TITLE

Characterizing self-rated health during a period of changing health status.

ABSTRACT

Self-rated health (SRH) is among the most frequently assessed health perceptions. The purpose of this study was to assess the tenability of the recently proposed distinctions of SRH, as a *spontaneous assessment* of overall health, or as an *enduring self-concept*. Individuals (n=449) undergoing total joint replacement for hip or knee osteoarthritis in Toronto, Canada were followed over 6 months of recovery. Health questionnaires, completed pre-surgery, and at 3 and 6 months post-surgery, included measures of pain, physical function, sports/recreation, fatigue, anxiety, depression, social participation, passive/active recreation, and community access. Structural equation modeling was used for the analyses. SRH was found to be responsive to current and changing mental well-being throughout the six months of recovery. Current SRH strongly predicted future SRH. In this clinical sample undergoing significant changes in health status, SRH displayed both enduring and spontaneous features; evidence is provided that both operate simultaneously. SRH may prove to be a simple yet critical health measure for identifying individuals who would benefit most from targeted interventions for improving overall health.

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INTRODUCTION

The use of a 'self-rated health' (SRH) question in population and clinical health surveys has become common (Finnegan, Marion & Cox, 2005; Jylha, Guralnik, Ferrucci, Jokela & Heikkinen, 1998; Lorraine, Hammock & Blanton, 2005; Menec & Chipperfield, 2001; Shadbolt, 1997). Historically, most SRH research has focused on its predictive significance for health outcomes, including social-psychological well-being (Hillen, Schaub, Hiestermann, Kirschner & Robra, 2000; Mulsant, Ganguli & Seaberg, 1997), morbidity (Dominick, Ahern, Gold & Heller, 2002; Idler & Kasl, 1991), health care utilization (Kennedy, Kasl & Vaccarino, 2001; Menec & Chipperfield, 2001) and mortality (Benyamini & Idler, 1999; Idler & Benyamini, 1997). Findings have predominantly been as expected; poorer self-perceived health is associated with poorer health outcomes.

A cumulative assessment of the literature suggests that the health-related correlates of SRH correspond with three global *health dimensions*. The majority of work examining potential predictors of SRH have focused on the dimension of *physical health*. Studies have shown SRH to be closely related to the experience of physical symptoms, including occurrences of pain (Mantyselka, Turunen, Ahonen & Kumpusalo, 2003; Perruccio, Power & Badley, 2005; Reyes-Gibby, Aday & Cleeland, 2002), functional limitations and disability (Hoeymans, Feskens, Kromhout & van den Bos, 1999; Leinonen, Heikkinen & Jylha, 2001; Perruccio et al., 2005), and fatigue and weakness (Kaplan & Baron-Epel, 2003; Stewart, Woodward, Rosen & Cutler, 2008). The majority of the work has focused on fair/poor SRH or worsening SRH and findings have been fairly consistent – poorer SRH is associated with greater disease severity and symptom burden.

The second health dimension is *mental well-being*. The predominant indicators for this

dimension have included depression and depressive symptoms (Han, 2002; Mulsant et al., 1997; Schnittker, 2005), anxiety and associated symptoms (Cockerham, Kunz & Lueschen, 1988; Kroenke, 2003; Stewart et al., 2008), psychological distress (Cockerham et al., 1988; Goldman, Glei & Chang, 2004; Larsson, Hemmingsson, Allebeck & Lundberg, 2002), and mastery or control, particularly among individuals with chronic conditions (Cott, Gignac & Badley, 1999; Nguyen, Donesky-Cuenco & Carrieri-Kohlman, 2008; Schulz & Decker, 1985). The label *mental well-being* is used deliberately since not all classifications within these studies are clinical diagnoses. Once again, findings have been fairly consistent, that poorer SRH is associated with a greater likelihood of depressive symptoms and worse scores on a variety of anxiety and distress scales. Greater levels of perceived mastery and control have been found to be associated with better SRH.

Finally, the third dimension is *social health*. Evidence suggests that a significant component of SRH is related to social functioning, including the extent of social engagement, participation in social activities, and the availability of social supports, networks and resources (Cagney, Browning & Wen, 2005; Hillen et al., 2000; Pilpel, Carmel & Galinsky, 1988; Zunzunegui, Kone, Johri, Beland, Wolfson & Bergman, 2004).

While the associations identified above have been relatively consistent, studies have found that between 30% to 80% of people with at least one chronic condition(s) or with chronic symptoms report good or better health (Cott et al., 1999; Mantyselka et al., 2003; Perruccio et al., 2005; Reyes-Gibby et al., 2002). In patients who survived hospitalization for stroke, myocardial infarction, or hip fracture, Wilcox et al. (Wilcox, Kasl & Idler, 1996) reported that in the six months following hospitalization, health perceptions did not universally decline after the illness. In examining the congruence-incongruence between observed health problems and SRH,

Chipperfield (Chipperfield, 1993) reported that while the majority of elders provided subjective health ratings that were congruent with their reports of diseases or health problems, incongruence was found in nearly 20% of cases. This incongruence between SRH and physical health suggests SRH reflects more than just physical health. A study by Unden and Elofsson (Unden & Elofsson, 2001) found a correlation of 0.45, with agreement in about 60% of cases, between SRH and physicians' assessment of physical health based on physical examinations. Whereas factors representing physical health explained most of the variance in physicians' ratings of patients' health, psychosocial health factors explained most of the variance in patients' SRH.

Following from a review of the social psychology literature around expressions of '*self*' in social contexts (Banaji & Prentice, 1994), Bailis and colleagues (Bailis, Segall & Chipperfield, 2003) recently suggested the potential utility of a process theory, raised in the review, for understanding self-conceptions of health. They put forward two interpretations of SRH, labeling one a *spontaneous assessment* of overall health and the other as an *enduring self-concept*. For the former, SRH is viewed as a feedback system, a response to one's current state of well-being or illness. This view sees SRH as a responsive, health status measure. For the latter, SRH is viewed as determined by an individual's inherent perceptions of their own health, particularly as either a healthy or unhealthy person. In this case, SRH represents the self-concept of health and is relatively stable over time, independent of observed changes in health status.

Given the level of importance that has been attributed to SRH and its potential to predict health outcomes, an accurate characterization of SRH (i.e. identifying potential constituent components) is critical, particularly if it can aid in identifying individuals on different trajectories of health changes and, in turn, improve the development of targeted interventions, for instance. Further, an enhanced interpretation of SRH sets a strong foundation for an appropriate and

necessary examination of the external validity of SRH across groups defined by a variety of factors such as cultural background, health conditions, and age groups.

Bailis et al. (Bailis et al., 2003) sought to test the two distinctions of SRH. Their study examined SRH and health status over two time points, 2 years apart, using a general population-based health survey (ages 18+ years, n=7505). Health status was captured as physical (sum of chronic conditions, sum of restrictions in 6 activities, presence/absence of disability days in previous 2 weeks, and a Health Utilities Index score) and mental health (summed distress and depression inventories) symptoms, a social support score, leisure physical activity, smoking, and body mass index. Their findings pointed towards SRH as being both static and dynamic, although predominantly static.

Similarly, a second study (Boardman, 2006) tested these distinctions in a general population sample of adolescents (n=13,511) over two time points, 1 year apart, and captured health status as six individual health problems and psychological symptoms. While these authors also concluded that both distinctions appear reasonable, SRH remained relatively static in this adolescent sample.

For both studies, it is reasonable to expect that a substantial proportion of a general population sample would undergo little to no change in health status over a relatively short period. The adult-based study did not report the proportion of individuals who did or did not undergo change in health status over the two years, but did indicate that more than half the sample reported no change in SRH over the two years. In the adolescent focused study, between 50% and 60% of the sample reported no change in physical or mental health status over the 1 year time frame and just over 50% reported no change in SRH.

There is reasonable difficulty in distinguishing between the interpretations of SRH when the

samples against which these interpretations are being evaluated are relatively stable with respect to health status. That is, it is difficult to determine whether the stability of SRH in a relatively unchanging population is a function of an enduring self-concept or a reflection of stability in health status.

The overall objective of the current study was to determine whether the distinct interpretations of SRH could be identified and characterized in a group of individuals undergoing health status changes. This longitudinal study followed a clinical sample of patients aged 18+ years undergoing primary total joint replacement (TJR) surgery for hip or knee osteoarthritis. TJR is well established as an effective intervention for reducing pain, improving function, and enhancing the quality of life in patients with osteoarthritis of the hip and knee (Jones, Westby, Greidanus, Johanson, Krebs, Robbins et al. 2005). As a result of this procedure, we can confidently predict that there will be improvement that takes place over a relatively short period of time. The specific objectives were to determine, over six months of recovery from total joint replacement, 1. The *predictive significance* of physical health, mental well-being and social health for SRH; and 2. To assess the distinct interpretations of SRH by determining A) The *relative stability* of SRH over the period of change in health status and B) Whether SRH is responsive to changes in the health dimensions.

METHODS

Study setting and patient sample

Individuals undergoing primary unilateral TJR for hip or knee osteoarthritis (449: 215 and 234 patients, respectively) were consecutively recruited from four Toronto, Canada hospitals. Individuals were eligible if they were 18+ years of age and able to read and comprehend English. Individuals having replacement surgery for other than OA, a hemi-arthroplasty, or revision-arthroplasty were ineligible.

The study was approved by the Research Ethics Board of the participating institutions. Mailed health questionnaires were completed pre-surgery and at 3 and 6 months post-surgery.

Self-rated health was captured by the question: "In general, would you say your health is (choose one)..." Excellent; Very Good; Good; Fair; Poor, with scores ranging from 1 to 5, respectively; the question was asked at each time-point. SRH was treated continuously in this study. It is not uncommon for an ordinal scale variable with 5 or more levels (Johnson & Creech, 1983; Zumbo & Zimmerman, 1993), particularly when it is viewed as a proxy for an underlying continuum, as is SRH (Leinonen, Heikkinen & Jylha, 2002), to be operationalized as such. Further, since the stability of SRH was being examined, it was particularly important to account for its reliability. Estimates available in the literature are based on SRH being operationalized as continuous. Using data from varying chronic condition groups, McHorney et al. (McHorney, Ware, Jr., Lu & Sherbourne, 1994) reported similar reliability estimates across the groups and 0.78 for the combined sample. Kosinski et al. (Kosinski, Keller, Hatoum, Kong & Ware, Jr., 1999) reported reliability estimates ranging from 0.76 to 0.79 based on clinical trial data from patients with moderate to severe hip and knee osteoarthritis and rheumatoid arthritis. Accordingly, SRH was operationalized with r=0.78 in this study, the average of reported

estimates.

Health status measures (serially collected)

Pain on activity was assessed using the Hip Disability (HOOS-pain) (Nilsdotter, Lohmander, Klassbo & Roos, 2003) and Knee Injury and Osteoarthritis Outcome Score (KOOS-pain) (Roos, Roos, Lohmander, Ekdahl & Beynnon, 1998) pain subscales. These measures assess the frequency and extent of pain during activities such as 'walking on a flat surface' and 'going up and down stairs'. The HOOS-pain and KOOS-pain are 10- and 9-item scales with response options ranging from 0-'none' to 4-'extreme'; scores are summed.

Limitations in activities of daily living (ADL) were captured using the Western Ontario and McMaster University Osteoarthritis Index (WOMAC), physical function subscale. A commonly used measure in TJR (Bellamy, Buchannan WW, Goldsmith CH, Campbell J & Stitt LW, 1988), this measure assesses individuals' ability to move around and look after themselves, eliciting the degree of difficulty experienced due to their hip or knee. The 17 items have response options ranging from 0-'not at all difficult' to 4-'extreme difficulty'; scores are summed.

Limitations in more physically demanding activities were assessed using the HOOS/KOOS *function in sport and recreation* subscale (Nilsdotter et al., 2003; Roos et al., 1998). Individuals rate their degree of difficulty when active on a level beyond that captured by the WOMAC. The subscales are 4- and 5-item scales with response options ranging from 0-'none' to 4-'extreme'; scores are summed.

Fatigue was assessed using the Profile of Mood States (POMS) fatigue subscale (McNair DM & Heuchert JWP, 2003). The POMS is a frequently used measure of fatigue in the literature (O'Connor, 2004) and has been used to study fatigue in a range of chronic conditions. The

subscale consists of 5 items scored 0-‘not at all’ to 4-‘extremely’; scores are summed.

Anxiety and *Depression* were captured using the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS has been widely used in outpatient populations (Herrmann, 1997). Both subscales consist of 7 items scored 0-3 with a summed score range of 0-21.

Social participation limitations were assessed using the Late Life Function and Disability Instrument limitation subscale, disability component (Jette, Haley, Coster, Kooyoomjian, Levenson, Heeren et al. 2002). Respondents rated the extent to which they feel limited in their ability to personally perform in 16 socially expected life tasks on a 1-‘completely’ to 5-‘not at all’ scale.

Difficulty traveling within community/neighbourhood and *Difficulty with recreation/leisure activities* were assessed using an adaptation of the Calderdale Health and Disablement Survey (Badley & Tennant, 1988). The former was designed to assess the extent to which a respondent’s chronic condition limits their mobility or ability to travel within their community, while the latter assesses the extent of difficulties in participating in social and leisure activities. Each is a 4-item measure with items scored 1-‘none’ to 5-‘can no longer do’; scores are summed.

Comorbidity: Individuals responded yes/no to a list of 14 medical problems identified in the Self-Administered Comorbidity Questionnaire (Sangha, Stucki, Liang, Fossel & Katz, 2003).

Time-independent covariates included age at surgery, sex, hip/knee, and level of education (≤high-school, ≥post-secondary).

Analyses

Descriptive statistics were computed and the proportions not reporting changes in SRH and

health status were examined. For ease of comparison, all health measure scores (except SRH and comorbidity counts) were transformed to a 0-100 scale; higher scores indicate worse health/more difficulty.

Structural equation modeling (SEM) was used for all model analyses using Mplus 3.13 (Muthen & Muthen, 2005).

Development of Latent Health Dimension variables

A measurement model was specified to reflect the hypotheses that the health measures corresponded with three health dimensions (Physical Health, Mental Well-being, and Social Health (Figure 1)). Confirmatory factor analysis (CFA) was used to test this measurement model. Fatigue was hypothesized to cross-load on both Physical Health and Mental Well-being (Williamson, Purcell, Sterne, Wessely, Hotopf, Farmer et al. 2005; Wolfe, Hawley & Wilson, 1996).

Since comorbidity was simply a count variable (i.e. not a measure of degree of severity/ extent of symptoms, etc), comorbidity was specified as a potential predictor of the health dimensions, along with the covariates.

Criteria for assessing model fit

Four indices were examined to determine overall model fit: RMSEA, SRMR, CFI and TLI. Good fit was supported by RMSEA ≤ 0.05 (with a 90% upper confidence limit <0.08) and a non-significant P(RMSEA≤ 0.05), SRMR≤ 0.08, and CFI and TLI ≥ 0.95 (Hu & Bentler, 1998; Hu & Bentler, 1999). Standardized covariance residual matrices, modification indices (MI) and expected parameter change values were also examined. Cutoff values were as follows,

respectively: 2.58 (Brown, 2006; Byrne, 1998), 4 and 0.30 (Kaplan, 1989; Kaplan, 1990). Completely standardized factor loadings ≥0.30 were used to operationally define a "salient" factor loading (Brown, 2006), along with statistical significance.

The longitudinal stability of the measurement model was tested to ensure that any temporal changes in health dimension scores were due to true changes and not changes in the measurement structure over time.

Analyses specific to the objectives

A cross-sectional SEM model was specified with SRH regressed on each of the latent health dimensions (Objective 1), and subsequently on the covariates, and was replicated at each time point. The potential for mediated effects between the health dimensions and SRH was also examined. This was followed by regressing current SRH on prior SRH (Objective 2A); this examination included simultaneously specifying direct relationships between time-adjacent health dimension scores. With prior SRH considered, current SRH was further regressed on past health dimension scores (Objective 2B). For all longitudinal analyses, repeated measures were specified to have their error variances covary over time.

RESULTS

Sixty percent of the sample was female and near equal proportions of hip and knee surgeries were represented (47.9% and 52.1%, respectively). The mean age of the sample was 63.5 years (range: 31, 88) and the majority reported post-secondary education (72%). Pre-surgery, 13.5% reported “excellent” SRH, 36% and 37% reported “very good” and “good”, respectively, and 13.7% “fair” or “poor” SRH.

Pre-surgical health measure scores are presented in Table 1. The mean scores for pain and limitations in ADL and in physically more demanding activities were 58.9, 52.5, and 84.3, respectively. For comparison, equivalent estimates in an age- and gender-matched community dwelling control group without evidence of radiographic OA (Roos, Roos & Lohmander, 1999) were 5, 10, and 12, respectively.

For anxiety and depression, mean scores were 30.5 and 25.7, respectively. While similar to a score of 29.2 for anxiety derived from normative data (Crawford, Henry, Crombie & Taylor, 2001), the mean score on depression was higher than the normative value of 17.5. Based on published cutoff values (Zigmond & Snaith, 1983), 65% and 76% of the current sample scored within ‘normal’ range for levels of anxiety and depression, respectively. Equivalent proportions are 66.8% and 88.6% in the general population.

Social participation limitation scores (mean=41.4) reflected a moderate-severe level of limitation. In comparing mean values between community-dwelling adults classified into four strata of functional disability (Jette et al., 2002), individuals classified as severely limited had a mean score of 44.6, while those without functional limitations scored an average of 17.5.

Changes in health status were observed over time. The proportions reporting no changes were <9% (Table 1). In contrast, nearly one-third of study participants reported no change in

SRH over this period of changing health status.

Assessing the hypothesized measurement model

Fit indices for the measurement model indicated that the hypothesized three-factor model fit the data very well (RMSEA=0.030 (90%CI: 0.000, 0.057), P(RMSEA≤0.05)=0.879; CFI=0.996; TLI=0.993; SRMR=0.023). All estimates were statistically significant (Table 2 – Initial model). The magnitude of the standardized factor loadings reflected strong associations between the health measures and their purported latent dimensions. Fatigue, as an indicator of physical health, was the only exception. However, comparison of a model which did and did not retain fatigue as a physical health indicator supported its retention as an indicator of physical health.

With the introduction of covariates and comorbidity into the model, fit indices suggested an acceptable fit. However, large localized MI's and residuals suggested the possibility of differential indicator functioning for the WOMAC and HOOS/KOOS Sport/Rec measures by surgical joint. With adjustment for this differential, model fit improved considerably (RMSEA=0.047 (90%CI: 0.031, 0.063), P(RMSEA≤0.05)=0.594; CFI=0.980; TLI=0.967; SRMR=0.029). This model was determined to be the final cross-sectional measurement model.

Results continued to show significant relationships between the health measures and their respective health dimensions (Table 2 – Final model). Adjusted for covariates, intercorrelations indicated a moderate relationship between the health dimensions (Physical with Mental: 0.348; Physical with Social: 0.689; Mental with Social: 0.376; all p-values <0.0001). Well below the suggested cutoff of 0.80, these intercorrelation estimates supported the distinctiveness of the health dimensions.

Stability of the measurement model over time

Fit indices for the longitudinal measurement model were consistent with a very good fitting model (RMSEA=0.045, P(RMSEA≤0.05)=0.814; CFI=0.968; TLI=0.957; SRMR=0.050). Individual χ^2 difference testing revealed a number of equivalent effects over time, supported by the relative consistency in completely standardized estimates. Fixing these relationships to be equal over time did not degrade overall model fit (RMSEA=0.045, P(RMSEA≤0.05)=0.818; CFI=0.968; TLI=0.957; SRMR=0.052) and a non-significant χ^2 difference test between the unconstrained and fully constrained models ensured that this was justified ($P(\chi^2_{10} \geq 13.623)=0.191$). These findings supported measurement stability over time.

Predictive significance of the health dimensions for SRH – Objective 1

At each time point (cross-sectional analyses) the model displayed very good overall fit, with similar results at each time point (Table 3, Part D). Mental well-being was the only health dimension to consistently predict SRH; standardized estimates ranged from 0.32 to 0.45 (Part A). While the effects of physical and social health on SRH were insignificant, significant intercorrelations between each of the dimensions remained. Further analyses suggested a mediated relationship between physical and social health and SRH through mental well-being (Perruccio, 2009). Age, sex, and surgical joint were not significantly associated with SRH (Part B). Lower education was significantly associated with poorer SRH as was a greater number of comorbid conditions. R^2 values for SRH were modest (Part C).

Stability of SRH during a period of change in health status - Objective 2A

Prior SRH was a significant predictor of SRH at both 3 and 6 months post-surgery (Table 4,

Part A). While these effects remained relatively consistent over time, the magnitude of the coefficients (0.69 and 0.75) suggested a moderate degree of stability in SRH. These findings were consistent with an enduring self-concept interpretation of SRH.

Accounting for longitudinal effects, mental well-being continued to be the only health dimension to significantly predict SRH at each time point (Part B) except at 6 months where it was non-significant. Similarly, comorbidity count did not significantly predict SRH at 3 and 6 months. Comorbidity remained a significant predictor of SRH at baseline only. Finally, the introduction of past SRH increased SRH R^2 values noticeably at 3 and 6 months to 0.72 and 0.93, suggesting that an important component missing from the cross-sectional analyses was past SRH.

For this model, indices suggested a moderate to good fit (RMSEA=0.054 (90% CI: 0.046, 0.061); P(RMSEA<0.05)=0.213; CFI=0.956; TLI =0.942; SRMR=0.080). MI values suggested further improvement in fit could be achieved, as hypothesized, by specifying direct effects between past health dimension scores and future SRH, suggesting that SRH may be responsive to changes in health status.

Responsiveness of SRH to changes in health status – Objective 2B

SRH was responsive to changes in mental well-being, but not physical and social health, over time (Table 5, Part A). Mental well-being once again significantly predicted SRH at 6 months (Part C), suggesting that this relationship (non-significant in Table 4, Part B) was being masked by a combination of a negative and positive relationships between repeated measures of mental well-being and between mental well-being and current and future SRH. A positive change in mental well-being over time was associated with a positive change in SRH. Consequently, these findings suggested that viewing SRH as responsive to changes in health status (spontaneous

assessment) has merit.

Having considered past health dimension effects on current SRH, the magnitude of effect of past SRH on current SRH increased to 0.77 and 0.99 at 3 and 6 months, respectively (Table 5, Part B). The smaller effects observed in the previous model appeared to be the result of the omission of the negative relationships between past mental well-being and current SRH in the model. This change in estimates towards the value of 1.0 provided additional support for the enduring self-concept interpretation of SRH as well.

DISCUSSION

Despite its frequent use in health and medical research, little is known about the nature of SRH, and it was not until recently that a conceptual interpretation of SRH was proposed. This study assessed the tenability of the recently proposed distinctions of SRH as a *spontaneous assessment* of overall health or as an *enduring self-concept* (Bailis et al., 2003) in a clinical sample and more fully characterized the relationships linking health dimensions to SRH.

Two previous studies sought to test the plausibility of these distinctions of SRH (Bailis et al., 2003; Boardman, 2006). The defensibility of the conclusions, however, was undermined by the fact that the studies were based on samples of individuals experiencing minimal changes in health status. Results from such a study may be misleading, apportioning greater weight to an enduring self-concept interpretation than is truly warranted.

In contrast, this study's longitudinal assessment of SRH was carried out in a sample which underwent significant health status changes over the observational period. This study's findings support the enduring, self-concept interpretation of SRH in view of the fact that a considerable component of SRH remained stable in the face of significant changes in health status. Additionally, our findings provide support for the spontaneous assessment interpretation of SRH. Consequently, these findings point towards both distinctions as holding true and operating simultaneously.

Results from the cross-sectional analyses indicated that 34% to 47% of the variation in SRH was being explained by the health dimensions at each of the time points, net of covariate effects, providing evidence in favour of SRH as being responsive to current health status. However, while these estimates were not negligible, they indicated that a significant proportion of the variation in SRH at each time point was not being explained by the present state of health.

The enduring self-concept interpretation of SRH suggests that there is relative stability in SRH over time notwithstanding perturbations in health status. With the introduction of past SRH into the model as a predictor of future SRH, the proportion of explained variance in SRH increased to 72% and 91%, respectively, by the second and third time points. These findings clearly indicated that, despite significant changes in health status, a considerable component of SRH was indeed stable over time. In this case, past SRH accounted for 16% and 34% of the variance in SRH at the 3-month and 6-month post-surgical time point, respectively. As a result, although past SRH did not fully predict future SRH, these findings suggest there is some merit to the enduring self-concept interpretation of SRH. It was clear, however, that this interpretation on its own was not sufficient for fully understanding SRH.

Upon considering past health status as a predictor of SRH, with concurrent consideration of current health status and past SRH, the proportion of explained variance in SRH increased by a further 11% and 7%, respectively, at 3 and 6 months. Consequently, SRH was found to be responsive to changes in health status as well, net of the effects of past SRH. While SRH was only responsive to changes in mental well-being, earlier findings would suggest that changes in physical and social health, while not directly impacting on SRH, are important factors nonetheless. These findings provided evidence in favour of the spontaneous assessment interpretation of SRH.

The original conceptualization of the self-concept view allowed for changes based on feedback about the success/failure of health-related goal pursuits. Since changes in mental health were closely tied to changes in self-rated health, and mental health is likely the only indicator here that conceptually should respond to goal performance, then there is a possibility that some of the change observed in self-rated health may reflect change in the self-concept. Unfortunately,

it was not possible to assess goal-pursuits directly in this study. This is an area that requires further research.

Collectively considered, these findings provide strong evidence to suggest that both distinctions of SRH are valid. From this longitudinal investigation, the concurrent operation of an enduring component and a spontaneous and responsive component of SRH were undoubtedly observed. The findings from this study point towards SRH as an essential health measure. The ability of a single question to reflect an individual's view of themselves, their current and changing health status, and, as previous studies have shown, to predict future health status is remarkable. Consequently, epidemiological research, whether population or clinically-based, and clinical practice would be remiss in not accounting for an individual's SRH when evaluating overall health, when attempting to forecast future health, and when developing intervention and management strategies to improve overall health.

Since the intent of public health practice and policy is to improve population health, these findings, based on a sample of individuals with improving health, also suggest that including SRH in population assessments and surveillance practices is perhaps a sensible, practical and efficient means by which to further identify groups in the population in which poor SRH may indicate an opportunity for intervention and additionally by which the impact of interventions can be monitored.

As noted previously, a number of population-based and clinical health studies have documented the reporting of good SRH among people living with a chronic condition(s) and chronic symptoms and disability (Chipperfield, 1993; Cott et al., 1999; Mantyselka et al., 2003; Perruccio et al., 2005; Reyes-Gibby et al., 2002; Wilcox et al., 1996). In the current surgical sample, more than 50% reported good or better SRH despite high levels of pain, physical

disability, and the presence of other chronic conditions prior to surgery. Further, among individuals whose pre-surgical conditions were similar, those reporting better prior SRH by and large experienced a better rate of recovery. This leaves one to consider whether SRH could help identify those individuals with a chronic condition on different health status trajectories. The social psychology literature suggests that individuals often adopt mechanisms or engage in activities which serve to protect their self-view from change (Banaji & Prentice, 1994). Bailis et al. (Bailis et al., 2003) broadened this theory to include one's view of themselves as a healthy or unhealthy individual, suggesting that the health behaviours and practices in which one engages may serve to protect an individual's self-concept of health (i.e. SRH, enduring self-concept view) from change. That is, individuals who report better SRH may be more likely to engage in practices or activities which serve to maintain this belief (i.e. adoption of practices to maintain or improve health). And, likewise, individuals who report poorer SRH, and who may view themselves as unhealthy individuals, may be less likely to adopt practices to improve their health. Consequently, SRH may prove to be a simple yet critical health measure for identifying individuals on different health trajectories and those individuals who would benefit most from targeted interventions for improving overall health (i.e. those on a worse trajectory of health).

It was an important advantage of this study that a broad range of health status measures were considered. Unlike previous studies which limited their investigations to specific aspects of health, such as physical health, or only considered direct relationships with SRH, this study was able to differentiate these relationships both by the concurrent consideration of multiple aspects of health and by adopting an analytical approach which allowed for the identification of direct and mediated pathways. A key finding was the predictive significance of mental well-being for SRH. The findings, though, do not suggest that physical and social health are inconsequential.

Rather, this study's findings suggest that physical and social health are steps in the pathway linking health status to SRH (Perruccio, 2009). These important inter-relationships between the health dimensions and their relationship with SRH is an area which warrants further exploration.

There were a number of variables identified in the literature as being associated with SRH that were not available in this study, including measures such as self-efficacy, mastery, and distress, and perceived social support and degree of social networks. It is difficult to determine whether the availability of these measures would have produced different results, particularly because the focus for this study was on latent health dimensions and not specific health measures. Nonetheless, the availability of these measures would have been advantageous. Further, to better understand the SRH concept, perhaps qualitative data should be explored to complement evidence from survey-based research.

For this study, social health, in particular social functioning, was viewed as related to the health concept given the context within which the dimensions were being examined (i.e. a group of individuals with a chronic condition(s) who were undergoing health-related changes). The social health-related questions posed to patients in our study specifically asked patients to document their level of difficulty as a result of their hip/knee problem. Therefore, while social functioning may impact physical and mental health, the short time over which these patients were followed and given that a post-surgical timeframe characterized predominantly by changes in physical health was examined, makes it unlikely that the social aspects of their health would predict their changes in physical and mental health.

As well, the present study was limited to a period of 6 months and this raises questions as to whether the identified relationships and trajectories persist over longer periods of time. With respect to assessing the viability of the distinctive interpretations of SRH, however, it was not the

length of observation that was critical but rather that the period of observation was characterized by a time of change in health status. In fact, the repeated assessments over a shorter period of time made it conceptually and practically easier to attribute changes in SRH to changes in health status. Nevertheless, changes in health may get transferred to changes in perception in time over longer periods, so follow-up time should be considered for this type of research.

This study was limited to a total joint replacement sample. The demographic and patient-reported outcome similarities between this cohort and other total joint replacement cohorts with osteoarthritis (Aarons, Hall, Hughes & Salmon, 1996; Bachmeier, March, Cross, Lapsley, Tribe, Courtenay et al. 2001; Jones, Voaklander, Johnston & Suarez-Almazor, 2000) make the generalizability of these findings to this population possible. Likely, these findings are further generalizable to other chronic condition groups for which pain and activity limitations are cardinal symptoms and for which interventions for improving health have been undertaken. While it is difficult to determine whether these findings are more broadly applicable to other chronic condition groups and further to the general population, the similarity of conclusions reached between this study and those of Bailis et al.'s and Boardman's population-based studies (Bailis et al., 2003; Boardman, 2006) would suggest applicability beyond any specific morbidity.

This study's findings provide additional and significant support to the importance that has been attributed to SRH for use in epidemiological and health research and clinical decision making. Though a short, simple question, this study confirms and more fully reveals an individual's response to the SRH query to be a complex, multifaceted health self-appraisal.

REFERENCES

Aarons,H., Hall,G., Hughes,S., & Salmon,P. (1996). Short-term recovery from hip and knee arthroplasty. *J Bone Joint Surg.Br.*, *78*(4), 555-558.

Bachmeier,C.J., March,L.M., Cross,M.J., Lapsley,H.M., Tribe,K.L., Courtenay,B.G., & Brooks,P.M. (2001). A comparison of outcomes in osteoarthritis patients undergoing total hip and knee replacement surgery. *Osteoarthritis Cartilage*, *9*(2), 137-146.

Badley,E.M., & Tennant,A. (1988). Calerdale health and disablement survey: main report. Manchester: ACR Epidemiology Research Unit, University of Manchester, 1988. (198 pages).

Bailis,D.S., Segall,A., & Chipperfield,J.G. (2003). Two views of self-rated general health status. *Soc.Sci.Med.*, *56*(2), 203-217.

Banaji,M.R., & Prentice,D.A. (1994). The Self in Social Contexts. *Annual Review of Psychology*, *45* 297-332.

Bellamy,N., Buchannan WW, Goldsmith CH, Campbell J, & Stitt LW (1988). Validation study WOMAC: a health status instrument for measuring clinically-important patient-relevant outcomes following total hip or knee arthroplasy in osteoarthritis. *J Orthop Rheumatol*, *15* 95-108.

Benyamini,Y., & Idler,E.L. (1999). Community Studies Reporting Association Between Self-Rated Health and Mortality: Additional Studies, 1995 to 1998. *Research on Aging*, *21* 392-401.

Boardman,J.D. (2006). Self-rated health among U.S. adolescents. *J Adolesc.Health*, *38*(4), 401-408.

Brown,T.A. (2006). Confirmatory Factor Analyses for Applied Research. New York, NY: The Guilford Press.

Byrne,B.M. (1998). Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming. Mahwah, NJ: Lawrence Erlbaum Associates.

Cagney,K.A., Browning,C.R., & Wen,M. (2005). Racial disparities in self-rated health at older ages: what difference does the neighborhood make? *J.Gerontol.B Psychol.Sci.Soc.Sci.*, *60*(4), S181-S190.

Chipperfield,J.G. (1993). Incongruence between health perceptions and health problems. *J Aging Health*, *5* 475-496.

Cockerham,W.C., Kunz,G., & Lueschen,G. (1988). Psychological distress, perceived health status, and physician utilization in America and West Germany. *Soc.Sci.Med.*, *26*(8), 829-838.

Cott,C.A., Gignac,M.A., & Badley,E.M. (1999). Determinants of self rated health for Canadians with chronic disease and disability. *J.Epidemiol.Community Health*, *53*(11), 731-736.

Crawford,J.R., Henry,J.D., Crombie,C., & Taylor,E.P. (2001). Normative data for the HADS from a large non-clinical sample. *Br.J Clin.Psychol.*, *40*(Pt 4), 429-434.

Dominick,K.L., Ahern,F.M., Gold,C.H., & Heller,D.A. (2002). Relationship of health-related quality of life to health care utilization and mortality among older adults. *Aging Clin.Exp.Res.*, *14*(6), 499-508.

Finnegan,L., Marion,L., & Cox,C. (2005). Profiles of self-rated health in midlife adults with chronic illnesses. *Nurs.Res.*, *54*(3), 167-177.

Goldman,N., Glei,D.A., & Chang,M.C. (2004). The role of clinical risk factors in understanding self-rated health. *Ann.Epidemiol.*, *14*(1), 49-57.

Han,B. (2002). Depressive symptoms and self-rated health in community-dwelling older adults: a longitudinal study. *J.Am.Geriatr.Soc.*, *50*(9), 1549-1556.

Herrmann,C. (1997). International experiences with the Hospital Anxiety and Depression Scale--a review of validation data and clinical results. *J Psychosom.Res.*, *42*(1), 17-41.

Hillen,T., Schaub,R., Hiestermann,A., Kirschner,W., & Robra,B.P. (2000). Self rating of health is associated with stressful life events, social support and residency in East and West Berlin shortly after the fall of the wall. *J.Epidemiol.Community Health*, *54*(8), 575-580.

Hoeymans,N., Feskens,E.J., Kromhout,D., & van den Bos,G.A. (1999). The contribution of chronic conditions and disabilities to poor self-rated health in elderly men. *J.Gerontol.A Biol.Sci.Med.Sci.*, *54*(10), M501-M506.

Hu,L., & Bentler,P.M. (1998). Fit indices in covariance strucuture modeling: Sensitivity to underparameterized model misspecification. *Psychol.Methods*, *3* 424-453.

Hu,L., & Bentler,P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6* 1-55.

Idler,E.L., & Benyamini,Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *J.Health Soc.Behav.*, *38*(1), 21-37.

Idler,E.L., & Kasl,S. (1991). Health perceptions and survival: do global evaluations of health status really predict mortality? *J.Gerontol.*, *46*(2), S55-S65.

Jette,A.M., Haley,S.M., Coster,W.J., Kooyoomjian,J.T., Levenson,S., Heeren,T., & Ashba,J. (2002). Late life function and disability instrument: I. Development and evaluation of the disability component. *J Gerontol.A Biol.Sci.Med.Sci.*, *57*(4), M209-M216.

Johnson,D.R., & Creech,J.C. (1983). Ordinal Measures in Multiple Indicator Models - A Simulation Study of Categorization Error. *American Sociological Review*, *48*(3), 398-407.

Jones,C.A., Voaklander,D.C., Johnston,D.W., & Suarez-Almazor,M.E. (2000). Health related quality of life outcomes after total hip and knee arthroplasties in a community based population. *J Rheumatol*, *27*(7), 1745-1752.

Jones,D.L., Westby,M.D., Greidanus,N., Johanson,N.A., Krebs,D.E., Robbins,L., Rooks,D.S., & Brander,V. (2005). Update on hip and knee arthroplasty: current state of evidence. *Arthritis Rheum*, *53*(5), 772-780.

Jylha,M., Guralnik,J.M., Ferrucci,L., Jokela,J., & Heikkinen,E. (1998). Is self-rated health comparable across cultures and genders? *J.Gerontol.B Psychol.Sci.Soc.Sci.*, *53*(3), S144-S152.

Kaplan,D. (1989). Model Modification in Covariance Structure-Analysis - Application of the Expected Parameter Change Statistic. *Multivariate Behavioral Research*, *24*(3), 285-305.

Kaplan,D. (1990). Evaluating and Modifying Covariance Structure Models - A Review and Recommendation. *Multivariate Behavioral Research*, *25*(2), 137-155.

Kaplan,G., & Baron-Epel,O. (2003). What lies behind the subjective evaluation of health status? *Soc.Sci.Med.*, *56*(8), 1669-1676.

Kennedy,B.S., Kasl,S.V., & Vaccarino,V. (2001). Repeated hospitalizations and self-rated health among the elderly: a multivariate failure time analysis. *Am.J.Epidemiol.*, *153*(3), 232-241.

Kosinski,M., Keller,S.D., Hatoum,H.T., Kong,S.X., & Ware,J.E., Jr. (1999). The SF-36 Health Survey as a generic outcome measure in clinical trials of patients with osteoarthritis and rheumatoid arthritis: tests of data quality, scaling assumptions and score reliability. *Med.Care*, *37*(5 Suppl), MS10-MS22.

Kroenke,K. (2003). Patients presenting with somatic complaints: epidemiology, psychiatric comorbidity and management. *Int.J.Methods Psychiatr.Res.*, *12*(1), 34-43.

Larsson,D., Hemmingsson,T., Allebeck,P., & Lundberg,I. (2002). Self-rated health and mortality among young men: what is the relation and how may it be explained? *Scand.J.Public Health*, *30*(4), 259-266.

Leinonen,R., Heikkinen,E., & Jylha,M. (2001). Predictors of decline in self-assessments of health among older people--a 5-year longitudinal study. *Soc.Sci.Med.*, *52*(9), 1329-1341.

Leinonen,R., Heikkinen,E., & Jylha,M. (2002). Changes in health, functional performance and activity predict changes in self-rated health: a 10-year follow-up study in older people. *Arch.Gerontol.Geriatr.*, *35*(1), 79-92.

Lorraine,P.J., Hammock,R.L., & Blanton,J.M. (2005). Predictors of self-rated health status among Texas residents. *Prev.Chronic.Dis.*, *2*(4), A12.

Mantyselka,P.T., Turunen,J.H., Ahonen,R.S., & Kumpusalo,E.A. (2003). Chronic pain and poor self-rated health. *JAMA*, *290*(18), 2435-2442.

McHorney,C.A., Ware,J.E., Jr., Lu,J.F., & Sherbourne,C.D. (1994). The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med.Care*, *32*(1), 40-66.

McNair DM, & Heuchert JWP (2003). POMS (Profile of Mood States) Technical Update and Scoring Sheet.

Menec,V.H., & Chipperfield,J.G. (2001). A prospective analysis of the relation between self-rated health and health care use among elderly Canadians. *Canadian Journal on Aging*, *20* 293-306.

Mulsant,B.H., Ganguli,M., & Seaberg,E.C. (1997). The relationship between self-rated health and depressive symptoms in an epidemiological sample of community-dwelling older adults. *J.Am.Geriatr.Soc.*, *45*(8), 954-958.

Muthen,B.O., & Muthen,L. (2005). Mplus.

Nguyen,H.Q., Donesky-Cuenco,D., & Carrieri-Kohlman,V. (2008). Associations between symptoms, functioning, and perceptions of mastery with global self-rated health in patients with COPD: a cross-sectional study. *Int.J Nurs.Stud.*, *45*(9), 1355-1365.

Nilsdotter,A.K., Lohmander,L.S., Klassbo,M., & Roos,E.M. (2003). Hip disability and osteoarthritis outcome score (HOOS)--validity and responsiveness in total hip replacement. *BMC.Musculoskelet.Disord.*, *4* 10.

O'Connor,P.J. (2004). Evaluation of four highly cited energy and fatigue mood measures. *J Psychosom.Res.*, *57*(5), 435-441.

Perruccio,A.V. (2009). The Contribution of Physical, Mental and Social Dimensions of Health to Predicting Self-Rated Health Over the Course of Recovery Following Total Joint Replacement Surgery.: University of Toronto.

Perruccio,A.V., Power,J.D., & Badley,E.M. (2005). Arthritis onset and worsening self-rated health: a longitudinal evaluation of the role of pain and activity limitations. *Arthritis Rheum.*, *53*(4), 571-577.

Pilpel,D., Carmel,S., & Galinsky,D. (1988). Self-rated health among the elderly. A comparative analysis of health status measures, leisure activities and social contacts in age/sex groups. *Compr.Gerontol.[B]*, *2*(3), 110-116.

Reyes-Gibby,C.C., Aday,L., & Cleeland,C. (2002). Impact of pain on self-rated health in the community-dwelling older adults. *Pain*, *95*(1-2), 75-82.

Roos,E.M., Roos,H.P., & Lohmander,L.S. (1999). WOMAC Osteoarthritis Index--additional dimensions for use in subjects with post-traumatic osteoarthritis of the knee. Western Ontario and MacMaster Universities. *Osteoarthritis Cartilage*, *7*(2), 216-221.

Roos,E.M., Roos,H.P., Lohmander,L.S., Ekdahl,C., & Beynnon,B.D. (1998). Knee Injury and Osteoarthritis Outcome Score (KOOS)--development of a self-administered outcome measure. *J Orthop Sports Phys.Ther.*, *28*(2), 88-96.

Sangha,O., Stucki,G., Liang,M.H., Fossel,A.H., & Katz,J.N. (2003). The Self-Administered Comorbidity Questionnaire: a new method to assess comorbidity for clinical and health services research. *Arthritis Rheum.*, *49*(2), 156-163.

Schnittker,J. (2005). When mental health becomes health: age and the shifting meaning of self-evaluations of general health. *Milbank Q.*, *83*(3), 397-423.

Schulz,R., & Decker,S. (1985). Long-term adjustment to physical disability: the role of social support, perceived control, and self-blame. *J Pers.Soc.Psychol.*, *48*(5), 1162-1172.

Shadbolt,B. (1997). Some correlates of self-rated health for Australian women. *Am.J.Public Health*, *87*(6), 951-956.

Stewart,S.T., Woodward,R.M., Rosen,A.B., & Cutler,D.M. (2008). The impact of symptoms and impairments on overall health in US national health data. *Med.Care*, *46*(9), 954-962.

Unden,A.L., & Elofsson,S. (2001). Health from the patient's point of view. How does it relate to the physician's judgement? *Fam.Pract.*, *18*(2), 174-180.

Wilcox,V.L., Kasl,S.V., & Idler,E.L. (1996). Self-rated health and physical disability in elderly survivors of a major medical event. *J.Gerontol.B Psychol.Sci.Soc.Sci.*, *51*(2), S96-104.

Williamson,R.J., Purcell,S., Sterne,A., Wessely,S., Hotopf,M., Farmer,A., & Sham,P.C. (2005). The relationship of fatigue to mental and physical health in a community sample. *Soc.Psychiatry Psychiatr.Epidemiol.*, *40*(2), 126-132.

Wolfe,F., Hawley,D.J., & Wilson,K. (1996). The prevalence and meaning of fatigue in rheumatic disease. *J.Rheumatol.*, *23*(8), 1407-1417.

Zigmond,A.S., & Snaith,R.P. (1983). The hospital anxiety and depression scale. *Acta Psychiatr.Scand.*, *67*(6), 361-370.

Zumbo,B.D., & Zimmerman,D.W. (1993). Is the Selection of Statistical-Methods Governed by Level of Measurement. *Canadian Psychology-Psychologie Canadienne*, *34*(4), 390-400.

Zunzunegui,M.V., Kone,A., Johri,M., Beland,F., Wolfson,C., & Bergman,H. (2004). Social networks and self-rated health in two French-speaking Canadian community dwelling populations over 65. *Soc.Sci.Med.*, *58*(10), 2069-2081.

Table 1. Description of study sample; mean (sd) at pre-surgery, 3 and 6 months post-surgery and proportion reporting no changes (n=449).

	Pre-surgery	3-months post-surgery	6-months post-surgery	Proportion reporting no change
Self-rated health	2.5 (0.94)	2.2 (0.86)	2.3 (0.88)	29.4%
Pain on activity	58.9 (17.09)	24.1 (18.14)	20.5 (17.90)	5.1%
Limitation in ADL	52.5 (17.69)	22.5 (16.42)	19.1 (15.68)	1.8%
Limitation in physically more demanding activities	84.3 (15.76)	63.7 (27.94)	57.0 (29.14)	8.7%
Fatigue	42.0 (27.49)	24.8 (22.08)	24.5 (22.88)	5.6%
Anxiety	30.3 (18.46)	18.4 (17.14)	18.0 (17.78)	3.5%
Depression	25.5 (16.66)	16.6 (16.80)	14.9 (15.54)	4.2%
Social participation limitations	41.4 (11.22)	27.7 (17.4)	24.8 (16.86)	4.0%
Difficulty traveling in community	45.1 (24.73)	22.8 (24.73)	18.1 (22.07)	6.7%
Difficulty with recreation/leisure activities	52.2 (23.25)	24.1 (23.66)	18.5 (19.69)	2.2%
Comorbidity – condition count	1.5 (1.49)	1.9 (1.68)	2.1 (1.78)	41.1%

Note: Higher scores represent greater symptoms/difficulties or worse health.

Table 2. Parameter estimates – standardized factor loadings of hypothesized latent health dimensions: Initial and final measurement model; pre-surgery.

	Initial model		Final model[a]	
	Standardized Estimates	p-value	Standardized Estimates	p-value
FACTOR LOADINGS				
Physical Health				
Pain on activity[b]	0.814		0.819	
Limitations in ADL	0.948	< 0.0001	0.942	< 0.0001
Limitations in physically more demanding activities	0.594	< 0.0001	0.619	< 0.0001
Fatigue	0.132	0.0208	0.128	0.0208
Mental Well-Being				
Depression[b]	0.856		0.845	
Fatigue	0.644	< 0.0001	0.656	< 0.0001
Anxiety	0.646	< 0.0001	0.650	< 0.0001
Social Health				
Social participation limitations[b]	0.575		0.582	
Difficulty with recreation/leisure	0.897	< 0.0001	0.888	< 0.0001
Difficulty with travel in community	0.826	< 0.0001	0.831	< 0.0001

[a]Model includes covariates. [b]Designated marker indicator; no p-value computed.

Table 3. Path coefficients and overall model fit – SEM with Self-rated health; cross-sectional analyses.

	Pre-surgery		3-months post-surgery		6-months post-surgery	
	Stand Est.	p-value	Stand Est.	p-value	Stand Est.	p-value
A. PATH COEFFICIENTS (current health status → current SRH)						
Self-Rated Health						
Physical Health	0.042	0.7482	-0.174	0.2436	0.074	0.6206
Mental Well-being	0.323	<0.0001	0.449	<0.0001	0.348	0.0005
Social Health	0.067	0.6241	0.224	0.1738	0.204	0.2176
B. COVARIATE EFFECTS (covariate → SRH)						
Age	0.025	0.6542	-0.018	0.7475	-0.009	0.8572
Sex-men vs women	0.057	0.2657	0.041	0.4883	0.075	0.1559
Education-low vs high	0.145	0.0062	0.059	0.2942	0.118	0.0212
Surg. joint-knee vs hip	0.049	0.3350	0.118	0.1065	0.053	0.3602
Comorbidity count	0.433	<0.0001	0.377	<0.0001	0.244	<0.0001
C. SRH R^2	0.460		0.559		0.580	
D. OVERALL MODEL FIT						
RMSEA	0.043		0.054		0.059	
(90% CI)	(0.027, 0.059)		(0.036, 0.071)		(0.042, 0.075)	
P(RMSEA≤0.05)	0.7420		0.3390		0.1830	
CFI	0.982		0.979		0.976	
TLI	0.969		0.964		0.959	
SRMR	0.028		0.029		0.030	

Table 4. Parameter estimates – model examining the stability of SRH; longitudinal analyses.

	Pre-surgery		3-months post-surgery		6-months post-surgery	
	Stand Est	p-value	Stand Est	p-value	Stand Est	p-value
A. REPEATED MEASURES						
			Pre-surgery → 3-months post		3-months → 6-months post	
SRH			0.685	<0.0001	0.748	<0.0001
Physical Health			0.379	<0.0001	0.863	<0.0001
Mental Well-Being			0.421	<0.0001	0.738	<0.0001
Social Health			0.744	<0.0001	0.876	<0.0001
Comorbidity			1.080	<0.0001	0.991	<0.0001
B. CURRENT HEALTH STATUS → CURRENT SRH						
Self-Rated Health						
Physical Health	0.038	0.8501	0.104	0.5307	0.059	0.6255
Mental Well-being	0.205	0.0431	0.262	0.0147	0.133	0.1148
Social Health	0.154	0.5144	0.113	0.5157	0.119	0.3447
C. COMORBIDITY COUNT → CURRENT SRH						
Comorbidity	0.433	<0.0001	0.017	0.8240	0.022	0.7130
D. SRH R^2	0.418		0.720		0.925	

Table 5. Parameter estimates – model examining the responsiveness of SRH to past and current health status; longitudinal analyses.

	Pre-surgery		3-months post-surgery		6-months post-surgery	
	Stand Est	p-value	Stand Est	p-value	Stand Est	p-value
A. PAST HEALTH STATUS → CURRENT SRH						
			Pre-surgery → 3-months post		3-months → 6-months post	
Self-Rated Health						
Physical Health			-0.296	0.1092	0.123	0.6341
Mental Well-being			-0.311	0.0054	-0.487	0.0018
Social Health			0.259	0.2364	-0.070	0.8049
B. REPEATED MEASURES						
			Pre-surgery → 3-months post		3-months → 6-months post	
Self-rated health			0.773	<0.0001	0.990	<0.0001
Physical Health			0.375	<0.0001	0.747	<0.0001
Mental Well-being			0.444	<0.0001	0.739	<0.0001
Social Health			0.748	<0.0001	0.880	<0.0001
Comorbidity			1.080	<0.0001	0.991	<0.0001
C. CURRENT HEALTH STATUS → CURRENT SRH						
Self-Rated Health						
Physical Health	0.113	0.5775	-0.029	0.8745	-0.070	0.7459
Mental Well-being	0.264	0.0114	0.492	0.0003	0.430	0.0018
Social Health	0.099	0.6708	-0.035	0.8579	0.173	0.4678
D. SRH R^2	0.452		0.826		0.993	
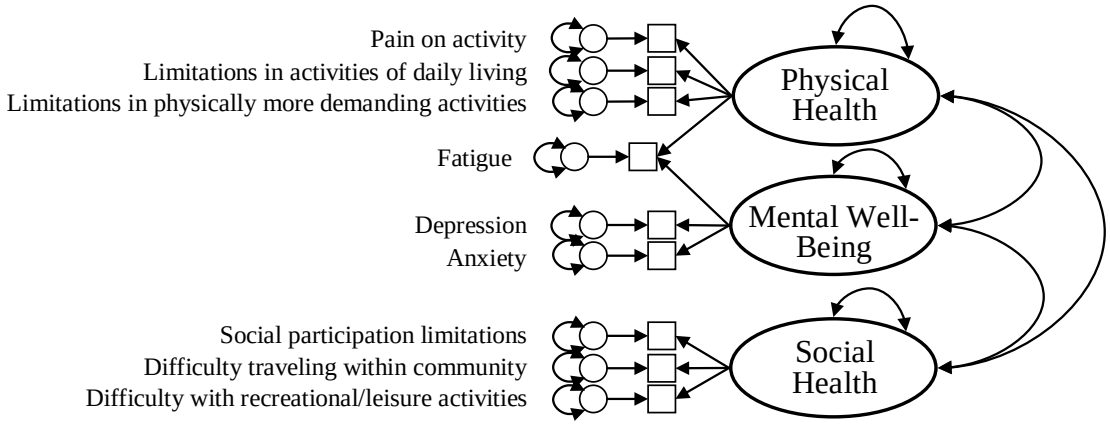
Figure 1. Hypothesized measurement model for self-rated health.