answer the income question were assigned the median income. The median self-rated health status was "good" (range: "poor"–"excellent") and the median comorbidity count was 4 (range: 1–8).

For the four items used to construct the freedom-from-debility score, reliability was high ($\alpha = 0.904$). There were only two missing answers: two participants answered three of the four questions only. The mean (SD) freedom-from-debility score was 41.3 (12.1) on a scale from 0 to 100 (range: 21.3–56.8); the median (IQR) was 43.2 (21.9). For the happiness items, reliability was high ($\alpha = 0.896$). There was only one missing answer: one participant answered three of the four questions only. The mean (SD) happiness score was 5.67 (1.36) on a 7-point scale (range: 1–7); the distribution was negatively skewed with a

Table 1 Respondent characteristics ($n = 383$)

Variable	n (%)	Mean (SD)
Race/ethnicity: African-American	148 (38.7)	
Gender: Male	107 (27.9)	
Age: Less than 65	236 (61.8)	
Education: High school or less	217 (56.8)	
Marital status: Married	207 (54.2)	
Family income: Less than $10,000/year	79 (20.6)	
Self-reported health: Unfavorable[a]	164 (42.9)	
Comorbidity count (range: 0–9)		3.69 (1.44)
Freedom-from-debility score (range: 0–100)		41.3 (12.1)

[a] Answered "fair" or "poor" when prompted: "In general, would you say your health is: *excellent*, *very good*, *good*, *fair*, or *poor*?"

Fig. 1 Distribution of subjective happiness scores ($n = 383$). The mean (SD) happiness score was 5.67 (1.36); the median (IQR) was 6.00 (1.50). Participants to the left of the *dashed line* were considered unhappy due to lower-quartile happiness scores (≤ 5.25)
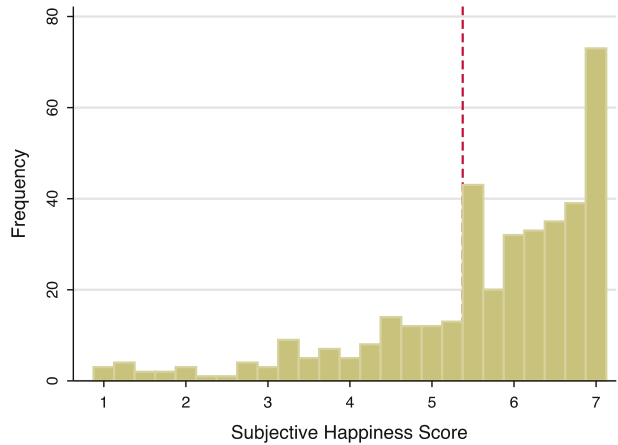
median (IQR) of 6.00 (1.50) (Fig. 1). We classified 108 participants as unhappy because of lower-quartile happiness scores (≤ 5.25).

We found a moderate correlation between freedom from debility and happiness ($\rho = 0.300$; $p < 0.001$). When participants were divided into four categories based on their freedom-from-debility score (Fig. 2), median happiness scores were monotonically increasing across categories; a test for trend was strongly significant ($p < 0.001$). Inter-quartile ranges were monotonically decreasing across categories; a test for equality of variances was strongly significant ($p < 0.001$). We also found a moderate correlation between the freedom-from-debility score and self-reported health status on a five-point scale ($\rho = 0.612$; $p < 0.001$).

In bivariate logistic regression analysis (Table 2), being less than 65 years of age was associated with greater odds of being unhappy; gender and race/ethnicity were not significantly associated with happiness. Having no college experience and having an annual family income of less than $10,000 were associated with greater odds of being unhappy; marital status was not significantly associated with happiness. Unfavorable self-reported health status was associated with greater odds of being unhappy; there was no association between the comorbidity count and happiness. In separate tests for the comorbidity count

Fig. 2 Subjective happiness scores over freedom-from-debility levels ($\rho = 0.300$; $p < 0.001$; $n = 383$). *Thick horizontal lines* represent medians, *boxes* represent interquartile ranges, and whiskers represent extreme values excluding outliers (*marked by dots*)
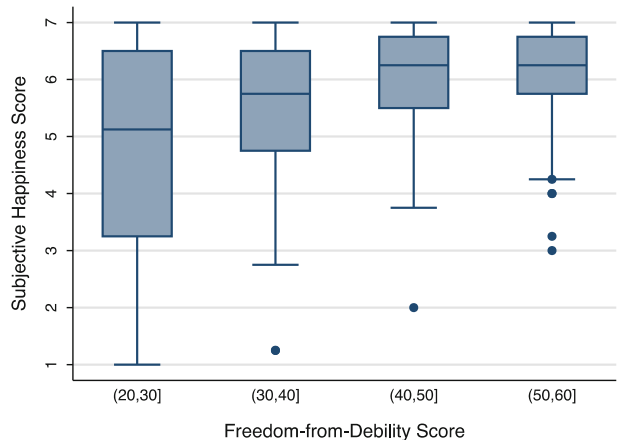
Table 2 Associations with lower-quartile happiness ($n = 383$)

Variable	OR (95 % CI) Unadjusted	OR (95 % CI) Adjusted
Race/ethnicity: African-American	1.19 (0.75–1.87)	0.85 (0.49–1.47)
Gender: Male	1.27 (0.78–2.07)	1.55 (0.85–2.82)
Age: Less than 65	1.99 (1.22–3.25)*	1.69 (0.96–2.96)
Education: High school or less	2.07 (1.29–3.32)*	1.39 (0.80–2.40)
Marital status: Married	0.71 (0.46–1.11)	0.89 (0.51–1.57)
Family income: Less than $10,000/year	2.89 (1.73–4.84)*	1.92 (0.99–3.69)
Self-reported health: Unfavorable[a]	5.55 (3.39–9.08)*	2.90 (1.59–5.26)*
Comorbidity count (range: 0–9)	1.09 (0.93–1.27)	1.06 (0.88–1.27)
Freedom-from-debility score (range: 0–100)	0.94 (0.92–0.96)*	0.97 (0.94–0.99)*
		Pseudo-$R^2 = 0.162$
		c-statistic $= 0.769$

[a] Answered "fair" or "poor" when prompted: "In general, would you say your health is: *excellent*, *very good*, *good*, *fair*, or *poor*?"

* $p < 0.05$

and the freedom-from-debility variable, the Tukey-Pregibon link test was non-significant, meaning that the linearity assumption cannot be rejected.

In multivariable logistic regression analysis (Table 2), favorable self-reported health status and freedom from debility were positively associated with happiness; there was no association between happiness and race/ethnicity, gender, age, education, marital status, or the comorbidity count. Family income was borderline significant. Standardized regression coefficients (computed following Hilbe 2009) indicate that the freedom-from-debility variable was the second most influential predictor of lower-quartile happiness in the model after self-reported health status: while the standardized coefficient associated with unfavorable self-reported health status was 0.291, the standardized coefficient associated with the freedom-from-debility score was −0.212.

4 Discussion

The main purpose of this paper was to explore the association between the degree to which disease disrupts daily functioning and happiness in a community setting. As our measure of the degree to which disease disrupts daily functioning we developed a measure—called the freedom-from-debility score—based on four SF-12 questions originally developed to represent "limitations in physical activities because of health problems" and "limitations in usual role activities because of physical health problems." The results were consistent with the hypothesis. We found a moderate correlation between freedom from debility and happiness ($\rho = 0.300$; $p < 0.001$); when participants were divided into categories based on their freedom-from-debility score, median happiness scores were monotonically increasing and interquartile ranges monotonically decreasing across categories. Controlling for demographic and socio-economic factors as well as health status (measured both subjectively and objectively), a one-point increase in freedom-from-debility score was associated with a three-percent reduction in the odds of being unhappy. Participants with unfavorable self-reported

health status had almost three times the odds of being unhappy. Other explanatory variables, including the comorbidity count, were not significantly associated with happiness.

Taken together, these results support the contention that health status is one of the most important predictors of happiness; indeed, in this analysis, the only variables that remained significant in multivariable analysis were indicators of health status (self-reported health status and freedom from debility). The findings also confirm that the association between health status and happiness depends greatly on the manner in which health status is measured; by contrast to self-reported health status and the freedom-from-debility score, our objective measure of health status (the comorbidity count) was not significantly associated with happiness in either bivariate or multivariable analysis. Finally, these data confirm the hypothesis that the degree to which health status interferes with daily functioning is significantly inversely associated with happiness; the freedom-from-debility variable was the second most influential predictor of lower-quartile happiness in the final model. Meanwhile, the fact that both self-reported health status and the freedom-from-debility score remain significant in the multivariable model, in conjunction with the fact that the two variables were only moderately correlated, indicates that each may have an independent effect on happiness scores.

The lack of a significant association between objective health status and happiness is particularly remarkable in light of the fact that our participants had a significant co-morbidity burden (with a median comorbidity count of four), which puts older adults at greater risk of functional decline (Hébert 1997). Our results support the notion that the functional relationship between objective health status and happiness must be understood in terms of approaches that incorporate additional psychological and social elements, such as the bio-psychosocial model and ICF conceptualization. The use of such approaches facilitates a more comprehensive investigation of the association between objective health status and happiness by also considering bi-directional relationships with and between subjective well-being, disruption of daily functioning, and other biological, psychological, and social factors in play. For example, a person's subjective well-being may be far less impaired than objective indicators of their health status would suggest if he or she experiences adversarial growth by employing successful coping or benefit-finding mechanisms. In addition, the person's social environment is obviously important in determining the extent to which disease disrupts daily functioning. Using an approach that accounts for additional psychological and social factors is critical to explain why subjective health status and disruption of daily functioning were associated with happiness while objective health status was not.

Our results have limitations. First, due to the cross-sectional nature of the data, the results do not permit causal inferences; hence, the results do not allow us to infer that disruption of daily functioning causes lower happiness levels. Second, the freedom-from-debility score has not been independently validated as a measure of the degree to which disease disrupts daily functioning. The four questions on which the score was based, however, have been extensively validated for use in the SF-12 context in order to represent limitations in physical and role activities because of health problems. Third, participants in this study were from a select population of older African-Americans and Caucasians currently taking prescription NSA-IDs, which makes the sample less representative of the general population. Yet, the fact that the sample exhibited substantial variation with respect to functional status was for our purposes a strength. And since NSAIDs are some of the most commonly prescribed medications, accounting for 70 million prescriptions and 30 billion over-the-counter medications yearly in the US alone (Green 2001), the results may remain generalizable to a large segment of the population. Fourth, the dichotomization of variables for purposes of regression analysis is associated with some loss of information; odds ratios should be interpreted in light of this fact.

Finally, we note that the present study does not explain why disruption to daily functioning should be associated with lower subjective well-being. It has been suggested that disruption to daily functioning represents a loss of personal control, which has been positively correlated with subjective well-being (Eckersley et al. 2001), but further study would be required to explain why the association obtains. Further study would also be required to establish the extent to which these results hold for other samples and whether a causal connection exists. A better understanding of the complex relationship between health status and subjective well-being, including the association between the degree to which disease disrupts daily functioning and happiness, could have important implications for the care and treatment of patients in both in- and out-patient settings and might lead to interventions that could dramatically improve people's subjective well-being.

Appendix 1: Debility questions from the SF-12

SF-2.   Think about moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf. Does your health now limit you a lot, limit you a little, or not limit you at all?
SF-3.   Think about climbing several flights of stairs. Does your health now limit you a lot, limit you a little, or not limit you at all?
SF-4.   During the past 4 weeks, how much of the time have you accomplished less than you would like as a result of your physical health?
SF-5.   During the past 4 weeks, how much of the time were you limited in the kind of work or regular daily activities you do as a result of your physical health?

Appendix 2: Happiness questions

1.   How happy do you consider yourself to be in general? 1 means that you do not consider yourself to be a very happy person and 7 means that you consider yourself to be a happy person.
2.   How do you compare your happiness to that of other people? 1 means that you are less happy than most people and 7 means that you are more happy than most people.
3.   Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. How well does this describe you? 1 means that the statement does not describe you at all and 7 means that it describes you a great deal.
4.   Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. How well does this describe you? 1 means that the statement does not describe you at all and 7 means that it describes you a great deal.

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