Perceived Health Status Is Associated With Hours of Exercise per Week in Older Adults Independent of Physical Health

Joanna Edel McHugh and Brian A. Lawlor

Background: Perceived health status does not always reflect actual health status. We investigated the association between objective and self-rated measures of health status and hours of exercise per week in older adults.

Method: As part of the TRIL clinic assessment, we gathered information from 473 community dwelling adults over the age of 65, regarding hours spent per week exercising, depression, personality, perceived health status, and objective health status (in the form of a comorbidity count). Regression analyses were performed on these data to investigate whether perceived health status, objective health status, personality and mood are associated with hours of exercise per week.

Results: Perceived and objective health status were significantly but weakly correlated. Both perceived and objective health status, as well as depression, were independently associated with hours of exercise per week.

Conclusions: We conclude that exercise uptake in older adults is contingent on both perceived and objective health status, as well as depression. Perceived health status has a stronger association with exercise uptake in older adults with lower depression levels. The current findings have implications for designing exercise interventions for older adults.

Keywords: self-rated health, physical activity, subjective health, geriatric population

Perceived health status may not always reflect the objectively measurable health status of an individual. However, the perception of one’s own physical health can be an informative and clinically relevant metric, to the extent that it can predict mortality, even when medical history, cardiovascular risk factors, and education have been controlled for. In fact, perceived health status may be a stronger predictor of mortality than either medical history or healthcare utilization. Perceived health status may also predict related, modifiable factors, such as likelihood to engage in health-related behaviors. The current study investigates these potential associations between perceived health status and modifiable health-related behaviors.

It is not quite clear the extent to which perceived health status reflects objectively measurable health status. It has previously been proposed that perceived health status reflects an individual’s awareness of symptoms, diagnoses and functional decline. When information about medical conditions and physical health is available, little variance in perceived health is explained via other factors. This would imply that there is little deviation between perceived health status and actual health status. However, some research has suggested that rather than being a reflection of actual health status, perceived health status is more contingent on social factors (eg, age, marital status, education, number in household, etc).

Perceived health status has many clinical implications, particularly in an aging population. Since health typically declines in old age, perceptions of one’s health are particularly relevant for this age group. It can predict healthcare utilization, diagnosed chronic illness, and physiological fitness, as well as exercise uptake, even when chronic comorbidities are controlled for.

The mechanisms of this relationship between exercise and perceived health status are not yet clear. This association may indeed be circular, since older adults who take regular exercise also report higher levels of perceived health status.

It would be worthwhile to ascertain potential causal relationships between perceived health status and exercise behavior. According to social cognitive theory, changing beliefs can be an effective way of modifying behaviors such as exercise uptake. Tools such as cognitive processing therapy have been successful in improving perceived health status in posttraumatic stress disorder patients. Giving positive feedback to older adults for other behaviors (eg, reading) has been effective in improving adherence.

Since exercise has so many significant effects on overall health, it would likely be beneficial to improve the likelihood of its uptake, and it is possible that this could be achieved by improving perceived health status in older adults.

It is also possible that the association between perceived health status and uptake of exercise is confounded by psychosocial variables. Junowitz reported an association between personality and perceived health status,
and this may be due to the tendency to endorse negative symptoms which is common in individuals with high neuroticism levels. With regards to mood, individuals with depression also view themselves and their health, by extension, negatively. Therefore it is possible that perceived health status reflects uptake of exercise, since low perceived health status could reflect high neuroticism and depression levels. Both depression and high neuroticism levels have previously been found to be associated with low levels of exercise. A depressed individual high in neuroticism levels therefore may engage in little exercise and also endorse poor perceived health status, which would erroneously manifest in a direct association between exercise and self reports of health status. In an aging population, mobility may be an issue also which would presumably lead to low exercise levels, and also to depression. A meta-analysis of 11 randomized, controlled studies found that 9 of these 11 studies showed a positive decrease in depressive symptoms following engagement with exercise, although there was a high level of variation among these studies. Thus the direction of causality between depression and exercise is not clear although there is clearly an association between the two. As well as contributing to the conclusiveness of our knowledge about the depression and exercise association, the current study aims to investigate anxiety and neuroticism in relation to exercise, which are hitherto underexplored variables in the area.

The aim of the current study was to investigate whether objective and subjective measures of health status are independently or interactively associated with exercise levels on older adults. Objective health status was measured using a proxy measurement of comorbidity count. This measure has often been used as an objective indicator of general physical health. It was predicted that there would be independent and separable associations between objective and subjective health status and exercise, reflecting the separable natures of the 2 constructs. Furthermore, we aimed to investigate whether the proposed relationship between perceived health status and exercise is mediated by depression and neuroticism in older populations.

Methods

Participants

Four-hundred and seventy-three participants attending the Technology Research for Independent Living (TRIL) Clinic were involved in the current study. The TRIL clinic offers an outpatient clinical service to community-dwelling adults over the age of 60 in the form of a comprehensive, biopsychosocial geriatric assessments, led by geriatricians, clinical research nurses, and research psychologists. Participants came from GP referrals, emergency department referrals, and self-referrals. Participants lived mostly in the greater Dublin area but some self-referred participants came from other parts of Ireland to participate in the current research. 69% of the sample were female, and the mean age was 72.55 (age range = 60–92). All participants had a mini mental state examination (MMSE) score of 23 or above, as this has previously been shown to be a reliable indicator of cognitive impairment in an older Irish population. All participants gave their informed consent before their inclusion in the study. Local Research Ethics Committee approval was obtained (SJH/AMNCH Research Ethics Committee approval reference number 2007/06/13).

Measures

The primary measure used in the current investigation was perceived health status. This was assessed using a verbal rating scale on 1 item: “How would you rate your overall health on a scale of 1 to 10?” A score of 1 reflected a poor assessment of one’s own health, while a score of 10 reflected a good assessment. This is a widely-used measure of subjective health report and has been shown to encompass many different dimensions of health (eg, functionality, coping with illness, feelings of wellbeing, etc.). Objective health measures were taken in the form of the age-adjusted Charlson comorbidity index (AACI). The Charlson index weights and scores the risk a participant has of dying from a list of 19 comorbid conditions which are differentially weighted according to their associated mortality risks. An extra score is added according to participants’ age for each decade over 40. Scores are summed to give a total score. Exercise was measured as hours per week spent in exercise activities. These data were elicited during a social interview administered by the research psychologist, in which participants were asked “How many hours a week do you spend doing physical activities?” Participants were then asked to elaborate upon the types of physical activity they engaged in, and if required, they were prompted that these activities included walking, jogging, cycling, swimming, aerobics, tennis, dancing, golf, or any other reported sporting activity. To control for potential confounding psychosocial effects, the neuroticism dimension of the revised Eysenck Personality Questionnaire (EPQ-R) was also administered to participants. This scale gives participants scores of 0–24, with scores of 12 or over indicating a significant degree of neuroticism. Depression was assessed using the Centre for Epidemiological Studies Depression measure (CESD-8) which gives participants scores of 0–8, with scores over 7 indicating case level depression, and anxiety was assessed using the Hospital Anxiety and Depression scales anxiety component (HADS-A) which gives participants scores of 0–21, with scores of 11 or above indicating case level anxiety.

Data Analysis

Descriptive statistical analysis was first performed on the outputs of the scales previously described. Bivariate correlation analyses were then performed with these outputs in relation to hours of exercise per week. Following this, backward stepwise multiple linear regression analysis was performed with hours of exercise per week
as the outcome, and perceived health status (PHS) and age-adjusted Charlson index (AACI) as predictors. This type of regression removes the least significant predictor variables to arrive at the most optimal model based on the data. To investigate potential interaction between PHS and AACI, the variables were centered upon their mean, and their product was then entered into the regression model as a predictor (for a detailed methodology of the interaction regression analysis, consult Aiken and West\(^3\)). If the product is found to be a significant predictor in a regression model, there is an interaction between the 2 factors. A second linear regression analysis was then performed with the same variables, with depression, anxiety and neuroticism included as potential confounders in the model. All data were analyzed using SPSS 16.0 software. The significance level of \(P < .05\) was set for all statistical procedures.

## Results

Descriptive statistics were produced for all outcome measures involved in the current analyses (see Table 1).

Bivariate correlation analyses were then performed. It was found that hours of exercise per week was correlated significantly with AACI (\(\rho = -0.329, P < .001\)), age (\(\rho = -0.266, P < .001\)), PHS (\(\rho = 0.348, P < .001\)), anxiety (\(\rho = -0.181, P < .001\)), depression (\(\rho = -0.308, P < .001\)) and neuroticism (\(\rho = -0.136, P < .01\)).

A multiple linear regression model was created with hours of exercise per week as the outcome variable, and AACI and PHS as predictors (see Table 2, section A). The model was shown to be significant \([F_{2,472} = 42.86, P < .001;\) adjusted \(R^2 = .151]\). Both AACI (\(\beta = -0.219\)) and PHS (\(\beta = 0.258\)) were associated with hours of exercise per week.

To further elucidate whether AACI and PHS were independent predictors of exercise, we investigated a potential interaction between AACI and PHS in their associations with hours of exercise per week. The interaction term was created from the newly centered variables and a second regression model was run (see Table 2, section B). This model was also shown to be significant \([F_{3,472} = 28.85, P < .001;\) adjusted \(R^2 = .15]\). In this model, only PHS and AACI were seen to be significantly associated with hours of exercise per week; the interaction was not significant.

To investigate the possibility that perceived health status could be confounded by personality or mood promoting negative endorsement, a regression model was created with comorbidity index (AACI), PHS, neuroticism, anxiety (HADS-A) and depression (CESD-8) as predictors, and hours of exercise per week as the dependent variable. This model was significant \([F_{3,441} = 36.73, P < .001;\) adjusted \(R^2 = .196]\). Comorbidities, perceived health status, and depression were seen to be significantly associated with hours of exercise per week (see Table 3, section A).

### Table 1 Descriptive Statistics for Hours of Exercise per Week (HEW), Age-Adjusted Charlson Index (AACI), Perceived Health Status (PHS), Anxiety (HADS), Depression (CESD), and Neuroticism (EPQ-N) Among the Study Sample

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>95% CI</th>
<th>Min-Max scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEW</td>
<td>473</td>
<td>5.88</td>
<td>5.53-6.23</td>
<td>0–28.3</td>
</tr>
<tr>
<td>AACI</td>
<td>473</td>
<td>3.95</td>
<td>3.65-4.25</td>
<td>0–10</td>
</tr>
<tr>
<td>PHS</td>
<td>473</td>
<td>7.58</td>
<td>7.43—7.73</td>
<td>0—10</td>
</tr>
<tr>
<td>HADS</td>
<td>469</td>
<td>5.28</td>
<td>4.86-5.70</td>
<td>0—21</td>
</tr>
<tr>
<td>CESD</td>
<td>473</td>
<td>1.77</td>
<td>1.44—2.1</td>
<td>0—8</td>
</tr>
</tbody>
</table>

### Table 2 Regression Model With Hours of Exercise per Week as the Outcome Variable, and (A) Objective (AACI) and Perceived (PHS) Health Status, and (B) Objective, Perceived Health, and the Interaction Variable Between the Two as Predictors

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Std. Error</th>
<th>(\beta)</th>
<th>t</th>
<th>Sig.</th>
<th>Tol.</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Objective and perceived health status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.427</td>
<td>0.908</td>
<td>2.672</td>
<td>0.008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AACI</td>
<td>-0.266</td>
<td>0.055</td>
<td>-0.219</td>
<td>-4.821</td>
<td>0.000</td>
<td>0.875</td>
<td>1.142</td>
</tr>
<tr>
<td>PHS</td>
<td>0.600</td>
<td>0.105</td>
<td>0.258</td>
<td>5.694</td>
<td>0.000</td>
<td>0.875</td>
<td>1.142</td>
</tr>
<tr>
<td>(B) Objective, perceived health status, and the interaction product variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>5.874</td>
<td>0.177</td>
<td>33.21</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AACI</td>
<td>-0.269</td>
<td>0.055</td>
<td>-0.221</td>
<td>-4.862</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHS</td>
<td>0.631</td>
<td>0.111</td>
<td>0.271</td>
<td>5.706</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>-0.028</td>
<td>0.031</td>
<td>-0.042</td>
<td>-0.925</td>
<td>0.355</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3  Regression Model With Hours of Exercise per Week as the Dependent Variable, and (A) Objective (AACI) and Perceived (PHS) Health Status, Neuroticism, Anxiety (HADS-A) and Depression (CESD-8) and (B) Centered Objective (AACI) and Perceived (PHS) Health Status, Depression (CESD), and the Interaction Coefficient of Perceived Health Status and Depression as Predictors

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Objective, perceived health status, neuroticism, anxiety and depression as predictors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.965</td>
<td>0.972</td>
<td>4.079</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>AACI</td>
<td>−0.227</td>
<td>0.056</td>
<td>−0.188</td>
<td>−4.061</td>
<td>0.000</td>
</tr>
<tr>
<td>PHS</td>
<td>0.472</td>
<td>0.109</td>
<td>0.204</td>
<td>4.321</td>
<td>0.000</td>
</tr>
<tr>
<td>CESD</td>
<td>−0.433</td>
<td>0.090</td>
<td>−0.220</td>
<td>−4.838</td>
<td>0.000</td>
</tr>
<tr>
<td>(B) Centered objective (AACI) and perceived (PHS) health status, depression (CESD), and the interaction coefficient of perceived health status and depression as predictors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.571</td>
<td>0.216</td>
<td>30.37</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>PHS</td>
<td>0.579</td>
<td>0.102</td>
<td>0.253</td>
<td>5.678</td>
<td>0.000</td>
</tr>
<tr>
<td>AACI</td>
<td>−0.248</td>
<td>0.054</td>
<td>−0.206</td>
<td>−4.58</td>
<td>0.000</td>
</tr>
<tr>
<td>CESD-PHS interaction</td>
<td>−0.057</td>
<td>0.012</td>
<td>−0.206</td>
<td>−4.904</td>
<td>0.000</td>
</tr>
</tbody>
</table>

A second linear regression was performed to investigate potential interaction between perceived health status and depression in their associations with hours of exercise. Centered variables of AACI, PHS, CESD-8 scores, and the product term of depression and PHS were entered as predictors. This model was significant \((F_{3,462} = 39.14, P < .001; \text{adjusted } R^2 = .198)\). Within this model, AACI and PHS were significantly associated with hours of exercise (see Table 3, section B). The interaction variable between depression and PHS was also significant.

To better understand the interaction between depression and PHS, it was plotted graphically (see Figure 1).

**Discussion**

As expected, objective health status, in the form of a comorbidity count, was found to be related to hours of exercise per week. Perceived health status, neuroticism, anxiety, and depression were all related to hours of exercise per week also, which is in line with previous findings in this area. Regression analyses showed that comorbidity count and perceived health status were both independently associated with hours of exercise per week, with no evidence of an additive or an interactive effect therein. It cannot be concluded on the basis
of the current results the extent to which perceived and objectively measured health status are separable as constructs, but with regards to exercise at least, they can be said to be separately associated with hours of exercise per week in older adults.

Depression was also shown to be associated with hours of exercise per week. Upon investigation of a potential interaction between depression and perceived health status as separable constructs, and their effect upon hours of exercise per week, we found that at perceived health status had a stronger relationship with hours of exercise per week in the nondepressed than in the depressed members of the sample. The interaction between depression and perceived health status in terms of hours of exercise per week could then be characterized as additive such that high perceived health status combined with low levels of depression result in the highest levels of exercise per week. We also investigated anxiety and neuroticism as potential associates of hours of exercise per week, but no significant regression relationship was here found. This represents an important and novel finding; anxiety and neuroticism may not have independent relationships with hours of exercise per week, when perceived health status, objective health status and depression are being accounted for.

The current findings have implications for areas of intervention to improve exercise uptake. Perceived health status represents a potential point of intervention for older adults taking insufficient levels of exercise. As previously mentioned within the framework of social cognitive theory, improving perceived health status could potentially increase likelihood to engage in exercise. Clearly this approach would not be suitable for all participants since it is possible that some are currently overestimating their general health, to the extent that they may not feel the need to exercise. This is not likely, however, since older adults tend to favorably compare their own health to that of others, in a process known as ‘social downgrading.’ The application of findings from social cognitive theory and cognitive processing therapies have already been explored to some extent in clinical populations; Dogra and colleagues investigated exercise interventions in older asthmatics, and recommended that educational intervention focusing on beliefs around the limitations caused by asthma could improve perceived health status. Since the current population consisted of largely healthy, community-dwelling volunteers, improving perceived health status may not be as simple as targeting perceptions of a specific issue such as that of asthma, but it is possible nonetheless that by making participants more informed about their health status, this could modify perceived health status.

Another approach to increasing exercise levels may be to focus on reducing levels of depression. High depression levels were associated with low levels of exercise per week in the sample, particularly for those participants who also reported low perceived health status. For those who had high perceived health status, depression levels still indicated low levels of exercise per week. This could be because of the strong overall relationship between health and exercise; those who have poor perceived health are more likely to be immobile or otherwise functionally impaired, which would preclude a lot of exercise. For those who have good self-rated health, then, barriers to high exercise levels may be more psychological in nature, which would explain the contribution of depression here. The current results then suggest that for generally healthy older adults who do not engage in sufficient exercise, it may be worthwhile screening for depression. While current results do not suggest a causal relationship between depression and exercise, the association therein is strong, such that targeting one should affect the other.

Since perceived health status maintained its association with exercise uptake after psychosocial measures were included in the regression model, it can be concluded that the relationship between perceived health status and exercise is not entirely contingent on tendency to negatively endorse, as would be related to incidence of depression and neuroticism. Personality did not appear to affect exercise uptake, but high depression levels were associated with low exercise uptake. Perceived health status is an independent construct, and its association with exercise is separable from psychosocial factors.

The current study had methodological limitations. Since the data were cross-sectional, present comment is limited to observing associations rather than causal relationships. Future research employing longitudinal methods could further investigate the causal nature of the association between depression, health, and exercise uptake. In addition, the population investigated were a community dwelling, voluntary group of older adults. These represent a largely healthy sample of the older population. Thus the current conclusions cannot be extrapolated toward older adults suffering from serious chronic illness, nor those living in residential care. Furthermore the average level of perceived and objective health status may have been positively skewed in comparison with the overall older population. Objective health status was indicated in the current investigation using a comorbidity count, which is simply a count of diseases and syndromes which a participant has been told they have by a doctor. This measure is potentially too narrow to encapsulate true objectively measurable physical health, and future research may be well-advised to employ a more holistic objective health variable to allow a fairer comparison of its predictive power when compared with subjective health status.

In conclusion, we report an association between perceived health status and hours of exercise per week that is distinct and separable to the relationship between actual health status and hours of exercise per week. Depression and perceived health status had an interactive effect on exercise levels. In nondepressed, community-dwelling older adults, aiming to improve perceived health status may be an efficacious way of increasing exercise frequency.
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References


