Title

The importance of self-rated health and mental well-being in predicting health outcomes following total joint replacement surgery for osteoarthritis.

Authors

Anthony V Perruccio, PhD 1*, Aileen M Davis, PhD 1,3, Sheilah Hogg-Johnson, PhD 2,4, Elizabeth M Badley, DPhil 1,2

1. Division of Health Care and Outcomes Research, Toronto Western Research Institute, University Health Network, Toronto, Canada
2. Dalla Lana School of Public Health, University of Toronto, Toronto, Canada
3. Graduate Departments of Physical Therapy, Rehabilitation Science and Health Policy, Management and Evaluation, University of Toronto, Toronto, Canada
4. Institute for Work and Health, Toronto, Canada

*Corresponding author:
TWRI
399 Bathurst St.
MP 10-322
Toronto, ON M5T 2S8
Phone: 416 603-5800 ext.3166
E-mail: perrucci@uhnres.utoronto.ca

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Abstract

Objective: Studies of the determinants, and the scope of outcomes examined, in patient-reported total joint replacement (TJR) outcomes have typically been limited to aspects of physical health. We investigated mental well-being, physical and social health and self-rated health (SRH) as predictors of future health status within a cohort undergoing a TJR for hip or knee osteoarthritis. We also investigated the inter-relationships among these health dimensions as they relate to SRH.

Methods: Participants (215 hip; 234 knee) completed measures pre-surgery and 3 and 6 months post-surgery: pain, physical function, fatigue, anxiety, depression, social participation limitations, passive/active recreation, and community mobility. Structural equation modeling was used to investigate the inter-relationship between the latent health dimensions (physical, mental, social) and the predictive significance of SRH for future health status.

Results: Mean age: 63.5 years (range: 31, 88); 60% female. Prior dimension status strongly predicted future status. Adjusted for prior dimension scores, comorbidity and sociodemographic characteristics, SRH predicted future scores for all three health dimensions. Worse prior SRH predicted less improvement at all time-points. The effects of physical and social health on SRH were fully mediated through mental well-being. Only mental well-being significantly predicted SRH, within and across time.

Conclusion: Mental well-being is critical for understanding the relationship between physical health and SRH. In addition SRH significantly predicts TJR outcomes, above and beyond prior physical health. The exclusive focus on any one health dimension may lead to missed opportunities for predicting and improving outcomes following surgery, and likely improving overall health generally.
Osteoarthritis (OA) is the most common joint disorder in the world and the leading cause of disability in Western populations. When conservative treatment fails to alleviate hip and knee joint pain and dysfunction caused by OA, total joint replacement (TJR) is an elective surgical option that can provide significant pain relief and improved function with proven cost-effectiveness (1-3).

Different types of outcomes have been used to evaluate TJR procedures. Traditionally, these outcomes centered on surgeon perceptions, were technically oriented (e.g., range of motion or radiographic findings), and focused primarily on pain and function. More recently, a greater emphasis has been placed on patient-centered outcomes and health-related quality of life (3).

Improvements in pain and function following hip and knee TJR have been well established (4-6). There is some work which has reported on improvements in other dimensions of health as well, including mental health and social functioning (4;7;8). However, while there has been work which has examined the determinants of these outcomes, the primary focus has been on evaluating demographic and socio-economic characteristics, pre-operative comorbidity and pre-operative pain and function as determinants of post-operative pain and function (9-11). These factors have modestly, though significantly, explained variations in post-operative pain and function. Prosthetic and procedure-related factors also have been examined as determinants (11;12). More recently, patient expectations and pre-operative psychological factors have been discussed and assessed as determinants of post-operative pain and function and health-related quality of life generally (13-15).

While individual determinants of hip and knee TJR outcomes have been identified, what has been neglected is the concomitant consideration of patient-reported mental and social health status with pain and physical function status. Moreover, a number of studies have documented
the predictive significance of self-rated health for a number of health outcomes, including social-psychological well-being, morbidity, health care utilization and mortality (16-18). These findings have been relatively consistent across varying chronic condition groups, clinical and community cohorts, and over varied time periods, even after controlling for morbidity, health-related behaviours, and access to health services. However, self-rated health has not been fully considered in TJR patient-reported outcomes. The aim of this study was to identify novel determinants of TJR outcomes during the recovery period and identify potential areas for targeted intervention, beyond physical aspects of health, which may improve the overall health of patients with arthritis and joint replacement surgery. We longitudinally examined the predictive significance of self-rated health for future health status (i.e. physical health, mental well-being and social health (labelled health dimensions)) in a cohort of individuals within 6 months of undergoing TJR surgery for hip or knee osteoarthritis. Prior to investigating these longitudinal relationships, we explored the inter-relationship between the health dimensions as they relate to self-rated health.
MATERIALS AND METHODS

Study setting and patient sample

Individuals undergoing primary unilateral TJR for hip or knee osteoarthritis (n=449: 215 and 234 patients, respectively) were consecutively recruited from four Toronto, Canada academic 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 hemiarthroplasty, or revision-arthroplasty were ineligible.

The study was approved by the University Health Network Research Ethics Board, the University of Toronto Office of Research Ethics and 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 at each time point by the question: “In general, would you say your health is...” Excellent; Very Good; Good; Fair; Poor with scores ranging from 1 to 5, respectively. SRH was treated continuously in this study. It is not uncommon for an ordinal scale variable with 5 or more levels, particularly when it is viewed as a proxy for an underlying continuum, as is SRH (19), to be operationalized as such. Further, since repeated measures of SRH were being examined, it was particularly important to account for its reliability. We specified SRH to have an $r=0.78$ in this study, the average of reported estimates from population and clinical trial data (20;21), which are based on SRH being operationalized as continuous.

Health status measures (serially collected)

Pain on activity was assessed using the Hip Disability (22) (HOOS) and Knee Injury (KOOS) and Osteoarthritis Outcome Score (23) pain subscales. These measures assess the
frequency and extent of pain during activities such as ‘walking on a flat surface’ and ‘going up/down stairs’.

*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 (24), this measure assesses individuals’ ability to move around and look after themselves, eliciting the degree of difficulty experienced due to their hip or knee.

*Limitations in more physically demanding activities* were assessed using the HOOS/KOOS function in sport and recreation subscale (22;23). Individuals rate their degree of difficulty when active on a level beyond that captured by the WOMAC.

*Fatigue* was assessed using the Profile of Mood States fatigue subscale (25). The POMS is a frequently used measure of fatigue in the literature and has been used to study fatigue in a range of chronic conditions.

*Anxiety* and *Depression* were captured using the Hospital Anxiety and Depression Scale (26). The HADS has been widely used in outpatient populations (27).

*Social participation limitations* were assessed using the Late Life Function and Disability Instrument limitation subscale, disability component (28). Respondents rated the extent to which they felt limited in their ability to personally perform in 16 socially expected life tasks.

*Difficulty traveling within community/neighbourhood* and *Difficulty with recreation/leisure activities* were assessed using an adaptation of the Calderdale Health and Disablement Survey (29). The questionnaire was designed to assess the extent to which a respondent’s chronic condition limits their mobility or ability to travel within their community and the extent of difficulties in participating in social and leisure activities.

*Comorbidity:* Individuals responded yes/no to a list of 14 medical problems identified in the
Self-Administered Comorbidity Questionnaire (30).

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

**Latent Health Dimensions**

Indicators for physical health, mental well-being and social health were developed as latent variables. The latent variable for physical health was captured by pain on activity, limitations in ADL, limitations in more physically demanding activities, and fatigue; the mental well-being latent variable by anxiety, depression, and fatigue; and the social health latent variable by social participation limitations, difficulty traveling within community/neighbourhood, and difficulty with recreation/leisure activities. Confirmatory factor analyses confirmed that the health measures corresponded with three health dimensions and the longitudinal stability of our measurement model (31), ensuring that temporal changes in health dimension scores were due to true changes and not changes in the measurement structure over time.

Since comorbidity was a count variable, and not a measure of degree of severity or extent of symptoms, it was specified as a predictor of the health dimensions, along with the covariates.

**Analyses**

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

Structural equation modeling was used throughout using Mplus 3.13. Four indices were used to determine overall model fit: RMSEA, SRMR, CFI and TLI. Good fit was supported by
RMSEA $\leq 0.05$ (with a 90% upper confidence limit $< 0.08$) and a non-significant $P(\text{RMSEA} \leq 0.05)$, SRMR $\leq 0.08$, and CFI and TLI $\geq 0.95$ (32;33). Standardized covariance residual matrices, modification indices and expected parameter change values also were examined.

To examine the inter-relationship between the health dimensions as they related to self-rated health, a structural regression model was specified whereby self-rated health was initially regressed on all of the latent health dimensions. The latent health dimensions were allowed to covary. The covariates and comorbidity count were specified as predictors of self-rated health and the health dimensions. Subsequently, to explore the potential for mediated effects between the latent health dimensions and self-rated health, analyses were undertaken whereby, initially, each of the latent health dimensions was considered as the only predictor of self-rated health (adjusted for covariates). This was followed by analyses which examined the significance of pair combinations of the health dimensions as predictors of self-rated health (adjusted for covariates). These analyses were replicated at each of the three time-points (i.e. pre-surgery, and 3 and 6 months post-surgery).

To test the predictive significance of self-rated health for physical health, mental well-being and social health, a structural regression model was specified whereby the health dimension statuses at the 3 and 6 month time points were regressed on prior self-rated health (i.e. pre-surgical and 3 month self-rated health, respectively). This model controlled for comorbidity count and the covariates. Additionally, to ensure that the relationships of interest were not confounded by prior health status and changes in health status, this model also controlled for prior health dimension status, prior self-rated health status, and for the effect of changes in the
health dimensions over time on future self-rated health. Repeated measures were specified to have their error variances covary over time.
RESULTS

Near equal proportions of hip and knee surgeries were represented (47.9% and 52.1%, respectively). Females comprised sixty percent of the sample. The mean age of the sample was 63.5 years (median: 64.0; range: 31, 88). The majority reported post-secondary education (72%). Pre-surgery, 13.5% reported “excellent” self-rated health (SRH), 36% and 37% reported “very good” and “good”, respectively, and 13.7% “fair” or “poor” SRH.

The mean health measure scores across time are presented in Table 1. As expected, pre-surgical scores for the physical health dimension measures showed a high level of severity in this TJR sample(34). The mean pre-surgical anxiety score was relatively similar to the mean score derived from normative data provided for the HADS(35). The mean depression score, however, was higher than that from normative data(35). Similar levels of limitation were observed between the social health dimension measures. A mean score of 41.4 for social participation limitations reflected a moderate to severe level of limitation(28).

With the cross-sectional analyses of self-rated health regressed on all of the health dimensions, adjusted for comorbidity count and covariates, the models displayed very good overall fit at each time point (RMSEA range: 0.043 to 0.059; P(RMSEA≤0.05) range: 0.1830 to 0.7420; CFI and TLI range: 0.959 to 0.982; SRMR range: 0.028 to 0.030). Age, sex, and surgical joint were not significantly associated with self-rated health. Lower education was significantly associated with poorer self-rated health as was a greater number of comorbid conditions. Consistently, mental well-being was the only health dimension to independently predict self-rated health (Table 2, Part A). However, while the effects of physical and social health on self-rated health were insignificant, significant intercorrelations were observed between each of the dimensions.
When considered independently, each of the health dimensions significantly predicted self-rated health across time points (Table 2, Part B; Figure 1, Models 1-3). However, when each of physical health and social health were considered in combination with mental well-being, only mental well-being remained significant (Table 2, Part C; Figure 1, Models 4 and 5). The intercorrelation between these health dimensions remained significant at all time points, however. This suggested that the effects of both physical and social health on self-rated health were being mediated through mental well-being. Further, when physical health and social health were considered in combination, only social health remained a significant predictor of self-rated health (Table 2, Part C; Figure 1, Model 6). Again, the intercorrelation between these two dimensions remained significant, further suggesting that the effects of physical health on self-rated health were mediated through social health.

Fit statistics for the longitudinal model which investigated whether past self-rated health predicted changes in the health dimensions over time indicated a very well fitting model (CFI=0.964; TLI=0.952; RMSEA=0.049 (90% CI: 0.041, 0.057); P(RMSEA<0.05)= 0.590; and SRMR=0.058). Figure 2 is a diagrammatic representation of this model. As noted in Figure 2, this model longitudinally adjusted for past health status, the effects of past self-rated health on future self-rated health, and the relationship between the health dimensions and self-rated health within time-points. Only significant effects are shown in Figure 2. Although not shown in the figure, this model also adjusted for the covariates and comorbidity count.

Having adjusted for past health dimension scores, past self-rated health significantly predicted future physical health, mental well-being and social health status at each of the follow-up time points, with the exception of social health by 6 months (Table 3, Part A). In all cases, worse past self-rated health predicted worse future health dimension scores. The effects were
greatest at 3 months post surgery and at both time points the significant effects on the dimensions were fairly similar.

Longitudinally, self-rated health was responsive only to changes in mental well-being (Table 3, Part B); the greater the improvement in mental well-being, the greater the improvement in self-rated health during the recovery period. Within time points, mental well-being remained the only health dimension which predicted self-rated health (Table 3, Part D). However, as was the case in the cross-sectional analyses, the intercorrelations between the health dimensions remained significant at all time points in the longitudinal model. This continued to support the view of a mediated effect of physical and social health on self-rated health through mental well-being. Finally, as expected, past health dimension status strongly predicted future health dimension scores (Table 3, Part C).

Significant covariate effects, predominantly at baseline, were observed (data not shown). Results are summarized below by health dimension, followed by effects on self-rated health.

For physical health: Older individuals scored better pre-surgically than younger individuals but worse by 3 months post-surgery. However, by 6 months no significant age effects were found. Women scored worse on physical health at baseline and at 6 months. Level of education was significant only at baseline, with a lower level of education associated with worse scores. Finally, a higher comorbidity count was associated with worse physical health.

For mental well-being: As for physical health, older individuals scored better at baseline, but by 3 months post-surgery scored worse than younger individuals. Women scored significantly worse only at baseline. An increased comorbidity count was positively associated with worse mental well-being scores only pre-surgically.

For social health: Age displayed no significant effect on social health at any time point.
Women scored worse pre-surgically and at 3 months post-surgery; no effect was found at 6 months. Individuals with lower education levels scored worse on social health both pre-surgically and at 6 months post-surgery. While individuals undergoing knee TJR scored better on social health pre-surgically than hip TJR patients, at 3 months post-surgery the reverse was true. Comorbidity count was positively associated with worse social health scores at baseline.

Neither age, sex, level of education or surgical joint was a significant predictor of self-rated health at any time point during the 6 months of observation, with the exception of education at baseline, where lower education was associated with poorer self-rated health.
DISCUSSION

This study considered self-rated health as a potential determinant of health outcomes following total hip and knee replacement surgery for osteoarthritis. Self-rated health has been well established as an important chronic disease health outcome. It has also consistently been shown to be associated with a number of important health outcomes. Even so, it has not been fully considered in total joint replacement patient-reported outcomes. Further, the study sought to characterize the relationship between physical, mental and social health (health dimensions) as they relate to self-rated health with an aim to better understand and characterize the role that these health dimensions potentially play in the maintenance and (or) achievement of good overall health, and subsequently to improved outcomes for individuals with arthritis who have had total joint replacement surgery.

Having taken into account past health status, changes in health status, the association between the health dimensions, sociodemographic characteristics, type of surgery and comorbidity, past self-rated health significantly predicted future health status within the 6 months following total joint replacement surgery for osteoarthritis. In fact, self-rated health predicted changes in all three of the health dimensions considered, physical health, mental well-being and social health. Not surprisingly, poorer past self-rated health predicted poorer future health status. This is consistent with earlier work which has shown fair/poor self-rated health to predict a number of negative health outcomes(16;17;36). In the present context, poorer self-rated health, both pre-operatively and during the recovery process, predicted less improvement over time. These findings provide a strong case for the predictive significance of self-rated health for health status in that the analyses concurrently accounted for past self-rated health and past health status. These findings suggest that a cyclical link between the health dimensions and
self-rated health is operational.

Finding that self-rated health is capable of representing current health status, changes in health status, and further predicting future health status, this study’s findings suggest that epidemiological research and clinical practice should consider an individual’s self-rated health when evaluating overall health, when attempting to forecast future health, and when developing intervention and management strategies to improve overall health. Clinically, these findings suggest that to consider self-rated health, particularly in the event of an intervention and subsequent recovery, is practical and important. In this total joint replacement sample with osteoarthritis, the rate of recovery was partially a function of past self-rated health status.

Initially, where all three of the health dimensions were simultaneously considered as potential predictors of self-rated health, only mental well-being (cross-sectionally) and changes in mental well-being (longitudinally) significantly predicted self-rated health and future self-rated health, respectively. This was surprising for two reasons. One, it was inconsistent with previous work which pointed primarily towards aspects of physical health as strong predictors of self-rated health (37-41). And two, the largest changes in health status were observed for measures attributed to physical health, primarily pain and activity limitations, in the present sample. Having considered only particular dimensions of health and making use of simple linear or logistic regression analyses, previous research may have missed important mediated effects. Our structural equation modeling analyses made it possible to examine direct and mediated effects. And, our findings support the view that mediated effects were operational – the effects of physical health on self-rated health were mediated through social health and mental well-being and the effects of social health on self-rated health through mental well-being in this osteoarthritis cohort recovering from total joint replacement surgery.
While previous work has not considered mediated pathways between health dimensions with respect to self-rated health in this population, there is literature in support of a mediated model. A recent review (42) examined the association of depression or anxiety with medical symptom burden in patients with chronic medical conditions. Findings were consistent across the studies with regards to somatic symptoms, including pain, being at least as consistently and strongly associated with depression and anxiety as were the physiologic measures that were felt to be more objective measures of disease severity. Findings suggested that the burden of physical symptoms and resulting functional impairment caused by complications of medical illness were likely to provoke or worsen episodes of anxiety and (or) depression. Some evidence suggesting that the effects between anxiety/depression and physical symptoms may be bidirectional also was put forward.

Several studies, based on a conceptual model linking social networks to psychosocial mechanisms through to factors more proximate to individual health, have assessed the link between integration into social networks and aspects of psychological health, particularly depressive symptoms, in cross-sectional and longitudinal general population samples, elderly samples, and chronic condition groups (43-45). Commonly, the existence of social networks, and perceptions of greater engagement in social networks, have been linked to fewer depressive symptoms and overall improved mental health. A few studies have further put forward that in groups with chronic conditions, the negative effects of physical symptomatology, primarily pain and functional disability, on psychological well-being are partially mediated through social network effects/supports (45-47).

Irrespective of the mechanism by which the health dimensions interact with each other, however, the predictive significance of mental well-being for self-rated health in this
osteoarthritis cohort appears critically important. These 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 self-rated health in individuals with osteoarthritis recovering from total joint replacement surgery. The identification of mediated pathways between the health dimensions in relation to self-rated health is an important contribution to our understanding of the health predictors of self-rated health, both in this particular population and generally. For patients with osteoarthritis undergoing total joint replacement surgery, and generally for chronic conditions characterized by pain and disability, these findings suggest that interventions limited to the mitigation of pain only, for example, may limit efforts to improve overall health. These findings point towards a need to concurrently consider various aspects of health and potential points of intervention in an effort to improve overall health.

The demographic and patient-reported outcome similarities between this cohort and other total joint replacement cohorts with OA (7;48;49) 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.

A recent study (50) compared patient reported functional outcomes following primary hip and knee total joint replacement between surgeries performed in academic and community hospitals in the Greater Toronto Area. The study included patients recruited from 5 teaching and 5 community hospitals. Significant differences in functional status and patient quality of life were not detected between the academic and community hospital groups at any of the study time points. Therefore, while the current investigation is based solely on academic hospital patients,
this evidence suggests that post-surgical trajectories of functional status and quality of life in the present sample are likely to be typical of primary hip and knee total joint replacement outcomes more generally.

While physical health has always been perceived as one of the major determinants of self-rated health, our results point to the importance of mental well-being, largely ignored in previous research, in understanding the relationship between physical health and self-rated health. These results are particularly intriguing given that this is a sample of individuals undergoing total joint replacement surgery, for which pain and limited physical function are significant indicators. Further, since self-rated health is a significant predictor of a number of health outcomes, including total joint replacement outcomes, our study suggests that researchers and care, treatment and management modalities should consider a broad range of health dimensions, not only physical aspects of health.
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Table 1. Sample health measure scores; mean (sd) at pre-surgery, 3 and 6 months post-surgery (n=449).

<table>
<thead>
<tr>
<th></th>
<th>Pre-surgery</th>
<th>3-months post-surgery</th>
<th>6-months post-surgery</th>
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<tbody>
<tr>
<td>Pain on activity</td>
<td>58.9 (17.09)</td>
<td>24.1 (18.14)</td>
<td>20.5 (17.90)</td>
</tr>
<tr>
<td>Limitation in ADL</td>
<td>52.5 (17.69)</td>
<td>22.5 (16.42)</td>
<td>19.1 (15.68)</td>
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<tr>
<td>Limitation in physically more demanding activities</td>
<td>84.3 (15.76)</td>
<td>63.7 (27.94)</td>
<td>57.0 (29.14)</td>
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<tr>
<td>Fatigue</td>
<td>42.0 (27.49)</td>
<td>24.8 (22.08)</td>
<td>24.5 (22.88)</td>
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<tr>
<td>Anxiety</td>
<td>30.3 (18.46)</td>
<td>18.4 (17.14)</td>
<td>18.0 (17.78)</td>
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<tr>
<td>Depression</td>
<td>25.5 (16.66)</td>
<td>16.6 (16.80)</td>
<td>14.9 (15.54)</td>
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<td>Social participation limitations</td>
<td>41.4 (11.22)</td>
<td>27.7 (17.4)</td>
<td>24.8 (16.86)</td>
</tr>
<tr>
<td>Difficulty traveling in community</td>
<td>45.1 (24.73)</td>
<td>22.8 (24.73)</td>
<td>18.1 (22.07)</td>
</tr>
<tr>
<td>Difficulty with recreation/leisure activities</td>
<td>52.2 (23.25)</td>
<td>24.1 (23.66)</td>
<td>18.5 (19.69)</td>
</tr>
</tbody>
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Note: Higher scores represent greater symptoms/difficulties or worse health.
Table 2. Path coefficients – structural equation model predicting self-rated health; cross-sectional analyses.

<table>
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<tr>
<th></th>
<th>Pre-Surgery</th>
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<th>3-months post-surgery</th>
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<th>6-months post-surgery</th>
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<tr>
<td></td>
<td>Standardized Estimate</td>
<td>p-value</td>
<td>Standardized Estimate</td>
<td>p-value</td>
<td>Standardized Estimate</td>
<td>p-value</td>
<td>Standardized Estimate</td>
<td>p-value</td>
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<tr>
<td>A. Health Dimensions Simultaneously Considered as Predictors of SRH</td>
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<tr>
<td>Physical Health</td>
<td>0.042</td>
<td>0.7482</td>
<td>-0.174</td>
<td>0.2436</td>
<td>0.074</td>
<td>0.6206</td>
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<tr>
<td>Mental Well-being</td>
<td>0.323</td>
<td>&lt;0.0001</td>
<td>0.449</td>
<td>&lt;0.0001</td>
<td>0.348</td>
<td>0.0005</td>
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<tr>
<td>Social Health</td>
<td>0.067</td>
<td>0.6241</td>
<td>0.224</td>
<td>0.1738</td>
<td>0.204</td>
<td>0.2176</td>
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<td>B. Health Dimensions as Independent Predictors of SRH</td>
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<td>Physical Health</td>
<td>0.240</td>
<td>&lt;0.0001</td>
<td>0.401</td>
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<td>Mental Well-being</td>
<td>0.406</td>
<td>&lt;0.0001</td>
<td>0.491</td>
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<td>0.576</td>
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<td>Social Health</td>
<td>0.266</td>
<td>&lt;0.0001</td>
<td>0.435</td>
<td>&lt;0.0001</td>
<td>0.498</td>
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<td>C. Pairwise Combinations of Health Dimensions as Predictors of SRH</td>
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<tr>
<td>Physical Health</td>
<td>0.013</td>
<td>0.8650</td>
<td>0.070</td>
<td>0.5505</td>
<td>0.177</td>
<td>0.2497</td>
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<tr>
<td>Mental Well-being</td>
<td>0.420</td>
<td>&lt;0.0001</td>
<td>0.554</td>
<td>&lt;0.0001</td>
<td>0.759</td>
<td>&lt;0.0001</td>
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<td></td>
</tr>
<tr>
<td>Social Health</td>
<td>0.085</td>
<td>0.2340</td>
<td>0.111</td>
<td>0.3335</td>
<td>0.184</td>
<td>0.0875</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Well-being</td>
<td>0.334</td>
<td>&lt;0.0001</td>
<td>0.419</td>
<td>0.0003</td>
<td>0.430</td>
<td>&lt;0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Health</td>
<td>0.070</td>
<td>0.6400</td>
<td>0.027</td>
<td>0.8680</td>
<td>0.228</td>
<td>0.1610</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Health</td>
<td>0.214</td>
<td>0.0440</td>
<td>0.445</td>
<td>0.0050</td>
<td>0.316</td>
<td>0.0490</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Path coefficients – final model; longitudinal analyses.

<table>
<thead>
<tr>
<th></th>
<th>Pre-surgery</th>
<th>3 months post-surgery</th>
<th>6 months post-surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Stand. Estimate</td>
<td>P-value</td>
</tr>
<tr>
<td>A. PATH COEFFICIENT (past self-rated health → current health status) Pre-surgery → 3 months post-surgery</td>
<td>5.565</td>
<td>0.281</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Physical Health</td>
<td>5.715</td>
<td>0.326</td>
<td>0.0007</td>
</tr>
<tr>
<td>Mental Well-being</td>
<td>5.825</td>
<td>0.448</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. PATH COEFFICIENT (past health status → current self-rated health) Pre-surgery → 3 months post-surgery</td>
<td>-0.016</td>
<td>-0.281</td>
<td>0.0983</td>
</tr>
<tr>
<td>Physical Health</td>
<td>-0.014</td>
<td>-0.251</td>
<td>0.0143</td>
</tr>
<tr>
<td>Mental Well-being</td>
<td>0.038</td>
<td>0.261</td>
<td>0.1802</td>
</tr>
<tr>
<td>Social Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. PATH COEFFICIENT, REPEATED MEASURES (e.g. self-rated health (t1) → self-rated health (t2)) Pre-surgery → 3 months post-surgery</td>
<td>0.819</td>
<td>0.835</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Self-rated health</td>
<td>0.326</td>
<td>0.286</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Physical Health</td>
<td>0.389</td>
<td>0.395</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mental Well-being</td>
<td>0.564</td>
<td>0.294</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>1.080</td>
<td>0.914</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>D. PATH COEFFICIENT (current health status → current self-rated health)</td>
<td>0.008</td>
<td>0.144</td>
<td>0.4758</td>
</tr>
<tr>
<td>Physical Health</td>
<td>0.018</td>
<td>0.312</td>
<td>0.0026</td>
</tr>
<tr>
<td>Mental Well-being</td>
<td>0.003</td>
<td>0.021</td>
<td>0.9283</td>
</tr>
</tbody>
</table>
Figure 1. Diagrammatic representation of findings from the examination of health dimensions as independent and pair predictors of self-rated health; cross-sectional analyses.

Note: Only statistically significant paths and covariations shown. Covariate effects not shown.
Figure 2. Depiction of final model; longitudinal analysis.

<table>
<thead>
<tr>
<th>Pre-surgery</th>
<th>3 months post-surgery</th>
<th>6 months post-surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRH₁</td>
<td>SRH₂</td>
<td>SRH₃</td>
</tr>
<tr>
<td>Physical₁</td>
<td>Physical₂</td>
<td>Physical₃</td>
</tr>
<tr>
<td>Mental₁</td>
<td>Mental₂</td>
<td>Mental₃</td>
</tr>
<tr>
<td>Social₁</td>
<td>Social₂</td>
<td>Social₃</td>
</tr>
</tbody>
</table>

Note: Only statistically significant paths and covariations shown. Covariate effects not shown.