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Patient-Reported Outcomes

Health-Related Quality of Life in a Slovak Representative Sample: A Validation Study of the Short Form-8 Scale

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ABSTRACT

Objectives: The Short Form-8 (SF-8) is a widely used 8-item tool for health-related quality of life assessment. This study aimed to evaluate the psychometric properties of the Slovak version of the SF-8 in a population sample.

Methods: A cross-sectional survey on a Slovak representative sample (n = 1018; mean age 46.24 ± 16.56 years; 51.3% women) monitoring health and well-being was performed in 2019. Exploratory network analysis and confirmatory factor analysis were used to assess the construct validity of the scale. Reliability and sociodemographic differences were evaluated.

Results: A 2-factor model had an adequate fit to the data [$\chi^2(19) = 186.2$, $P < .001$, comparative fit index = 0.998, Tucker-Lewis index = 0.997, root mean square error of approximation = 0.093, standardized root mean of residuals = 0.039], with high reliability (α = 0.93, ω = 0.95). The physical component score and mental component score (MCS) were negatively associated with the presence of chronic health conditions. Lower physical component score and MCS were associated with higher age ($P < .001$), and lower MCS were associated with female gender ($P < .001$).

Conclusions: The Slovak version of the SF-8 represents a valuable tool for measuring health-related quality of life in the Slovak population in both practice and research.

Keywords: health-related quality of life, psychometric network analysis, SF-8, Slovak representative sample, validity.

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Introduction

Quality of life (QoL) is a broad concept referring to a person's overall well-being. The World Health Organization defines QoL as a "state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity," and in 1995 it had evolved as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns."[1] QoL incorporates the physical, emotional, and social aspects of one's life. An integral component of overall QoL is health-related QoL (HRQoL), which assesses an individual's perceived physical and mental health (MH).[2] HRQoL is accepted as a valid indicator of health status and as a criterion for medical treatments.[3,4]

In the healthcare sector, there has been an increasing effort to evaluate not only clinical and laboratory health indicators but also a patient's subjective life satisfaction and his/her daily functioning.[5,6] The HRQoL concept allows long-term monitoring of an individual's overall condition. Knowledge of the development of HRQoL in a person can lead to the identification of the onset of problematic health and can help people make timely changes in their lifestyle to promote their health.[7] Previous studies have also pointed out that HRQoL is a predictor of treatment success and patient survival.[8,9] This predictive ability suggests that long-term monitoring of HRQoL is an important part of the healthcare process and should be considered in medical decision making.[9] In addition, this kind of information can be further disseminated among the target population, increasing their awareness of the possible consequences of changes in their HRQoL.

Increasing HRQoL has been identified by various international health organizations as a goal for all persons at all stages of life.[10-12] The concept of HRQoL is also often mentioned in connection with the aging of the population.[13] At the same time as the percentage of elderly people increases, the number of chronically ill, incurable patients also increases. There is a myriad of impacts and consequences of chronic diseases on human health.[14] Therefore, there is also an increasing need to measure how much these diseases affect the lives of individuals and the society.[2] Evaluating HRQoL can be used to more sensitively approach the setting and evaluation of healthcare goals for these people.[15,16]

There are several measures that evaluate HRQoL. One of the most commonly used is the Short Form-36 (SF-36) health survey,[17] which was developed in the 1980s for use in the Medical Outcomes Study as a tool for screening and monitoring the progress of a disease or its regression.[17] The SF-36 has been widely

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accepted as a reliable tool to clinically assess a patient's health status, both physical and mental.[18,19] Although the measure is widely used in research and practice and has already been translated into many languages,[20] several abbreviated versions have also been derived due to the time-consuming (5-10 minutes) nature of the original questionnaire. The Short Form-12,[21] Short Form-6D,[22] and Short Form-8 (SF-8)[23] versions have been created and are commonly used.

The SF-8 health survey is composed of 8 questions and completing it takes only 1 to 2 minutes.[23] Each of the 8 questions covers 1 domain of health: general health, physical functioning, limitations in physical activities due to health problems, bodily pain, vitality (VT), limitations in social activities due to health problems, MH, and limitations due to emotional problems. From the individual domain values, overall physical and MH summary measures can be derived. The SF-8 has been shown to effectively monitor population health in large surveys in general and clinical populations.[24] Different versions of the SF-8 have been developed: a standard monitoring health status during the last 4 weeks, an acute one assessing health status during the last week, and a 24-hour acute version.[24] The original version of the SF-8 was developed in the English language, and its scoring was normalized to the US general population.[23] The standard version of SF-8 has been validated in several languages, eg, German,[25] Setswana,[26] Czech,[27] Chinese,[28] or Japanese.[29] The structure of the scale has been settled on 2 factors, one describing physical health and the other MH.

Similar to the SF-36, the SF-8 can be used to evaluate a patient's QoL during illness or treatment.[30] For different subgroups and diagnoses, the SF-8 has been shown to be a valid and reliable tool, eg, diabetes,[31] cancer,[32] acute injury,[33] chronic pain,[34] older people,[35] surgical patients,[36] or conflict-affected populations.[37]

An official translation and validation of the SF-8 are not yet been available in the Slovak Republic. There are no characteristics of a representative sample of the adult Slovak population using either the SF-8 or the SF-36. Making the SF-8 available in the Slovak language will help to enhance research, healthcare, and public health efforts in the country. Therefore, the main focus of the present study is to evaluate the psychometric properties of the scale. This study aimed to (1) verify the factor structure of the Slovak version of the SF-8 health survey, (2) describe its basic psychometric properties, and (3) compare summary scores of physical and MH among respondents with and without specific long-term health complaints.

Methods

Study Design

This is an observational study with a cross-sectional design.

Participants

Data collection and administration were performed by the professional survey company FOCUS on behalf of the research team. The data were collected in face-to-face standardized interviews performed by a team of trained professionals in April 2019. All responses were recorded electronically by tablet or computer using the computer-assisted personal interviewing data collection method.[38] Participation in the survey was anonymous and voluntary. The study sample was selected randomly by the survey company according to several sociodemographic quotas (gender, age group, level of education, economic activity, size of place of living, and region of living) reflecting the general population of the Slovak Republic in year 2019.[39] The study sample comprises 1018 participants (48.7% men; mean age 46.2 ± 16.6 years) and forms a representative sample of the adult general population of the Slovak Republic across all 8 regions of the country. The study was approved by the Ethics Committee of the Olomouc University Social Health Institute, Palacky University Olomouc (no. 2019/05).

Measures

SF-8 health survey

The SF-8 health survey assesses 8 items commonly represented in health surveys: general health perception, physical functioning (limitations in physical activities due to health problems), role physical (limitations in usual activities due to physical health problems), bodily pain, VT, social functioning (limitations in social activities due to health problems), MH, and role emotional (limitations due to emotional health problems).[23] The SF-8 also provides 2 summary scores for MH and physical health (the mental component score [MCS] and the physical component score [PCS]).

Participants self-evaluate the perception of their health condition during the last 4 weeks, responding to questions on a 5-point scale. In questions 1 and 4, participants self-evaluate their health status on a 6-point scale response. Each response is scored in accordance with the SF-36 (version 2, norm-based scoring methods that were normalized to a US general population). This standard-based scoring facilitates comparisons among different versions of the questionnaire, given that the scores are normalized to the same reference population.[23] The score is represented as a T-score that ranges from 0 to 100, with the mean value of 50 and the standard deviation of 10. A higher score indicates better health status.

The SF-8 questionnaire was translated into Slovak following the standard International Quality of Life Assessment forward-backward translation methodology (see Supplementary Material).[40]

Long-term health conditions

The participants of the present study were asked the question "Do you have any long-lasting disorder or disability? Please, mark all possibilities which are related to you." Respondents had the possibility to indicate 18 health conditions. For the purposes of the present study, the following health conditions were analyzed: hypertension, back pain, allergy, migraine, pain of unknown origin, and depression and/or anxiety.

Statistical Analyses

As an exploratory part of the analysis, a psychometric network analysis (NA) was used using the *qgraph*[41] and *bootnet*[42] packages of the R software (R Foundation for Statistical Computing, Vienna, Austria). The network was estimated using the EBICglasso estimator,[43] implementing the graphical least absolute shrinkage and selection operator, where edges in the network represent regularized partial correlations between the nodes, after conditioning on all other network nodes.[44] Furthermore, the parameters of centrality, stability, and replicability were evaluated. Confirmatory factor analysis (CFA) was then used to verify the dimensional structure of the SF-8 scale. The CFA was performed using the *Lavaan* package.[45] The diagonally weighted least squares method based on a matrix of polychoric correlations was used to estimate the CFA parameters. To assess the fit of the models with the data, the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean of residuals (SRMR) were used. For CFI and TLI, a cutoff value higher than 0.95 represents an excellent fit, and a value higher than 0.90 represents an acceptable fit with the data.[46] For RMSEA and SRMR, a cutoff value lower than 0.06 represents an

excellent fit, whereas values lower than 0.08 show an acceptable fit to the data.[46,47] The reliability of SF-8 and its subscales was evaluated by Cronbach's α and McDonald's omega coefficients.

The distribution of PCS and MCS measures was assessed using the Shapiro–Wilk test and histograms. Given that the data did not meet the assumption of normality, nonparametric statistical methods were used for the analysis. Spearman correlation coefficient, which is based on the rank of variables, was used to assess the correlation of individual items and the summary measures of the SF-8 scale. Analysis of variance was calculated by the Kruskal–Wallis test for all variables, except gender and long-term health complaints, for which the Mann–Whitney U test was applied. Dunn–Bonferroni correction was used in multiple group comparisons. For measuring the difference between group means, a standardized effect size Cohen's d was used.[48] A large effect size is considered a Cohen d higher than 0.8.

The R software, version 3.6.3, and the IBM SPSS, version 24 (IBM Corp, Armonk, New York, NY), programs were used for statistical analysis. For all statistical tests, the significance level was set to $P < .05$.

Results

Characteristics of the Research Sample

The sociodemographic characteristics of the research sample are presented in Table 1.

Table 1. The sociodemographic characteristics of the research sample.

Characteristic	n (%)
Sex	
Male	496 (48.72)
Female	522 (51.28)
Age (years)	
18-24	110 (10.81)
25-34	187 (18.37)
35-44	199 (19.55)
45-54	166 (16.30)
55-64	168 (16.50)
65+	188 (18.47)
Education	
Primary school	137 (13.46)
Completed apprenticeship	272 (26.72)
Secondary school, graduated	382 (37.52)
College/university	227 (22.30)
Marital status	
Single	225 (22.10)
Currently married	553 (54.32)
Divorced	72 (7.08)
Widowed	78 (7.66)
Living with a partner (unmarried)	90 (8.84)
Economic activity	
Student	60 (5.89)
Disabled	19 (1.87)
Employed	557 (54.71)
Entrepreneur	83 (8.15)
At home/maternity/parental leave	35 (3.44)
Unemployed	36 (3.54)
Pensioner	228 (22.40)
Long-term complaints	
No illness*	375 (36.8)
Backpain	320 (31.4)
Hypertension	172 (16.9)
Allergy	124 (12.2)
Migraine	81 (8.0)
Pain of unknown origin	66 (6.5)
Depression and/or anxiety	48 (4.7)

*No illness serves as a reference for all analyses.

Psychometric Properties of the SF-8 Scale

Factor structure of the scale

To explore the factor structure of the SF-8 scale, a psychometric NA was used. According to Figure 1, the network splits into 2 parts corresponding to the 2 standard subscales of the SF-8 (physical and mental). The importance of the individual scale items (ie, the nodes in the network) was evaluated with the centrality indices. The indices include node strength, closeness, and betweenness. Items VT and MH have the lowest values of the centrality indices; ie, they are least connected and have the lowest strength for predicting other nodes.

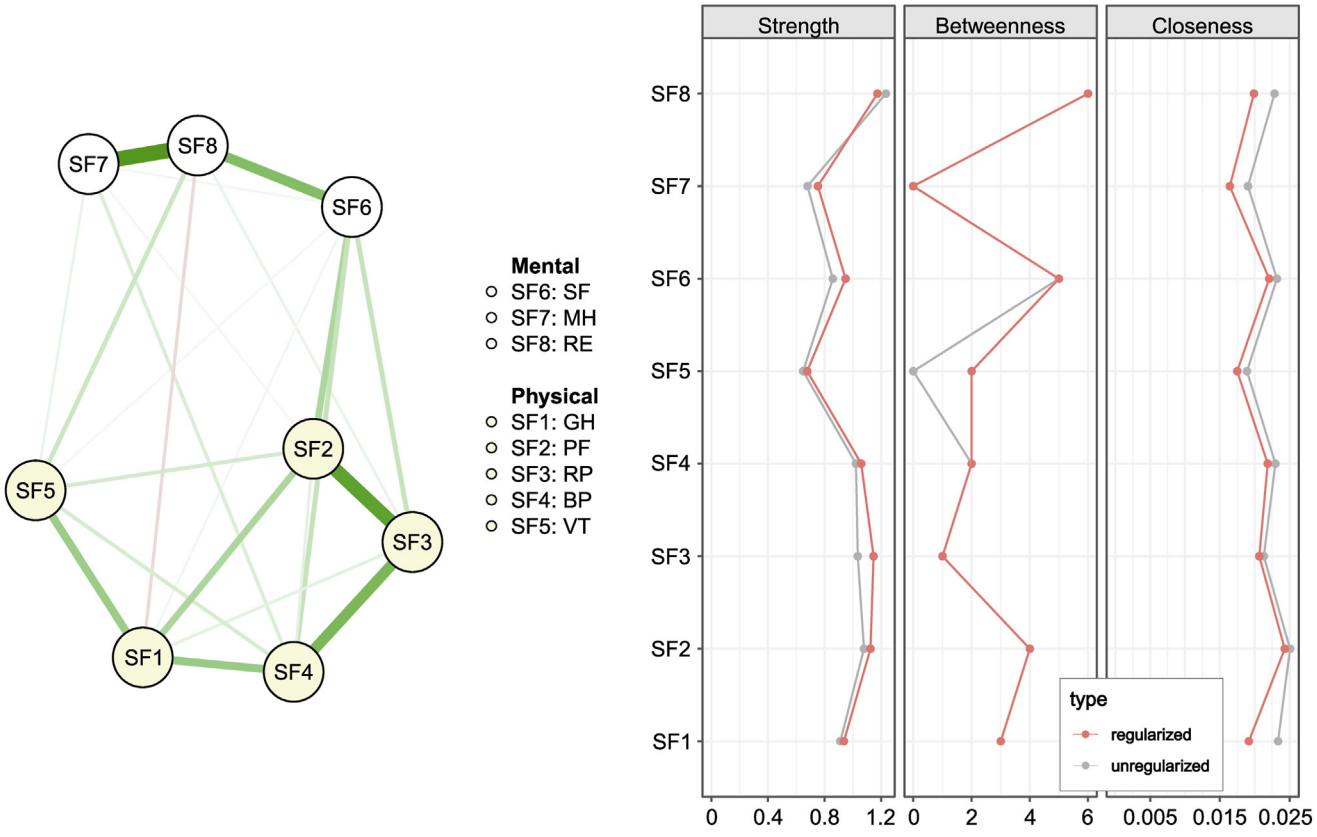
The relationship among the individual SF-8 items, as well as the summary scores of the PCS and MCS, was assessed with nonparametric Spearman correlations. The correlation coefficients were positive, moderate to high, with values ranging from 0.37 to 0.90 (see Table 2). All correlations were statistically significant, with $P < .001$.

After the results of the NA and the discussion about the factorial structure of the SF-8 scale in the scientific literature,[16,25,27,49] we verified the standard 2-factor model and a 1-factor model with the CFA analysis. The model fit values are presented in Table 3. Both models confirmed a high value of CFI and TLI coefficients (>0.95) and a low value of SRMR (<0.06). The RMSEA parameter seems to be problematic in our data, given that the admissible value <0.08[46] was not reached in the 1-factor and the full 2-factor models. The chi-square difference test recommends the use of a 2-factor model [χ^2 (df = 1) = 74.5, $P < .001$]. To improve the RMSEA parameter of the model, we excluded the items with the lowest connectivity in the network, ie, VT and MH. After the exclusion of the VT item, the RMSEA parameter increased, and after the exclusion of the MH item, the RMSEA parameter decreased sufficiently to an admissible value (see Table 3). However, the MH item needs to be kept in the scale, given that the MH factor would contain only 2 items after removing the MH item and thus could not be considered as a separate factor.[50] In addition, the loading of all items in the full 2-factor model was relatively high (>0.79). Therefore, we will consider the standard 2-factor model structure to be valid in the Slovak environment. The model is shown in Figure 2.

Reliability

The internal consistency of the SF-8 scale was verified for the complete 8-item scale. This analysis showed high reliability of the scale confirmed by a Cronbach's alpha of 0.93 (95% CI 0.93-0.94). After the removal of the individual items from the scale, a slight decrease was found in the alpha coefficient. The alpha coefficients for the subscales separately were 0.92 (95% CI 0.91-0.93) for the physical subscale and 0.85 (95% CI 0.84-0.87) for the mental subscale. The Cronbach's alpha coefficient assumes a unidimensional scale; therefore, we also assessed the reliability using the McDonald's omega coefficient (ω). The overall reliability of the Slovak version of the SF-8 scale was high, with a hierarchical omega of ω_h = 0.88 and a total omega of ω_t = 0.95. The omega coefficients for the subscales separately were 0.93 (95% CI 0.92-0.94) for the physical health subscale and 0.85 (95% CI 0.84-0.87) for the MH subscale.

Figure 1. Estimated network structure for the sample of 1018 participants simulated using the true model and computed centrality indices. Centrality indices are shown as standardized z-scores.



Convergent validity

The association of the summary scores of physical health (PCS) and MH (MCS) with the presence of self-reported occurrence of chronic long-term health complaints was assessed (Table 4). In this study, 6 types of subjectively reported long-term health problems were evaluated (hypertension, back pain, allergy, migraine, pain of unknown origin, depression and/or anxiety). In respondents reporting any of these complaints the values of the PCS and MCS were significantly lower ($P < .001$) than in respondents reporting no long-term complaints with a large effect size (Cohen d > 0.90).

Differences in PCS and MCS in Sociodemographic Groups

We investigated male-female differences in the PCS and MCS, and no gender differences were found in the PCS. Men had significantly higher MCS than women, but with only a small effect size ($P < .001$, Cohen d = 0.32). Younger age groups had significantly higher PCS and MCS than older age groups, with a medium effect size ($P < .001$, Cohen d = 0.56) (Table 4).

Discussion

This study aimed to evaluate the psychometric properties of the Slovak version of the SF-8 in a representative sample and to assess differences in sociodemographic groups. The results showed that the SF-8 is a valid and reliable tool for evaluating health status in the Slovak population.

Factor Structure of the SF-8 Scale

The psychometric NA indicated the gathering of items into a standard 2-factor structure, as was previously presented in several studies.[25,27,49] In our study, the VT and MH items have the lowest values of the centrality indices; ie, they are the least connected and have the lowest strength for predicting other nodes.

First of all, the VT item is the most arguable item in the SF-8. Its ambiguous associations and cross-loading have been repeatedly reported in previous studies,[23] and VT was formerly recognized as a general component correlating both with PCS and MCS.[37] Some authors[29,49] have suggested removing this item due to its low performance in the confirmatory analysis. Lang's study[28] even mentioned the possibility of having the VT item as a third factor. According to our results, exclusion of the VT item did not lead to a higher goodness of fit of the CFA model or a stronger internal consistency of the scale. Furthermore, based on the remaining fit criteria (CFI, TLI, SRMR), the full 2-factor model performs well. Therefore, we cannot support removing the VT item from the scale.

Second, the MH item also had lower values for the centrality indices. Although removing this item led to a slight improvement of the model fit, the MH item needs to be kept in the scale, because the MH factor consists of only 3 items. If the MH item it removed, the remaining 2-item subscale could not be considered as a separate factor.[50] Further, according to a study by Tomás,[49] the MH item has substantial meaning to the MH component. Therefore, we do not recommend removing the item from the scale.

Table 2. Spearman correlation coefficients measuring the relationship between the SF-8 items and scores for physical (PCS) and mental (MCS) health.

Variable	GH	PF	RP	BP	VT	SF	MH	RE	PCS	MCS
GH	—									
PF	0.699	—								
RP	0.689	0.833	—							
BP	0.714	0.774	0.814	—						
VT	0.651	0.617	0.603	0.623	—					
SF	0.620	0.750	0.740	0.727	0.587	—				
MH	0.443	0.479	0.512	0.532	0.476	0.572	—			
RE	0.455	0.561	0.573	0.565	0.506	0.671	0.704	—		
PCS	0.821	0.878	0.900	0.880	0.704	0.733	0.375	0.516	—	
MCS	0.486	0.420	0.433	0.488	0.634	0.624	0.897	0.788	0.389	—

Note. All correlations were statistically significant with $P < .001$.
BP indicates bodily pain; GH, general health perception; MCS, mental component score; MH, mental health; PCS, physical component score; PF, physical functioning; RE, emotional roles; RP, role physical; SF, social functioning; VT, vitality.

Long-Term Health Complaints

In the present study, there were differences in the summary scores of the SF-8 questionnaire among participants with and without long-term health complaints, including back pain, allergy, migraine, pain of unknown origin, depression and/or anxiety, and hypertension. Therefore, the SF-8 may help to distinguish the clinical and nonclinical population groups.[27] A significantly lower score on the PCS and MCS was achieved in participants reporting any of the long-term health complaints studied. The lowest levels of both the PCS and MCS in the present study were found in respondents reporting pain of unknown origin or depression and anxiety. Long-term pain can cause a worsening of overall physical health and is associated with depression and anxiety.[51] Lower PCS was previously reported in connection with hypertension,[52,53] back pain,[54] migraine,[55] depression,[56] and numerous chronic illnesses.[57] The association between long-term pain and MH and physical health has been explored in previous studies.[27,54] In the scientific literature, it has already been acknowledged that a vicious circle exists between pain and worsening MH and physical health.[51,58] This vicious circle needs to be addressed, and targeted interventions could lead to the achievement of higher QoL for the afflicted individuals.[59] Long-term health complaints often affect all aspects of life, including physical, cognitive, emotional, behavioral, and social functions.[27,57]

Sociodemographic Differences

According to our results, there was no significant difference in the PCS between men and women, but men had a significantly higher MCS than women. A lower level of MH in women was also found in the validation studies in the Czech Republic,[27] Spain,[36] and Brazil.[16] The scientific literature reveals that gender differences in MH are not based on the quantity or the frequency of MH problems.[60,61] Rather, they are based on the different types of MH problems experienced by males and females. In general, women more often have depression and anxiety (ie, internalizing disorders), whereas men are reported to have higher rates of substance use disorders and antisocial behaviors (ie, externalizing disorders).[62] The MH component of the SF-8 scale predominantly represents internalizing disorders, which may be the reason why women score lower in the MCS than men in Slovakia and other countries.

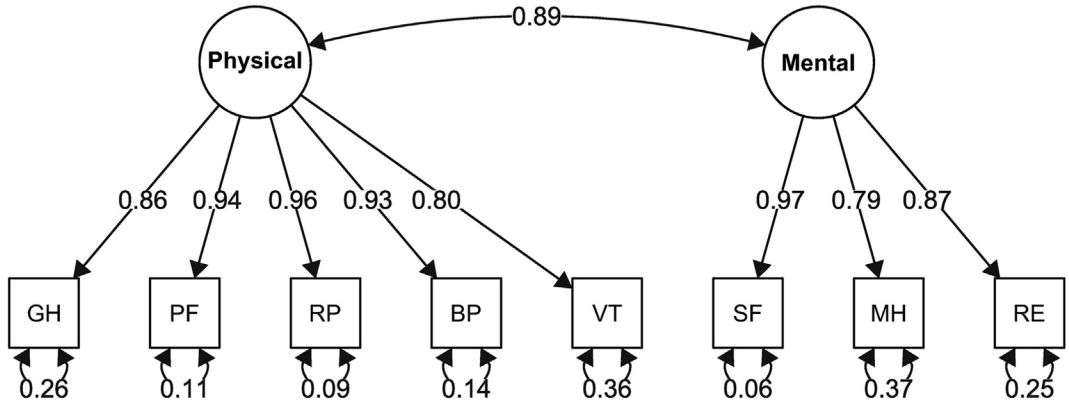
Our study also observed that lower PCS and MCS were related to higher age. This finding was expected and is consistent with

Table 3. Results of a confirmatory factor analysis (CFA): fit parameters of the compared models.

Parameter		2 factors		
	1 factor	Full model	Without the VT item	Without the MH item
DWLS chi-square	353.1 (df 20)	186.2 (df 19)	161.3 (df 13)	44.5 (df 13)
P value	< .001	< .001	< .001	< .001
CFI	0.996	0.998	0.998	0.999
TLI	0.995	0.997	0.997	0.999
RMSEA (90% CI)	0.128 (0.116-0.140)	0.093 (0.081-0.105)	0.106 (0.092-0.121)	0.049 (0.034-0.065)
SRMR	0.059	0.039	0.041	0.021

df indicates degrees of freedom; CFI, comparative fit index; DWLS, diagonally weighted least squares; MH, mental health; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker-Lewis index; VT, vitality.

Figure 2. SEM of the confirmatory factor analysis with individual SF-8 items distributed into 2 standard subscales (physical and mental).



BP indicates bodily pain; GH, general health perception; MH, mental health; PF, physical functioning; RE, emotional roles; RP, role physical; SEM, structural equation modeling; SF, social functioning; SF-8, Short Form-8; VT, vitality.

other scientific studies.[16,28] The decrease in the PCS may be explained by the biological process of aging, whereas the decrease in the MCS may be associated with the subjective perception of health complications.[16]

Strengths and Limitations of the Study

A strength of this study is the use of a large representative sample of the Slovak population. Thus, the results of the study can be extended to the whole Slovak population.

A cross-sectional study design is a limitation because it does not allow us to draw any causal conclusions. The main limitation is that the data were obtained as a self-report survey; therefore, the data may be biased due to social desirability. In addition, because of the self-report nature of the study, we do not know the objective medical diagnosis of the reported long-term complaints. In contrast, self-reported disease inventories are commonly used in national studies, and the results of such studies suggest that self-reported somatic disease assessment is a valid option in health research.[63]

Table 4. Comparison of the PCS and MCS between respondents with and without long-term health complaints (self-reported) and in the sociodemographic groups.

Variables	PCS				MCS			
Long-term complaints	Mean	SD	*P* value	Cohen d	Mean	SD	*P* value	Cohen d
No illness*	55.94	3.96	–	–	55.86	4.69	–	–
Backpain	43.21	9.09	< .001	1.866	49.24	8.92	< .001	0.950
Hypertension	41.16	9.29	< .001	2.402	48.67	9.81	< .001	1.069
Allergy	47.91	9.42	< .001	1.381	49.83	8.59	< .001	1.022
Migraine	45.79	8.12	< .001	2.047	47.40	8.53	< .001	1.521
Pain of unknown origin	36.50	9.10	< .001	3.835	43.69	10.35	< .001	2.070
Depression and/or anxiety	40.77	60.94	< .001	3.165	38.22	58.84	< .001	3.337

Sociodemographic group	Mean	SD	*P* value	Cohen d	Mean	SD	*P* value	Cohen d
Sex			.104	0.102			< .001	0.322
Male	49.79	9.32			53.21	7.47		
Female	49.08	9.35			50.83	8.44		
Age (years)			< .001	1.436			< .001	0.562
18-24	55.95	5.42			55.16	5.96		
25-34	54.58	5.08			53.99	6.13		
35-44	52.83	6.51			53.49	6.19		
45-54	49.32	8.58			52.36	7.45		
55-64	45.52	8.96			50.37	9.09		
65+	40.46	9.58			47.69	9.95		

Note. Mann–Whitney test was used for comparison.
MCS indicates mental component score; PCS, physical component score.
*No illness serves as a reference for all analyses.

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Conclusions

The results of this study confirmed that the Slovak version of the SF-8 survey had sufficient psychometric properties in terms of factor analysis, reliability, and convergent validity. The properties of the scale are comparable with the standard English version and validated versions in other countries.[16,25,27,49] Despite the results discussed earlier, we recommend not using a shortened version of the SF-8. The SF-8 scale represents a suitable tool for evaluating physical and MH in research or clinical practice in the Slovak Republic.

Author Disclosures

Author disclosure forms can be accessed below in the Supplemental Material section.

Supplemental Material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.vhri.2024.101058.

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