Correlates of Subjective Well-being in Stroke Patients

Torgeir Bruun Wyller, MD; Jostein Holmen, MD, PhD; Petter Laake, PhD; Knut Laake, MD, PhD

Background and Purpose—Data on survival and functioning after stroke needs to be supplemented by measures emphasizing the patients’ subjective perception. We studied (1) subjective well-being (SWB) as a latent variable in a common-factor model with four items, (2) the reliability of these four items, and (3) variables related to SWB in stroke patients.

Methods—Data on all stroke patients (n=1417) and a random subsample of stroke-free individuals of similar age (n=1439) were collected from the Nord-Trøndelag Health Survey, a cross-sectional study of 74 977 persons. Based on a two-sample factor analysis model, scores of SWB were calculated, and variables explaining SWB were studied in a regression model.

Results—Four items were a priori believed to measure SWB as a latent variable (“satisfaction,” “strength,” “calmness,” and “cheerfulness”). This was confirmed by factor analysis. The reliability of these items (the proportion of the variance of the items that can be explained by the common factor) was between .42 and .53. Regression analyses showed a significant effect of having had a stroke, gender (lower SWB in men), age (increasing SWB with increasing age), perceived general health, nervousness, loneliness, sleep problems, social support, and use of analgesics. There was no statistical interaction between these variables and having had a stroke.

Conclusions—Higher SWB after stroke relates to female gender, older age, good general and mental health, and a firm social network. (Stroke. 1998;29:363-367.)

Key Words: attitude to health ■ quality of life ■ stroke ■ social support

Until a few years ago, stroke research was largely focused on survival. A need to improve the quality of the lives saved is now being increasingly acknowledged. Identification of variables related to life satisfaction in stroke patients is a prerequisite for such efforts.

The concept of quality of life (QOL) has gained increasing popularity among researchers studying the consequences of stroke and other chronic diseases for the individual. However, important criticism has been raised against the use of QOL in medical research. The investigators often fail to specify on what aspect of life they focus and tend not to choose their terms carefully. Concepts like SWB and QOL are not easily measurable. The proportion of the variance of the items that can be explained by the common factor is denoted as the reliability of the items.

Several authors have compared the SWB (or QOL) of stroke patients with that of nonstroke subjects. With few exceptions, they have found a considerably lower SWB among stroke patients. Our knowledge is more fragmentary, however, as to which aspects of the stroke patients’ lives are the most important determinants of SWB. Studies dealing with this issue have included various sets of possible explanatory variables. The dependent variables have been operationalized in various ways, and a majority of the studies have rather small samples and thus have low statistical power.

The present work had three objectives. First, to study SWB as a latent variable; second, to assess the reliability of the items related to the latent variable; and third, to study variables explaining SWB in a large, population-based sample of stroke patients and stroke-free individuals. Four items were a priori believed to reflect SWB in the stroke as well as the nonstroke populations. These were “satisfaction,” “strength,” “calmness,” and “cheerfulness” (Table 1).

Subjects and Methods

Screened Population

Nord-Trøndelag county is situated in the middle of Norway. About 127 000 of Norway’s 4.2 million inhabitants live there,
mostly in rural areas. All inhabitants aged $\geq 20$ years (85,100 persons) were invited to participate in the Nord-Trøndelag Health Survey\textsuperscript{21,22} during the period from January 1984 to February 1986, and 74,977 persons (88.1\%) attended. The attendance was 76.7\% in the age group 20 to 29 years, increased steadily to a maximum of 93.8\% in the age group 50 to 69 years, and then fell to 89.1\% in the age group 70 to 79 years, and to 71.6\% among persons aged $\geq 80$ years. Causes for nonattendance have been studied in detail.\textsuperscript{21,22} No differences in health status or mortality were found between the younger nonattendants and the attendants of similar age. The nonattendants in these age groups were mainly men, stating “lack of time” as the reason for not attending. In the age group 70 to 79 years, however, 25\% of the nonattendants stated “health problems” as the reason for not participating, and among nonattendants aged $\geq 80$ years, the corresponding percentage was 35. Among these older nonattendants, the mortality during the screening period was approximately fourfold that of attendants of similar age. After the screening period, the mortality among the older nonattendants fell to approximately twice that of attendants of the same age. This is thought to reflect the fact that some did not attend the screening because of terminal illness.\textsuperscript{21,22}

**Screening Procedure**

A postal questionnaire was distributed in advance and collected at attendance. The screening nurses verified that all the questions had been answered and assisted the respondents in filling out the questionnaire if help was needed. The participants were asked to return a second questionnaire by mail, and 64,543 (86.1\% did so). Furthermore, the screening procedure included a chest x-ray and measurements of height, weight, and blood pressure. Participants who were $\geq 40$ years old or suffered from diabetes also had their blood glucose (nonfasting) measured.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score Categories</th>
<th>Mean (SD) Stroke</th>
<th>Mean (SD) No Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables in SWB factor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0 ... 6</td>
<td>3.99 (1.22)</td>
<td>4.46 (1.07)</td>
</tr>
<tr>
<td>Strength</td>
<td>0 ... 6</td>
<td>2.81 (1.18)</td>
<td>3.41 (1.09)</td>
</tr>
<tr>
<td>Calmness</td>
<td>0 ... 3</td>
<td>1.99 (0.95)</td>
<td>2.30 (0.87)</td>
</tr>
<tr>
<td>Cheerfulness</td>
<td>0 ... 6</td>
<td>3.65 (1.12)</td>
<td>3.98 (1.00)</td>
</tr>
<tr>
<td><strong>Explanatory variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived health</td>
<td>0 ... 3</td>
<td>1.04 (0.68)</td>
<td>1.55 (0.69)</td>
</tr>
<tr>
<td>Analgesics</td>
<td>0 ... 3</td>
<td>2.25 (1.07)</td>
<td>2.39 (1.01)</td>
</tr>
<tr>
<td>Impaired mobility</td>
<td>0 ... 3</td>
<td>1.85 (1.26)</td>
<td>2.54 (0.91)</td>
</tr>
<tr>
<td>Nervousness</td>
<td>0 ... 3</td>
<td>2.30 (0.82)</td>
<td>2.47 (0.71)</td>
</tr>
<tr>
<td>Sleep problems</td>
<td>0 ... 3</td>
<td>2.18 (0.95)</td>
<td>2.34 (0.85)</td>
</tr>
<tr>
<td>Help and support as needed</td>
<td>0 ... 4</td>
<td>2.86 (1.22)</td>
<td>2.78 (1.20)</td>
</tr>
<tr>
<td>Loneliness</td>
<td>0 ... 4</td>
<td>2.60 (1.14)</td>
<td>2.80 (1.09)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0 ... 1</td>
<td>0.17*</td>
<td>0.07*</td>
</tr>
<tr>
<td>Angina</td>
<td>0 ... 1</td>
<td>0.20*</td>
<td>0.10*</td>
</tr>
</tbody>
</table>

SWB indicates subjective well-being.

*Proportion with the characteristic in the population.
Study Population

Of those screened, 1417 persons reported having suffered a stroke previously. Their mean age was 71.6 years (SD 12.6), and 48.9% were men. Details about these subjects have been published elsewhere. From the remaining records, we collected a stratified random reference sample of 1439 individuals (46.3% men), with the same age distribution as the stroke patients.

Statistical Methods

A two-sample confirmatory factor analysis was performed, with the stroke and the nonstroke subjects as the two groups. Four items (Table 1) were used as indicators of SWB as a latent variable. The variables were assumed to have multinormal distributions, and maximum likelihood estimates of the factor model parameters were calculated. Since the variables are ordinal rather than continuous, factor analysis methodology that takes the ordinality of the data into account was also applied. Similar results were obtained, and methods based on multinormality were used for further analyses.

Using this factor model, we calculated the factor score. We named the factor score SWB and used this score as the dependent variable in subsequent analyses. The ordinality of multilevel explanatory variables was checked, and adjacent categories were collapsed where appropriate.

Results

The mean scores of the variables are given in Table 1. A two-sample factor model was fitted with use of the four variables. A factor model that constrained the factor loadings to be equal between the samples, but to vary over the items, explained the data adequately (Figure). A higher SWB score reflects a better well-being. The estimated difference in mean SWB score between stroke and nonstroke persons was -0.44 (95% confidence interval, -0.54 to -0.34; P = .0004). We also fitted factor models that in addition to the four SWB items included items mainly tapping mental health. This resulted, however, in a significant loss of fit of the one-factor model.

The reliability of the four items “satisfaction,” “strength,” “calmness,” and “cheerfulness,” was .53, .43, .42, and .49, respectively.

For further analyses we used the SWB scores as the dependent variable. The explanatory variables applied were age, gender, and several indicators of general and mental health, functional capacity, the respondent’s social network, and morbidity. We fitted linear regression models for each of the potential explanatory variables. Each model contained two covariates: the grouping variable (stroke/no stroke) and one of the other explanatory variables (Table 2). Variables with P < .10 were then considered for inclusion in a subsequent multivariate analysis. Gender and age were included in this model regardless of their statistical significance. A model with 12 explanatory variables (Table 2) explained 50.3% of the variance in the SWB score, and none of the remaining variables contributed significantly to the model. We found statistically significant effects of having had a stroke, gender (higher SWB in women), age (increas-

\[ \text{Satisfaction} \]
\[ \text{Strength} \]
\[ \text{Calmness} \]
\[ \text{Cheerfulness} \]

Two-sample factor model for subjective well-being (SWB). e indicates residual error. Model fit: \( \chi^2 = 15.6, df = 9; P = .07 \).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>P</th>
<th>Coefficient</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>-0.46</td>
<td>0.04</td>
<td>&lt;0.005</td>
<td>-0.14</td>
<td>0.04</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.06</td>
<td>0.04</td>
<td>0.14</td>
<td>0.17</td>
<td>0.03</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Age (per 10 years)</td>
<td>-0.02</td>
<td>0.02</td>
<td>0.20</td>
<td>0.04</td>
<td>0.01</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Perceived health</td>
<td>0.60</td>
<td>0.03</td>
<td>&lt;0.005</td>
<td>0.38</td>
<td>0.03</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Analgesics</td>
<td>0.31</td>
<td>0.03</td>
<td>&lt;0.005</td>
<td>0.07</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Impaired mobility</td>
<td>0.24</td>
<td>0.03</td>
<td>&lt;0.005</td>
<td>0.03</td>
<td>0.03</td>
<td>0.21</td>
</tr>
<tr>
<td>Nervousness</td>
<td>0.59</td>
<td>0.02</td>
<td>&lt;0.005</td>
<td>0.31</td>
<td>0.03</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Sleep problems</td>
<td>0.45</td>
<td>0.03</td>
<td>&lt;0.005</td>
<td>0.13</td>
<td>0.03</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Help and support</td>
<td>0.22</td>
<td>0.02</td>
<td>&lt;0.005</td>
<td>0.09</td>
<td>0.02</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Loneliness</td>
<td>0.35</td>
<td>0.02</td>
<td>&lt;0.005</td>
<td>0.19</td>
<td>0.02</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Diabetes</td>
<td>-0.22</td>
<td>0.07</td>
<td>&lt;0.005</td>
<td>-0.03</td>
<td>0.06</td>
<td>0.61</td>
</tr>
<tr>
<td>Angina</td>
<td>-0.26</td>
<td>0.06</td>
<td>&lt;0.005</td>
<td>0.00</td>
<td>0.05</td>
<td>0.97</td>
</tr>
</tbody>
</table>

n = 1536 for the fully adjusted model. The fully adjusted model explained 50.3% of the variance.

*The grouping variable (stroke/no stroke) and one of the other explanatory variables (except the first model, which contains stroke only).
†Adjusted for all covariates simultaneously.
ing SWB with increasing age), perceived general health, nervousness, loneliness, sleep problems, social support, and use of analgesics. The fit of the model was established by inspection of standardized residuals and Cook distances, ie, different plots illustrating to which degree the observed data deviate from the estimated.

To assess whether the role of the explanatory variables differed between stroke patients and controls, interaction terms were introduced. We fitted regression models containing the variables shown in Table 2 plus an interaction term consisting of the grouping variable (stroke/no stroke) and one of the other explanatory variables. In neither of these models did the interaction term reach statistical significance (results not shown). This indicates that the effect of the explanatory variables on SWB is similar for stroke patients and nonstroke subjects.

**Discussion**

The concurrent validity of a measure of SWB is difficult to establish, because no accepted gold standard exists. One has to rely on the construct validity, which in this study was indeed supported by the confirmatory factor analysis (Figure). Some authors include in their measurement of SWB also items mainly tapping mental health. Our results indicate, however, that SWB and mental health, though interrelated, are separate concepts.

The findings confirmed that stroke survivors have significantly lower SWB than control subjects of similar age. However, in another recent study the SWB of stroke patients was reported to be similar to that of a normative population. That study was, however, carried out in a highly selected sample.

The variables that were found to be independently associated with SWB in this study (Table 2) can be roughly summed up as gender, age, physical and mental health, and the social network. The finding of a higher SWB among women is surprising, because most authors report that SWB is either gender independent or lower in females. The gender difference on SWB was slight but statistically significant in the full multivariate analysis in our sample. In this model we also found a positive effect of increasing age on SWB. With our cross-sectional study design, we cannot assess whether this is an effect of age or cohort. Other authors have found that the effect of age is dependent on whether the dependent variable (eg, QOL or SWB) is weighted toward satisfaction or happiness; self-reported happiness seems to decline whereas satisfaction may increase with age.

An effect of the respondent’s social network on SWB has been found in most studies in which such variables have been included, in stroke survivors as well as in other groups. Also, perceived health has been found to correlate highly with SWB in numerous studies, but this relation has, to our knowledge, not been studied specifically in stroke survivors.

Most stroke studies focus on some measurement of disability, mainly performance regarding ADL. Our analysis, including mobility as a typical ADL task, indicated that this variable, though statistically significant in bivariate analysis, has no independent effect on SWB when perceived general health and the respondent’s social network are also taken into account. In a previous study of stroke patients, which included formal assessments of various impairments and disabilities, we found that arm motor impairments had a stronger impact than ADL capacity on SWB.

In conclusion, in this population-based sample of stroke patients we found that SWB is considerably lower than in reference subjects of similar age. In stroke and nonstroke subjects, high SWB is mainly explained by female gender, older age, good general and mental health, and a firm social network. In order to understand, and perhaps improve, the SWB of individual stroke survivors, the social context as well as the patient’s subjective perception of the situation need to be taken into consideration.

**Acknowledgments**

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**References**


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